



Teachers, Disadvantaged Students, and School Performance:

The Case of Forsyth County Elementary Schools

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EXECUTIVE SUMMARY

Forsyth County, North Carolina has one of the lowest rates of upward economic mobility in the entire United States. Researchers find that one of the strongest correlates of upward mobility is the quality of schools in the local system. Analyzing Forsyth County elementary school data, I find that the percentage of experienced teachers at a school is a significant predictor of performance. At high-performing schools, a much larger share of their faculties consist of highly experienced and educated teachers, compared to low-performing schools that predominately serve economically disadvantaged children. High-quality teachers can have significant long-term impacts on elementary school children, especially those from underprivileged families. Yet in Forsyth County, schools with greater shares of disadvantaged children have lower percentages of teachers with these characteristics. I argue that the school system can assist in reversing low mobility rates by allocating more experienced teachers toward low-performing elementary schools that serve mostly disadvantaged children.

INTRODUCTION

In their seminal paper on intergenerational income mobility, Raj Chetty, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez identify Forsyth County, North Carolina as having the third lowest rate of upward economic mobility in the United States.¹ A child born to parents in the bottom 20 percent of the income distribution has less than a 5 percent chance of reaching the top 20 percent. Chetty et al. identify five factors that are the most correlated with upward mobility.² One of these factors is the quality of primary schools in the local system. Chetty et al. conclude their discussion of schools' role in promoting economic mobility by emphasizing that their findings "strengthen the view that much of the difference in intergenerational income mobility across areas emerges while children are relatively young."³

In Forsyth County, a strong predictor of an elementary school's performance is the percentage of experienced teachers it has on its faculty.⁴ Struggling schools have higher rates of teacher turnover, which is negatively related to performance.⁵ Teachers with more experience and education, however, comprise a much smaller share of the faculty at low-performing elementary schools that serve more economically disadvantaged children – children who have the greatest need for these kinds of teachers.⁶ To reverse low mobility rates in Forsyth County, recognizing the

¹ Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014). Where is the land of opportunity? The geography of intergenerational mobility in the United States. *The Quarterly Journal of Economics*, 129(4), 1553-1623.

² *Id.* at 1.

³ *Id.*

⁴ Each year, NC public schools receive a score based on their performance. This score, which ranges from 100 to 0 with a corresponding letter grade (A to F), is determined by two primary components. The first component (80%) is derived from the schools' achievement scores, which are based on accountability measures. Accountability measures involve statewide grade level assessments, end-of-grade-tests that assess reading and mathematics, and English language attainment assessments for students considered English Learners. The remaining 20 percent is based on the academic growth of the schools' students. Academic growth is measured as the progress students make relative to the average progress made by students throughout NC (for a given grade and subject). Hence, this measures the progress that students have made since the previous year, as a result of the academic instructions received. This information can be found here: <http://www.ncpublicschools.org/src/>

⁵ The NC public school system provides the percentage of teacher who were employed at a particular school the previous year, but have since left the school system (for 2017 and 2018). This metric is referred to as teacher turnover.

⁶ The NC public school system provides the percentage of economically disadvantaged students attending each school in the state, in 2017 and 2018. According to the NC system, a student is considered economically disadvantaged if he/she is a member of a household with an income level below the poverty line.

role that primary schools can play is imperative because as Chetty et al. note, the seeds of upward mobility are sown in early childhood.⁷

My paper proceeds as follows. First, I briefly review the literature. Second, I present the highlights from my analysis.⁸ Last, I discuss the implications of my findings.

BACKGROUND LITERATURE

Attending a high-quality school can have numerous long-term benefits. Dobbie and Fryer Jr. find that high-quality schools in the Harlem Children's Zone can substantially increase the achievements of disadvantaged children.⁹ They demonstrate that attending elementary schools within this zone can close achievement gaps between white and black children.¹⁰ Analyzing Project STAR data, researchers find that children randomly assigned to higher quality classrooms earn more in adulthood and are more likely to attend college.¹¹ Card and Kruger show that for every additional year of schooling spent in a state with high-quality schools, men earn a higher rate of return.¹² The specific characteristics that determine a school's effectiveness at promoting student achievement is of particular interest to researchers. Indeed, studies find that the kinds of teachers a school has can significantly impact its students' long term outcomes.

