IMPACT OF TRAINING AND DEVELOPMENT ON THE PERFORMANCE OF UNIVERSITY TEACHERS, A CASE STUDY IN PAKISTAN

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ABSTRACT

The Higher Education Commission (HEC) in Pakistan seeks to improve the quality of teaching by university teachers. The Commission has initiated different forms of training according to the areas of expertise in order to improve skills and effectiveness of teaching. Nearly every state in the nation is involved in the movement to raise education standards in Pakistan This research investigates the effectiveness of such teacher training on the performance of university teachers.

This study is focused on the role of training on the personal and academic development among university teachers. Data were collecting from thirty Pakistan universities by using a simple random technique. It revealed that teacher training was beneficial for professional development as well as for teaching performance. In particular the adoption of new technology and its impact on professional development had a positive impact in the performance of the university teachers.

A complementary survey was made based on thirty education institutes. The results showed that using modern tools improved professional development. It also suggested that improved knowledge, skills and attitudes was necessary for the teacher aides to support the teaching program and facilitate learning and communication. It was further revealed that effective teacher aides required competencies in broad areas of human relations, instructional activities, non-instructional activities, and basic skills. The study concluded that basic and advanced level training is necessary for future training programs in Pakistan.

Key Words: Impact, Training and Development, Performance, University Teachers

INTRODUCTION:

Given the emphasis parents, students, and educators place on teachers, evidence that observable measures of teacher quality explain little of the variation in student performance provides a conundrum for researchers. It may be that parents and students overstate the importance of teachers, but an alternative explanation is simply that measurable characteristic such as experience, certification, advanced degrees, and even scores on standardized tests explain little of the true variation in teacher effectiveness. This paper, using matched panel data on teachers training performance, estimates variations in teacher quality. These estimates, which show large differences in teaching style and training impact on university teachers of the market for teacher quality.

In a series of papers, Dolton and van der Klaauw (1995, (1999) investigate the impact of alternative opportunities on teacher transitions. They find evidence that opportunity wages affect the probabilities of both entry and exit. These results are consistent with earlier work by Murnane and Olsen (1989, (1990), which found that opportunity wages affected duration in teaching in both Michigan and North Carolina. Podgursky, Monroe, and Watson (2004) analyse the relationship of exits to teacher test scores.

The set of tests of teacher's performance we employ were developed for quite different purposes. We develop an adjusted test score gain measure that accounts for differences in HEC, trainings on the performance of university teachers of because of the structure of the tests, are systematically related to prior achievement. Extensive sorting by race, ethnicity, income, and other factors leads to substantial differences in average academic preparation across teachers that make it crucial to account for any link between pre-test score and gain induced by test structure. Our test score normalization also enables us to examine reliably whether the effectiveness of a teacher varies HEC based university teacher's trainings as a result of initial test score or of demographic characteristics including race. The analysis confirms the existence of large and important variation in teacher quality including substantial learning in the first year on the job. It also supports the notion that good teachers tend to be superior across the achievement distribution. Virtually none of the variation in quality is explained by commonly measured (and rewarded) characteristics with the exception few While the development of this methodology is discussed below, recent methodological work on the approach is found in Rivkin, Hanushek, and Kain (forthcoming 2005), Aaronson, Barrow, and Sander (2003) and Rockoff (2004). The interaction with measurement error issues can be traced to discussions in Kane and Staiger (2002). A somewhat different but related strand of research comes out of the Tennessee value-added work of William Sanders and his co-authors (Sanders and Horn (1994); Sanders, Saxton, and Horn (1997)); see also the methodological discussions in Ballou, Sanders, and Wright (2004). 5 Bacolod and Tobias (2003), in a related discussion, raise doubts about the appropriateness of a simple value added model because of the possibility of a nonlinear relationship between pre and post tests.