Teacher quality is crucially important in increasing achievement, especially for disadvantaged children.¹³ Hanushek estimates that having a teacher who is slightly above average in effectiveness can result in a student earning an additional \$400,000 in lifetime earnings.¹⁴ Using a different

⁷ *Id.*

⁸ My analysis uses publicly available school performance data, which can be found at the North Carolina public school website.

⁹ Dobbie, W., & Fryer Jr, R. G. (2011). Are high-quality schools enough to increase achievement among the poor? Evidence from the Harlem Children's Zone. *American Economic Journal: Applied Economics*, 3(3), 158-87.

¹⁰ *Id.* at 9.

¹¹ Chetty, R., Friedman, J. N., Hilger, N., Saez, E., Schanzenbach, D. W., & Yagan, D. (2011). How does your kindergarten classroom affect your earnings? Evidence from Project STAR. *The Quarterly Journal of Economics*, 126(4), 1593-1660.

¹² Card, D., & Krueger, A. B. (1992). Does school quality matter? Returns to education and the characteristics of public schools in the United States. *Journal of Political Economy*, 100(1), 1-40.

¹³ Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in the Chicago public high schools. *Journal of Labor Economics*, 25(1), 95-135.

¹⁴ Hanushek, E. A. (2011). The economic value of higher teacher quality. *Economics of Education Review*, 30(3), 466-479.

approach, Chetty, Friedman, and Rockoff estimate that if a teacher in the bottom 5% of effectiveness was replaced by an average teacher, the average student's lifetime earnings would increase by over \$250,000.¹⁵ Chetty et al. also find that kindergarteners randomly assigned to an experienced teacher earned more in adulthood.¹⁶ Hence, effective teachers are stimulators of upward mobility through their positive influence on students.

Numerous studies find evidence that certain teacher characteristics increase achievement.¹⁷ Researchers find that teacher certifications, licenses, and years of experience are important factors in early student learning and achievement.¹⁸ Other findings suggest that experienced teachers are highly effective at promoting math and reading skills, particularly in elementary schools.¹⁹ Nye, Konstantopoulos and Hedges find similar results demonstrating that the relation between teacher experience and elementary school student achievement is significant.²⁰ Therefore, teacher experience and qualifications can improve student achievement, especially in elementary school. Indeed, the earlier children are exposed to enriching environments, the better the long-term outcomes. This strongly suggests that elementary school, which is the first stage of one's primary education, is a critically important driver of upward mobility. Therefore, it is critical that we

¹⁵ 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), 2633-79.

¹⁶ *Id.* at 15.

¹⁷ Cavalluzzo, L. C. (2004). Is National Board Certification an Effective Signal of Teacher Quality? CNA Corporation; Hanushek, E. A., Kain, J. F., O'Brien, D. M., & Rivkin, S. G. (2005). The market for teacher quality (No. w11154). National Bureau of Economic Research; Rockoff, J. E. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *American Economic Review*, 94(2), 247-252; Rowan, B., Chiang, F. S., & Miller, R. J. (1997). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education*, 256-284; Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research*, 66(3), 361-396; Dee, T.S. 2004. Teachers, Race and Student Achievement in a Randomized Experiment. *Review of Economics and Statistics*, 86(1), 195-210.

¹⁸ Croninger, R. G., Rice, J. K., Rathbun, A., & Nishio, M. (2007). Teacher qualifications and early learning: Effects of certification, degree, and experience on first-grade student achievement. *Economics of Education Review*, 26(3), 312-324.

¹⁹ Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, 95(7-8), 798-812.











²⁰ Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004). How large are teacher effects?. *Educational Evaluation and Policy Analysis*, 26(3), 237-257.

understand how Forsyth County’s elementary schools and teachers can stimulate economic mobility amongst the county’s disadvantaged children.

FINDINGS

Table 1 highlights the key findings from a correlation analysis.²¹ Schools with larger shares of teachers with 0 to 4 years of experience tend to have lower scores. In contrast, schools with larger shares of teachers with over 10 years of experience tend to earn higher scores. Likewise, having larger shares of teachers with advanced degrees and full licenses are also positively related to scores, while teacher turnover is negatively related to scores.

Table 1. Correlations with Performance Score

	School Performance Score	
	2018	2017
% of Teachers with...		
• 0 - 4 Years of Experience		
• Over 10 Years of Experience		
• Advanced Degrees		
• Full Licenses		
Teacher Turnover		

²¹ All correlation coefficients have a statistical confidence of 99 percent.

Figure 1 shows the average share of teachers with 0 to 4, 4 to 10, or over 10 years of experience at Forsyth County elementary schools in 2018, conditional on performance grades. At schools that earned higher grades, the share of teachers with over 10 years of experience is larger, on average, compared to schools that earned lower grades. While at low-performing schools, inexperienced teachers comprise a much larger share.²²

Figure 1. Experience and Performance Grades

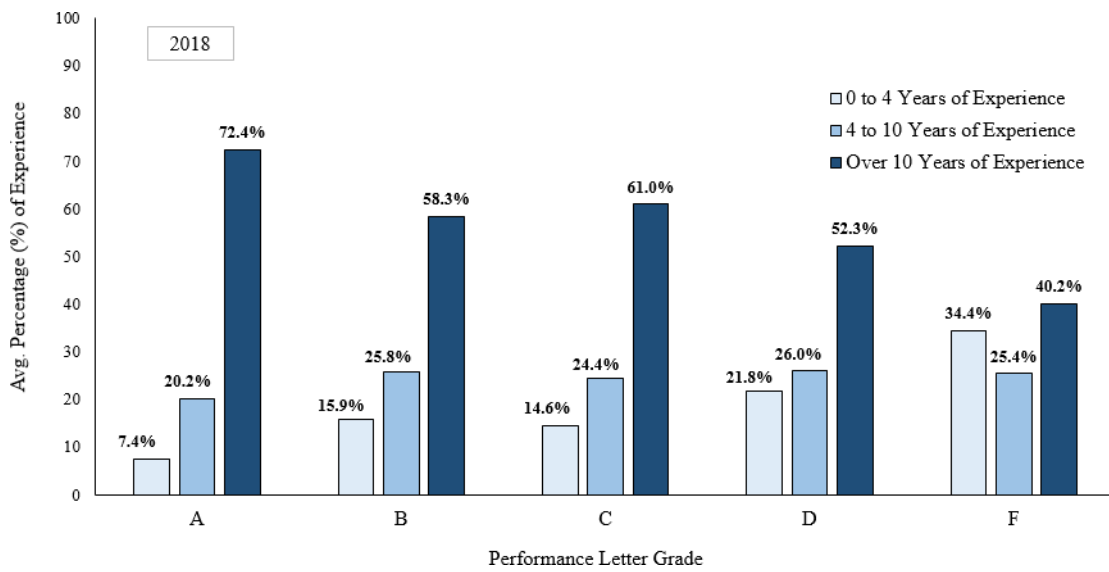


Figure 2 show the average percentage of teachers with advanced degrees at Forsyth County elementary schools in 2018, conditional on their performance grades. The share of teachers with advanced degrees at high-performing schools is larger than at low-performing schools.²³

²² The distribution of teacher experiences in 2018 is very similar to the distribution in 2017.

²³ The distribution of teachers with advanced degrees in 2018 is very similar to the distribution in 2017.