Econometric Model Description

The basic model relates achievement growth to the flow of current inputs such as:

$$1. \qquad \Delta A_{isg} = A_{isg}g - A_{isg-1g-1} = f(X_{ig}, S_{ig}, Y_i, \varepsilon_{isg})$$

Where A_{isg} is achievement of university i, in academic grades and grade g, and ΔA is the gain in achievement across grades; X is a vector of non university, factors including family, peers, and neighbourhoods; S is a vector of university and teacher factors; γ is individual differences in achievement growth; and ε is a random error. This formulation controls for past individual, family, and University factors and permits concentration on the contemporaneous circumstances that are generally measured along with student achievement. Nonetheless, focusing on annual gains does not eliminate the difficulties in separating the various inputs from confounding factors. A series of specification and measurement issues must be addressed before it is possible to obtain credible estimates of the influence of teachers on student achievement.

General Specification Issues

Past analyses, even those with detailed data about Universities and teachers, have been unable to characterize reliably the important aspects of Universities and teachers by fitting simple parametric models using commonly observed University and teacher characteristics (Hanushek 6 Random assignment or instrumental variables techniques might be used to purge the estimates of confounding influences, although serial correlation in the variables of interest often complicates the interpretation of the results. Another alternative is estimation models of test score levels with student fixed effects. While this removes fixed unobserved factors that affect the performance level, it does not control for time varying influences in the past including the quality of recent teachers.

Alternative growth formulations including placing the earlier achievement, $1\ 1\ g\ is\ g\ A -$, on the right hand side have been employed; see Hanushek (1979). We discuss these alternatives explicitly below when we consider measurement issues. (2003), Hanushek and Rivkin (2004)). The alternative, which we pursue here, is the semi parametric estimation of teacher and University effects. Consider:

$$2. \qquad \Delta A_{isg} = f'(X_{ig}, S_{ig}, Y_i, \varepsilon_{isg}) \sum tjT + (yi\ \varepsilon_{isg})$$

Where T_{ijg}=1 if student i has teacher j in grade g and is 0 otherwise, $ig\ S$ represents University factors other than individual teachers, and we combine the unmeasured individual and idiosyncratic terms (γ,ε) into a common error term. In this formulation teacher fixed effects, tj provide a natural measure of teacher quality based on value added to services outcome given to students. Although this approach circumvents problems of identifying the separate components of teacher effectiveness, it must address a variety of selection issues related to the matching of teachers and students. Because of the endogeneity of community and University choice for families and of administrator decisions for classroom placement, the unmeasured influences on achievement are almost certainly not orthogonal to teacher quality. In particular, students with family background and other factors conducive to higher achievement will tend to seek out better Universities with higher quality teachers. Administrative decisions regarding teacher and student classroom assignments may amplify or dampen the correlations introduced by such family choices. The matching of better students with higher quality teachers would tend to increase the positive correlations produced by family decisions, while conscious efforts to place more effective teachers.

$$3. \qquad E\ (Yi + \varepsilon_{isg1} f'(X_{ig}, S_{ig)}, T_{ijg)} = 0$$

The requirement that teacher fixed effects are orthogonal to the error highlights the importance of accounting for systematic elements of families in which they grew up affect teacher quality. The most important interpretive issue revolves around separating teachers and other Universities factors. The simplest example is the role of the principal. Many people believe that good principals are key to improving university teachers performance success is highly related to the quality of the HEC based training. At the same time, simple measures such as administrator certification, administrator education, or administrator experience have not proved to be reliable measures of quality. On the one hand this approach goes too far to the extent that the typical teacher in some Universities is better than the typical teacher in others, perhaps in part because an important dimension of administrator skill is the ability to identify and develop good teachers. By eliminating all between University variations in teacher quality, the estimator

implicitly attributes all aggregate University variation to some universities factor other than the teachers. While we emphasize the within-University estimates because they represent the more conservative perspective on the variation in teacher quality, we also consistently present estimates based on the variations across the entire district in order to indicate the range of plausible estimates. While the concentration on within University variation does not guard against all potential selection problems, we believe it provides a reasonable lower bound on the individual teacher effects.

Test Measurement Issues

Although psychometricians have long been concerned about the properties of cognitive tests and the implications for research on impact on training on university teachers much attention to these issues until recently. Our analysis relies on the achievement tests used in) to assess basic student proficiency in a range of subjects.