Figure 2. Advanced Degrees and Performance Grades

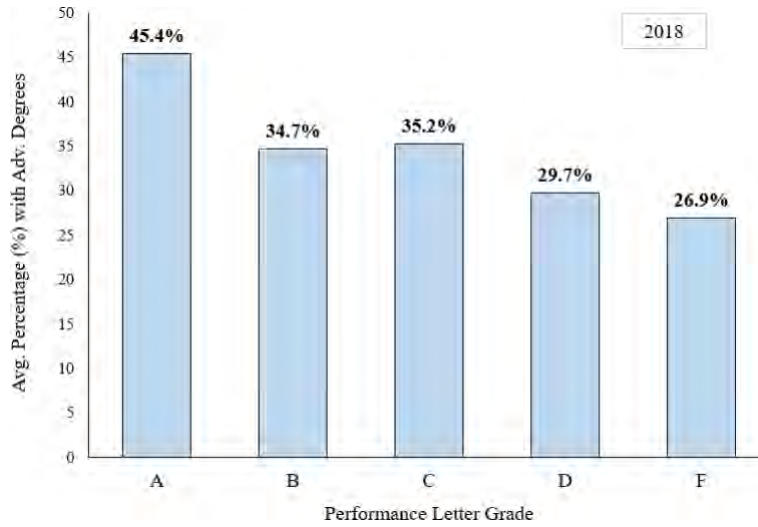
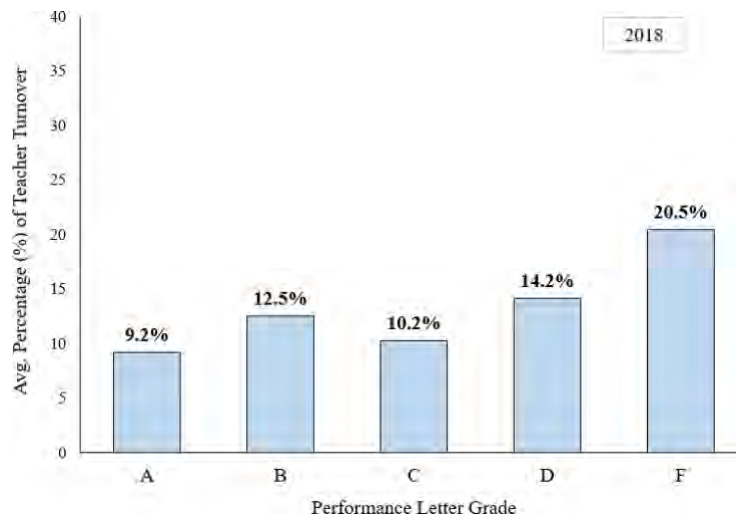


Figure 3 display the average turnover rate at elementary schools in 2018, conditional on performance grades. Schools that earned higher grades had lower turnover rates, compared to schools that earned lower grades.²⁴

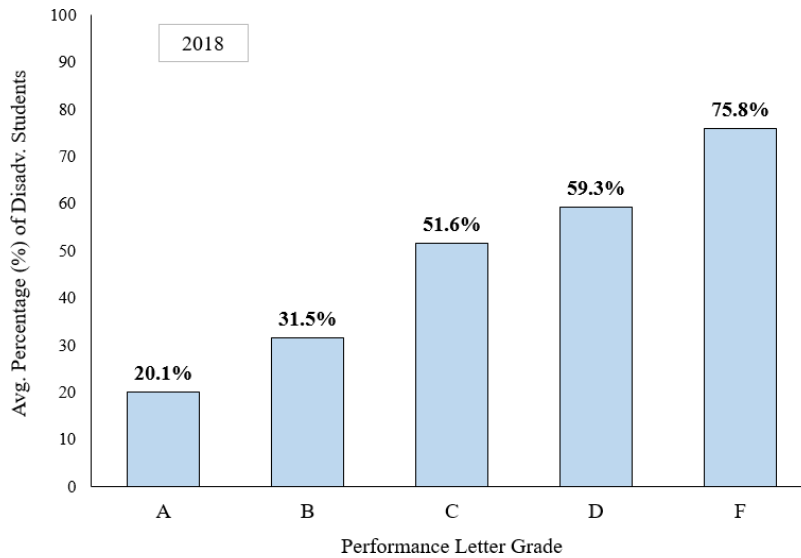
Figure 3. Turnover and Performance Grades



²⁴Teacher turnovers in 2018 are very similar to those in 2017.

The distributions show that better performing schools have higher percentages of experienced teachers. High-performing schools have larger shares of well-educated teachers, and low-performing schools experience higher turnover rates. Moreover, low-performing schools predominately serve disadvantaged students (See Figure 4).²⁵ Furthermore, having large shares of disadvantaged children is inversely related to the share of highly experienced and educated teachers on staff (See Table 2).²⁶

Figure 4. Disadvantaged Students and Performance Grades



²⁵ The distribution of economically disadvantaged students in 2018 is very similar to the distribution in 2017.

²⁶ All correlation coefficients have a statistical confidence of 99 percent.

Table 2. Correlations with Economically Disadvantaged Students

	Economically Disadvantaged Students	
	2018	2017
% of Teachers with...		
• 0 - 4 Years of Experience	+	+
• Over 10 Years of Experience	-	-
• Advanced Degrees	-	-
• Full Licenses	-	-
Teacher Turnover	+	+

I implement a linear regression analysis to measure the impact of the key variables on school performance, while holding constant other variables.^{27, 28} Table 3 displays the key findings.