Table.1 University Teachers differences in Province wise.

	Sindh	Punjab	N.W.F.P	Balouchistan
Teacher year Variation	0.20	0.40	0.10	0.056
Teachers Quality Variation	.33	.56	.60	.13
Leadership traits	.66	.55	.70	.15

Notes:

a) The columns provide the variance in teachers achievement gains explained by fixed effects for teachers by year.

b) University Teachers characteristics are gender, race/ethnicity, grade, limited English proficiency, special education, student mobility status, and year dummy variables.

c) Leadership traits of the university teachers and their comparison with other university teachers in the province.
Highest weight = 1
.1= 1

Consequently, gains in each score interval are distributed with mean zero and standard deviation one in each year and teachers are judged based on their performance after the trainings attended of HEC in the initial test score distribution. This normalization also permits us to explore the possibility that effectiveness for teachers varies across the distribution, such as might occur if teachers tend to specialize in certain types of students. Although standardized gains parametric nonlinear relationship between pre- and post-test scores and subsequently rely on residuals from predicted scores for individuals to assess Universities; see also Tobias (2004). Their approach is quite similar to our own in spirit, although problems related to the inclusion of the pertest as a regression remain. Hanushek (1992) does not, however, find that test measurement errors are important in biasing the estimates of educational production functions that include pre-test scores on the right hand side. Note that simple gains models that include student fixed effects implicitly compare students at similar places in the skill distribution serve as our primary measure of teacher quality, we also present estimates based on the raw, unadjusted gains in achievement in order to provide a direct comparison to existing research. Even though this transformation of the dependent variable addresses a number of issues related to the structure of the test, it does not mitigate problems caused by errors in measurement and test reliability.

Importantly, in contrast to parametric models for which classical measurement error in the dependent variable does not introduce bias, such error does contaminate estimates of the variance in teacher quality derived from teacher fixed effects. As previously discussed in Aaronson, Barrow, and Sander (2003) and Rockoff (2004), any such error inflates estimates of the variance in teacher quality. Our estimates of teacher quality, *j t*, are conditional means of teacher's performance and necessarily include any aggregate test measurement error for classrooms. We now rewrite *j t* as the sum of the true quality index (tj) and an error component (vj).

4. $E(r)\,var(t)/var(t) = \square$

Multiplication of the estimated variance of t by the year-to-year correlation thus provides a measurement error corrected estimate of the overall variance in teacher quality. Importantly, this approach addresses problems related to both the noisiness of tests as measures of learning and any single year shocks (either purposeful or random) in classroom average student quality.19 The removal of all non-persistent variation also eliminates some portion of the true variation in quality resulting from changes in actual effectiveness. We attempt to mitigate this problem by removing first year teachers from the correlation calculations because of the sizeable gains to experience in the initial year (see Rivkin, Hanushek, and Kain (forthcoming 2005) and below). Yet the estimate of quality may change even an the absence of any change in performance, because the within University estimates of quality are defined relative to other teachers. Any turnover can dramatically change a teacher's place in the quality distribution in her University. Therefore, by considering just the persistent quality differences (equation 8), some true systematic differences in teachers are masked by a varying comparison group and are treated as random noise – amplifying the downward bias in the estimation of the variation in teacher quality.20 neither paper makes a convincing argument that they have a valid estimate of the error component of the between teacher variance. 19 This differs sharply from corrections based on the sampling error of estimated fixed effects. Those approaches are directly related to the equation error variance in the sample, so that anything that reduces that error – including sample selection, the classroom sorting of students on the basis of unobservable, and simply adding more regresses to the model – tends to reduce the estimated error and thus the measurement error correction. Simply splitting the sample and using the correlations among the samples to correct the variance would also fail to remove the influences of such annual shocks. 20 As discussed below, similar problems can arise with estimation relying on student fixed effects if there is limited mobility across Universities.

Data Collection from HEC

Data were collected from the various HEC based centre in various university as well as Provinces and sample size was 200 and simple random technique were applied and Genstat software was used for the analysis of data. The results are qualitatively quite similar for reading, although, consistent with the findings of our previous work in Pakistan's public Universities appear to exert a much larger impact on math than reading in grades Teacher and administrative personnel information in the data set were include characteristics such as race/ethnicity, degrees earned, years of experience, certification test results, tenure with 21 Part of the difference structure communication and delivering successfully presentation were discussed.

The Distribution of Teacher Quality

This section describes the distribution of teacher quality in University teachers and examines the sensitivity of the estimates to controls for student, peer, and other differences across different universities and years. By using the persistence of teacher effects over time, we account for the contribution of measurement error to estimated differences among teachers. A complementary analysis considers the roles experience, certification examination scores, and educational attainment play in explaining differences in teacher quality. Finally, we extend the basic modelling to consider the role of match quality that potentially leads teachers to be differentially effective with students of varying ability or backgrounds.

Performance Variations across Teachers

A fundamental issue is how much variations in teacher quality exist. If this is small, policies to improve student performance should concentrate on issues other than the hiring and retention of teachers. 16 As noted, separating the elements of teacher quality from other possible influences on achievement is difficult, and some ambiguity will necessarily remain. Moreover, this analysis is further limited in important ways: It is clearly conditional upon both the test instruments and the institutional structure of Lone Star Universities and their hiring patterns. We begin with a basic description of the contributions of teachers, principals, and other institutional features of district Universities in shaping student achievement. Table 1 reports the between classroom (teacher by year) variance, the adjacent year correlation of estimated teacher value added, and the measurement error adjusted estimate of the variance in teacher quality for different specifications. The first and second use both within and between University variation, while the third and fourth use only within University variation. In addition, the second and fourth specifications regression adjusts for differences in observable characteristics. Differences among the specifications provide information on the extent of student sorting and on the magnitude of within relative to between University and year variation in classroom average gains. The top row reveals that controlling for observable student characteristics and using only within University and year variation reduces the between teacher variance in standardized gain. As expected given that most sorting occurs among Universities, controls for measured student heterogeneity have a much larger effect in specifications not restricted to within University and year variation.22 The second row reports the adjacent year correlations in estimated teacher value added. The magnitudes range from 0.50 to 0.42, suggesting that roughly half of the variance is persistent. These correlations show considerable stability in the impact of individual teachers, particularly when just compared to other teachers in the same University. Again the controls for student heterogeneity reduce the correlations much less in the within University and year specifications. Since some of the year to year variation in estimated teacher value added relative to others in the 22 Student characteristics are eligibility for free or reduced lunch, gender, race/ethnicity, grade, limited English proficiency, special education, student mobility status, and year dummy variables.

a) The columns provide the variance in Teachers achievement gains during the HEC based training.
b) Teacher characteristics are eligibility for free or reduced lunch, gender, race/ ethnicity, grade, limited English proficiency, special education, student mobility status, and year dummy variables. Universities differences in various levels and their differences of cultural environments and standard.