Table 3. Regression Estimates

	School performance score...
When the share of teachers with 4 to 10 years of experience <i>increases</i> by 1 percentage point...	+ 0.338 points
When the share of teachers with over 10 years of experience <i>increases</i> by 1 percentage point...	+ 0.256 points

²⁷ I use ordinary least squares to estimate the linear regression model.

²⁸ The other variables included in the regression model are the following: average daily student attendance, percentage of economically disadvantaged students, unique book titles available in the library per student, average class size, and year.

Teacher experience is significantly related to performance score. When the share of teachers with 4 to 10 years of experience increases by 1 percentage point, relative to the share of teachers with 0 to 4 years of experience, performance score increases by 0.338 points, holding all else constant.²⁹ When the percentage of teachers with over 10 years of experience increases by 1 percentage point, relative to the percentage of teachers with 0 to 4 years of experience, performance score increases by 0.256 points, holding all else constant.³⁰ Here's a simple illustrative example to provide some context to these results.

In 2018, Petree Elementary School had a performance score of 28, which made it the lowest performing elementary school in the county. Meadowlark Elementary School had a performance score of 89, which made it the highest performing elementary school in the county. At Petree, around 47 percent of teachers had over 10 years of experience and 12.5 percent of teachers had 4 to 10 years of experience. While at Meadowlark, 75 percent of teachers had over 10 years of experience and around 30 percent of teachers had 4 to 10 years of experience. If teacher experience at Petree Elementary was to become like that at Meadowlark, then the percent of teachers with over 10 years of experience would increase by 28 percentage points and the percent of teachers with 4 to 10 years of experience would increase by 17.5 percentage points. As a result of these changes to teacher experience, Petree's performance score rises by $(28 \times 0.256) + (17.5 \times 0.338) = 13.08$ points. Hence, Petree's score rises from 28 (F) to 41 (D).

DISCUSSION

There are noticeable differences between Forsyth County's low- and high-performing elementary schools. At low-performing schools, the share of highly experienced and educated teachers is smaller than those at high-performing schools. Furthermore, the county's low-

²⁹ Statistical confidence: 99 percent.

³⁰ Statistical confidence: 95 percent.

performing schools serve student populations predominately comprised of disadvantaged children. My findings are consistent with other studies that describe similarly skewed distributions of high-quality teachers. Research regularly demonstrates that disadvantaged children have the greatest need for high-quality teachers. Having an effective school teacher, as early as kindergarten, can result in significant increases to lifetime earnings.³¹ Since Forsyth County’s disadvantaged children are less likely to benefit from this, they are missing out on valuable opportunities to improve their upward mobility.

Low-performing Forsyth County elementary schools experience higher turnover than high-performing schools. A 2004 study by Guin found that schools with high turnover have severe difficulties “implementing a coherent curriculum and sustaining positive working relationships among teachers.”³² Indeed, turnover has a particularly negative effect on lower-achieving schools, due to losses in productivity and experience.³³ A study involving 850,000 fourth and fifth-grade students found that high turnover leads to lower math and English scores.³⁴ These detrimental effects were even worse for black students.³⁵

Researchers emphasize that schools with chronic turnover disproportionately serve underprivileged children.³⁶ Exacerbating performance gaps between affluent and disadvantaged schools is the fact that high-quality teachers often leave low-performing schools.³⁷ These effective teachers tend to leave for high-performing schools, while less effective and inexperienced teachers

³¹ 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), 2633-79; Hanushek, E. A. (2011). The economic value of higher teacher quality. *Economics of Education Review*, 30(3), 466-479.

³² Guin, K. (2004). Chronic teacher turnover in urban elementary schools. *Education Policy Analysis Archives*, 12, 42.

³³ 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.

³⁴ Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal*, 50(1), 4-36.

³⁵ *Id.* at 34.

³⁶ *Id.* at 34; Barnes, G., Crowe, E., & Schaefer, B. (2007). The Cost of Teacher Turnover in Five School Districts: A Pilot Study. National Commission on Teaching and America's Future.