The most conservative estimate of the variance in teacher quality in Column 4 is based entirely on within-University variations disciplines achievement gains controlling for measured student heterogeneity and measurement error. Although this specification eliminates any between university variations in teacher quality and changes time in the quality of instruction for a given teacher, it protects against variations in the effectiveness of Head of Departments, teachers characteristics, random measurement error and year to year differences in student ability and the like. Despite the fact that it almost certainly understates the true variations in the quality of instruction, the variance estimate of 0.047 indicates the presence of substantial differences in teacher quality when put in the context of training. This implies that a one standard deviation increase in teacher quality raises standardized gain by 0.22 standard deviations. In other words, a student who has a teacher at the 85th percentile can expect annual achievement gains of at least 0.22 s.d. above those of a student who has the median teacher. Since these quality variations relate to single years of achievement gains for students, they underscore the fact that the particular draw of teachers for an individual student can accumulate to huge impacts on ultimate achievement. The range of ambiguity about the causal impact of teacher quality differences is also relatively small. The best bounds on the standard deviation of teacher quality are 0.22 to 0.27 (the estimates with controls for measured differences among students (race, subsidized lunch status, LEP, and special education status). These estimates can be compared to the bound on teacher quality differences reported in Rivkin, Hanushek, and Kain (forthcoming 2005). That lower bound of 0.11 standard deviations estimate is based entirely on within University differences over time for the same students, subject to measurement error that almost certainly attenuates the estimate, and based on specifications that 18 control comprehensively for possible sources of upward bias. Importantly, however, that estimate is not directly comparable to the estimates here, because it is based on the distribution of raw gains, which have a standard deviation of approximately two-thirds of the standard deviation of the standardized gain used here. Putting our current estimates on the same scale, two-thirds of our within-University estimate of 0.22 equals slightly less than 0.15.23. The finding of significant quality variation within University and years coupled with the large annual turnover of teachers (below) enters directly in discussions of teacher performance incentives and teacher personnel practices more generally. First, although regression adjusted teacher average test score gains in a given year are clearly noisy measures of teacher quality, they nonetheless capture important variation among teachers within and almost certainly between Universities. In contrast, just having the test score level provides far less information on teacher value added. Second, any incentive program (such as incorporated in many state accountability systems) that focuses just on between University performances ignores the primary source of quality variation that occurs within University. The importance of within University variations also highlights problems with the suggestion in Kane and Staiger (2002) that accountability systems should aggregate test scores over time in a way that produces the least noisy estimate of University average performance.24 The changing cadre of teachers in a University certainly contributes to the year-to year variation in University average performance, and turnover is likely to lead to larger year to year differences in small University in which the University average variation in teacher quality from year to year will generally be larger. Not only does such inter temporal averaging miss the majority of real variation in teacher quality, but, more importantly, it also confuses the performance of 23 Alternatively, direct estimates using raw gains rather than standardized gains produces an estimate of XX. 24 Kane and Staiger (2002) consider a variety of dimensions of measurement error and appropriately highlight the error introduced by separately evaluating small subgroups of the students. The text discussion refers to aggregate University measures. 19 current teachers with that of their predecessors and thus provides a weaker incentive for improvement.

Measurable Teacher Characteristics

Prior studies suggest that most observable characteristics other than experience explain little of the variation in teacher quality (Hanushek (2003)). This section adopts the common education production function framework but extends it to circumvent analytic problems that have plagued prior work. The basic formulation is:

5. $G\ isg = f(Xig) + \alpha TC\ TCijg + (Y + \varepsilon\ isg)$

Where TC is a vector of measurable teacher characteristics with associated impact parameters, α TC. Although the adjusted gain specification deals directly with fixed factors that enter into achievement differences, the inclusion of time varying family effects and, at times, individual student fixed effects addresses issues of no University factors that systematically affect the growth in student performance. We concentrate on the effects of a master's degree, a passing score on certification examinations, and experience on standardized math score gains. These are particularly important characteristics because they are directly linked to teacher compensation. The initial estimates concentrate on the sample of teachers with information on certification tests. While we do not know the precise scores on the relevant certification tests, we do know whether they passed the first time they took the test and whether they have ever passed the test.13 The results in Table 2 show that the hypotheses of no significant differences in teacher value added on the basis of teacher education or certification examination performance cannot be 13 Note that there are many different certificates, and thus many different tests, for which teachers can qualify. We make no attempt to distinguish among alternative certificates.

Table 2. Estimated Impacts of Advanced Training of HEC on teachers perception towards quality.

Level Education of University Teacher	HEC training Duration-One month	No. fixed effect	With Effect
M.A/MSc	-	0.015(1.17)	0.006
MS	-	0.0034	0.054
Ph.D	-	0.002	0.040

Absolute value of t-statistics in parentheses)

Rejected at conventional levels regardless of whether teacher effects are included. These findings reinforce prior studies and raise serious questions about the desirability of requiring or rewarding with higher pay those with a post-graduate degree and the efficacy of the existing certification procedures in Pakistan. To describe the impact of teacher experience, we return to the more complete sample of teachers (which does not exclude teachers without certification data).Existing evidence suggests that most improvement occurs very early in the career (see Hanushek and Rivkin (2004), Rivkin, Hanushek, and Kain (forthcoming 2005)), but experience may affect teachers achievement gains through a number of channels. The first is learning by doing. The second is non-random selection: If less talented teachers are either more or less likely to quit than more talented peers on average, estimates of the return to experience capture the change in the average quality of the teaching pool. Finally, teachers may vary effort systematically with experience in response to tenure decisions or other institutional and contractual issues. Each of these causal links raises the possibility of highly nonlinear relationship between the quality of instruction and experience. Therefore we include a series of dummy variables indicating first, second, third, fourth and fifth year teachers. (Teachers with more than five years experience are the omitted category. Preliminary analysis, not shown, found

no experience effects beyond five years of experience). The results in Table 3 highlight the much lower average performance of first year teachers. Notice that the inclusion of student fixed effects does not alter significantly the return to experience, but the addition of teacher fixed effects reduces the penalty for first year teachers by roughly 25 percent and also eliminates any quality deficit for second year teachers. This pattern indicates some selection effects in that inexperienced teachers who exit following the University year are systematically less effective than other teachers. We will return to this issue in the transition section below. Finally, it appears that fourth year teachers perform systematically 26 Note that the estimation in Table 2 also includes teacher experience, and the results for experience are qualitatively similar to those reported here.

Table: 3. Estimated Impact of Experience Level
(Comparison teachers more than 6 years of teaching experience).

Years of Teaching	No. of fixed effect	With Teachers fixed effects
1st Year	-0.14 (8.34)	-0.14 (9.50)
2nd Year	-0.02 (1.45)	-0.02 (1.72)
3rd Year	0.04 (1.44)	0.03 (1.34)
4th Year	0.05 (2.83)	0.08 (3.14)
5th Year	0.04 (1.71)	0.03 (1.55)

Better than others, suggesting the possibility that average incentives are quite strong in the fourth year. These experience effects indicate that the high turnover among Pakistani universities teachers, and particularly urban teachers, has detrimental effects on student achievement. The first year effects estimated here show that having a first year teacher on average is roughly equivalent to having a teacher a half standard deviation down in the quality distribution.

Teachers Matching Skills

The analysis so far presumes that each teacher can be ranked according to a single underlying dimension of quality and that we can infer this from information about student progress, but this may not be a satisfactory characterization. Teachers may specialize with particular skill groups or merely decide to target a particular skill range. Student and teacher demographic characteristics may also influence the quality of student/teacher interactions. Each of these cases alters the concept of teacher quality by raising the possibility that it is not constant for all students. Importantly, the distribution of quality that we trace out may also be influenced by differences in the nature of classroom matching across University and principals. To investigate specialization by student achievement, we divide students into three academic preparation classifications (based on initial scores) and compute the correlation between the teacher average gain for students in one category with the teacher average 27 These figures refer to 1994-96 in Texas (Hanushek, Kain, and Rivkin (2004)). The rate of new hires varies some over time, depending on student demographics, the extent of teacher retirement, and the numbers of returning teachers who have prior experience. 22 standardized gain for students in the other categories.28 The positive correlations of 0.45 between the low and middle categories, 0.57

between the high and middle categories, and 0.31 between the low and high categories refute the notion that the effects of any curricular targeting or matching are large relative to the impact of overall teacher quality. The strong positive correlation between the average standardized gains in the top and bottom categories is particularly striking given the relatively small number of students in the bottom category in University with large numbers of students in the top category and the large error variance described above. The possibility of differential effects by the matching of teacher and student race is also exists, if for example students respond better to teachers in the same ethnic group. The reanalysis of the Coleman Report data by Ehrenberg and Brewer (1995) suggested a positive race matching effect but raised questions about how quality differentials of black teachers might work against race matching with students. Dee (2004), using the random assignment data from the Tennessee STAR, finds strong evidence for beneficial effects from matching the race of teacher and students.