³⁷ Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2008). Who leaves? Teacher attrition and student achievement (No. w14022). National Bureau of Economic Research.

remain.³⁸ These more effective teachers have employment opportunities at high-performing and competitive schools, which tend to be better resourced and higher quality. The less effective teachers remain at the low-performing schools simply because they have no other choice. Hence, high-quality teachers at Forsyth County’s low-performing schools likely have short tenures.

POLICY IMPLICATIONS

There is a suboptimal mix of highly experienced and educated teachers at Forsyth County’s low-performing elementary schools. These schools, however, need faculties where the majority of teachers are highly experienced and educated because they predominately serve disadvantaged children. Policies are available to affect the teacher experience and education mix at low-performing schools.

The school system should continue to pursue plans, and expand existing ones, to draw more experienced and educated teachers to low-performing schools and shrink the share of novice teachers there. This would adjust the “teacher mix” at these schools with the goal of maximizing student achievement by increasing exposure to high-quality teachers. The resulting mix would have highly experienced and educated teachers comprise a majority share of the faculty. There are existing programs like this in Forsyth County. Programs like Inspire340 strive to improve the achievement and success of under-served children across Winston-Salem/Forsyth County Schools.³⁹ Not only does this program receive extra school district support, but private donors can also contribute funds and resources. Inspire340’s primary objective is to recruit teachers dedicated to helping students reach their full potential, by offering better supplies and incentives.⁴⁰ Hence,

³⁸ *Id.* at 37.

³⁹ What is Inspire240? (n.d.). Winston-Salem Forsyth County Schools. Retrieved from Winston Salem Forsyth County School website. (Accessed on October 3, 2019).

⁴⁰ *Id.* at 39.

programs like this can contribute to adjusting the distributions of experienced and educated teachers throughout the county.

Incentive structures to attract these teachers to struggling schools is a strategy with a potentially large pay-off. Public school teachers are employees. Employees at private businesses, for example, are often enticed to move to new locations depending on where their talents are most needed. Forsyth County might consider a similar approach. These incentive-based strategies can work, though the incentives require more than just pay raises. As Darling-Hammond writes, school systems have tried to attract high-quality teachers to high-need schools using pay raises and bonuses.⁴¹ However, the results are mixed on whether these strategies worked.⁴² The more effective incentives include opportunities to participate in school-level decision making, work for supportive administrators, and join faculties that fosters collegial relationships.⁴³

Without strategies that incorporate these incentives, there will likely be a persistent divide across Forsyth County elementary schools.⁴⁴ The long-term results may include diminished rates of upward mobility among disadvantaged children. Furthermore, since low-performing schools have smaller shares of experienced teachers, novice teachers may be less likely to benefit from interacting with and mentoring from experienced educators. Mentoring can be extremely beneficial to novice teachers, which can improve effectiveness and reduce turnover.

Turnover is costly for schools and students.⁴⁵ To counteract high turnover, school systems must allocate more resources to training new employees. Moreover, it becomes less likely that teachers

⁴¹ Darling-Hammond, L. (2010) Recruiting and retaining teachers: Turning around the race to the bottom in high-need schools. *Journal of Curriculum and Instruction*, 4(1), 16-32.

⁴² *Id.* at 41.

⁴³ *Id.*

⁴⁴ Retrieved from Winston Salem Forsyth County School website. (Accessed on October 3, 2019).

⁴⁵ Shakrani, S. (2008). Teacher Turnover: Costly Crisis, Solvable Problem. Education Policy Center at Michigan State University; 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.

grow accustomed to particular school environments, reducing their productivity potential. Since higher rates of turnover occur at low-performing schools, and low-performing schools have larger shares of both inexperienced teachers and economically disadvantaged students, these turnover rates are likely capturing cases where teachers leave the profession.⁴⁶ This can lead to teacher shortages.⁴⁷

In the past, North Carolina has offered bonuses to experienced teachers at high-poverty schools to improve retention. Researchers found that the bonuses reduced turnover by 12 percent.⁴⁸ In his 2004 study, Ingersoll found that over 65 percent of teachers who left their positions at high-poverty schools reported that better monetary compensation needs to be offered if schools want to reduce turnover.⁴⁹ However, others argue that retention policies should promote the elements of teachers' working conditions most important to them, which are collegial relationships and school culture.⁵⁰ Huling-Austin's research supports this too, demonstrating that "novice teachers need collegial support from experienced teachers and peers."⁵¹ Mentoring and supportive relationships promote school loyalty and confidence in one's abilities, both of which can decrease turnover.⁵² A mentor program could be an inexpensive and effective program for the Forsyth County school system to pursue. Recently, a program like this was created. The Teacher Leadership Academy was founded in 2017, following a grant received from the Winston-Salem Foundation.⁵³ The program supports

⁴⁶ *Id.* at 45.