Teacher Transitions

Another important determinant of the distribution of teacher quality is the pattern of transitions within the district. The high rate of teacher turnover in large urban districts engender considerable concern among educators, in large part because of the belief that such districts tend to lose their most skilled teachers. Although existing work does consider the impact of salaries, alternative opportunities, working conditions and other observable characteristics on transition probabilities, there exists no evidence on the link between actual performance in the classroom and transitions. One aspect of this – the effect of initial teacher experience – has already been 26 noted. Here we compare the overall effectiveness of teachers who exit the Lone Star District between 1996 and 2000 with those who remain. We divide teachers into four mobility categories for each year that they teach: remaining in the same University, moving to a new University in the Lone Star District, moving to a new University outside of Lone Star, or exiting the Pakistan's public Universities entirely. These categories correspond to those in policy discussions about teacher turnover. Three features of teacher mobility rates are important. First, consistent with a number of prior studies, teacher turnover is large (see, for example, Boyd *et al. (2002*), Hanushek, Kain, and Rivkin (2004), and Podgursky, Monroe, and Watson (2004)). As described in detail in Appendix A, the turnover of inexperienced teachers is especially high. Only 70 percent of teachers with less than three years of experience remain in the same University from year to year. Second, teacher turnover is systematically related to characteristics of the student body, most importantly the achievement level of students in a University. Third, and relevant for the subsequent estimation of mobility patterns, teachers who changing jobs. We turn now to our direct estimates of quality differences to focus on the implications of the observed transitions. Table 6 reports estimates of differences in teacher quality by transition type for a series of regressions that differ according to whether or not they control for student fixed effects, University-by-year fixed effects, and the status of women teachers who return following a one year hiatus which may have been a maternity leave. In the first three columns the transition classification ignores the subsequent return, while for the final specification women returnees are reclassified on the basis of where they teach in the year following their return. Note that the University-by-year fixed effect specifications generate coefficients based on differences within University. All estimates compare those who leave a University with those who remain. There is no distinction between involuntary and voluntary changes, because such information is not available, but past analysis suggests that virtually all transitions are teacher initiated.

The estimates in Table 6 provide little or no evidence that more effective teachers have higher exit probabilities. On the contrary, those who exit are significantly less effective on

average than stayers regardless of whether they are compared to all stayers in the University and year. Moreover, those who switch campuses within the same provinces are also significantly less effective, while teachers who switch with same province do not appear to differ significantly from the stayers. These mean differences are certainly informative, but they do not paint a comprehensive picture of the distributions of stayers and movers. It is important to know if movers come disproportionately from the tails of the distribution. Are inner city Universities actually losing a large number of the most promising teachers to other districts? Do those who really struggle have a very high rate of attrition? In order to learn more about quality differences by transition status, Figures 2 plots kernel density estimates of the distributions of teacher fixed effects by move status based on regressions of adjusted student gain on a full set of teacher by year fixed effects, teacher experience dummies included above, and student characteristics. Because of the aforementioned sorting of teachers among Universities, we also plot estimated teacher fixed effects produced by specifications that include University fixed effects (Figure 3) Regardless of the specification, however, the distributions of those who either change campuses or exit public Universities fall distinctly below those who stay, while quality distributions for those who change districts are quite similar to those of the stayers. Although the specifications control for experience effects, the differences across transition categories may differ systematically by experience. Therefore Table 7 reports separate estimates of differences by transition type for teachers with one, two, and three years of experience. Unfortunately most of these coefficients are not precisely estimated, but two distinct experience patterns do emerge. In the case of within district campus changes and exits out of the public Universities.Tend to be slightly above average in performance, although this difference is not statistically significant and any quality premium appears to decline (and even reverse) with experience. Interestingly, plots of the full distribution of teachers in the lower experience categories (not shown) give some idea of the source of the mean differences that were identified. The numbers of teachers in the transition groups by experience get rather small, but the positive mean for the inexperienced district changers appears to be driven by a small number of very good teachers who leave, and the distribution for the bulk of district switchers falls slightly to the left of those who do not move. For those who exit teaching, the right hand tail of quality is very similar to that for the stayers, but there is a noticeably thicker left hand half of the quality distribution for exiters. **A final issue is the interpretation** of the finding that teachers who exit the Texas public Universities are systematically less effective than those who remain. While these teachers may have been less effective in the classroom throughout their careers, it is also possible that the exit year was anomalous and not indicative of typical performance. For example, the exiting teacher might have had a particularly unruly class or might have reacted to some other bad situation in the University such as conflict with a new principal. An alternative possibility is that effort is reduced once the decision is made not to return and that at least a portion of the transition quality gap arises from the feedback effect of the decision to exit. To investigate these possibilities, we measure teacher quality on the basis of student gains in the year prior to each transition.. Nonetheless, the fact that the differences holds for the within University comparisons suggest that it is not simply a new principal or any University wide problem that is driving the results.