⁴⁷ *Id.*

⁴⁸ Clotfelter, C., Glennie, E., Ladd, H., & Vigdor, J. (2008). Would higher salaries keep teachers in high-poverty schools? Evidence from a policy intervention in North Carolina. *Journal of Public Economics*, 92(5-6), 1352-1370.

⁴⁹ Ingersoll, R. M. (2004). Why do high-poverty schools have difficulty staffing their classrooms with qualified teachers? Washington, DC: Center for American Progress.

⁵⁰ 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.

⁵¹ Huling-Austin, L. (1992). Research on learning to teach: Implications for teacher induction and mentoring programs. *Journal of Teacher Education*, 43(3), 173-180.

⁵² Kardos, S. M., Johnson, S. M., Peske, H. G., Kauffman, D., & Liu, E. (2001). Counting on colleagues: New teachers encounter the professional cultures of their schools. *Educational Administration Quarterly*, 37(2), 250-290.

⁵³ Underwood, K. (2017). Teachers helping fellow teachers. Winston-Salem Forsyth County Schools. Retrieved from Winston Salem Forsyth County School website. (Accessed on October 3, 2019).

teacher development through intimate training and mentoring from colleagues and experienced teachers.⁵⁴ The ultimate goals of this academy are to maximize student outcomes and teacher development and effectiveness.⁵⁵ This program, and others like it, can facilitate the mentoring that teachers need, likely improving retention and student achievement.⁵⁶

Strategies that successfully address the challenges discussed throughout this paper will benefit more than just Forsyth County's students and teachers. Local governments and businesses will benefit in the long run too. As children, especially those who are disadvantaged, experience higher lifetime earnings from their exposures to enriching elementary school environments, governments will earn greater tax revenues as a result. Additionally, early exposure to these environments has been shown to reduce costly behavior, such drug use and crime, which will in turn save tax payer dollars. With higher rates of upward mobility bringing about greater education attainment, as adults, these children will be more qualified and desirable job candidates, expanding businesses' pool of potential employees. Considering many large employers in Forsyth County face employee shortages, this outcome will surely be very beneficial. Hence, tackling the elementary school challenges in Forsyth County, NC can result in "win-win-win" outcomes for the three major players in the community - businesses, individuals, and governments.

CONCLUDING REMARKS

There is a noticeable divide between high- and low-performing elementary schools in Forsyth County, NC. High-performing schools enjoy larger shares of experienced teachers with advanced degrees, while low-performing schools have higher turnover rates. As the share of experienced

⁵⁴ Teacher Academy. (n.d.). Winston-Salem Forsyth County Schools. Retrieved from Winston Salem Forsyth County School website. (Accessed on October 3, 2019).

⁵⁵ Teacher leaders 2018-19 school year announced. (2018). Winston-Salem Forsyth County Schools. Retrieved from Winston Salem Forsyth County School website. (Accessed on October 3, 2019).

⁵⁶ As of 2019, 100 teachers were participating in the Leadership Academy. In fact, each year since the academy's founding, the academy has grown in number of participants; Teacher academy grows to 100 teachers. (2019). Winston-Salem Forsyth County Schools. Retrieved from Winston Salem Forsyth County School website. (Accessed on October 3, 2019).

teachers rises, a school's score increases. Furthermore, as teacher turnover rises, a school's score falls. If these same disparities existed prior to 2017, then many disadvantaged children in Forsyth County have likely experienced lower rates of upward mobility. Furthermore, if these disparities persist, economically disadvantaged children may lose out on opportunities to boost their upward mobility. There are available policies that can reverse these trends. Elementary schools and teachers have an important role to play in the future of Forsyth County as promoters of upward economic mobility.