CONCLUSIONS

Much policy debate revolves around the importance of teacher quality, but little consistent evidence has been available about the importance or character of quality variations. This paper investigates a number of dimensions of the HEC based trainings and their impact on teachers of various public sector universities and their market for teacher quality: the magnitude of the variation in quality; the contributions of experience and teacher education to that variation; the importance of student teacher matching; quality differences between those who remain in the large, urban province and those who leave for other province or professions; and the extent to which suburban districts use salary and student characteristics to attract better teachers. Three methodological issues are important. First, because of the psychometric characteristics of the Pakistan, it is crucial to standardize the test for the initial level of achievement in order to compare teachers across the entire distribution. Second, we control for potential non teacher factors through both direct measurement of student body characteristics and, at times, by restricting attention just to within-University variations in quality. Third, we use repeated measures of teacher performance to obtain estimate of measurement error versus systematic quality differences. The analysis of the determinants of quality reveals some very important insights. First, we confirm that there is significant learning about the craft of teaching that goes on in the first few years of teaching. The largest impact is the first year of experience, and experience effects disappear quickly after the first year. Second, teachers who do well with students in one part of the achievement distribution also do well with students in other parts of the distribution, suggesting that teacher-student matching by initial preparation is not a particularly important issue. Third, students benefit from having a same race teacher, quality held constant, and that benefit is sizeable.. If we cumulate these effects across six years of primary teaching experiences of various HEC training given to the University teachers, the experience differential could account for 0.04 s.d. average difference between whites and either blacks or Hispanics in the district. A commonly voiced policy concern is the possibility that large Rural Universities lose their better teachers to other occupations or to suburban Universities. Here we find little if any support for the notion that the better teachers are the most likely to exit the public Universities entirely. To the contrary, teachers exiting the public Universities are significantly less effective on average in the year prior to leaving than those who remain, and those moving to other Provinces are quite similar in terms of effectiveness. Similarly, there is little systematic evidence in support of the view that the rural universities loses its better teachers because they prefer to work in urban or big cities. . Much has been made of the fact that salary differentials in metropolitan areas exist and that these may frequently lead to a drain of high quality teachers. This view is reinforced by analyses that show urban areas to be net suppliers of teachers to other districts and that show urban to lose teachers disproportionately from Universities with low achievement and high minority populations. Although high turnover teachers because of the lower performance of inexperienced teachers, the evidence does not support the related concern that the best teachers are those most likely to leave. The identification of large variation in the quality of instruction within Universities notwithstanding the presence of substantial measurement error has at least two additional implications for education policy. First, even if the test score has a larger signal to noise ratio, the appropriately constructed achievement gain is the proper measure with which to measure value added. It is much more closely related to current teacher performance and controls for important family and community differences that tend to confound estimates of teacher value added. And second, any formal or informal teacher evaluation program that aggregates performance to the University level or across years misses the majority of the variation in the quality of instruction. This weakens the incentives for good teachers to enter and remain in teaching, ineffective teachers to

leave, and all teachers to put forth greater effort. These costs should be compared with the superiority of measuring performance at the University level in terms of fostering greater teacher cooperation within the University. Finally, the last empirical section examines whether Province make use of salary and demographic characteristics to procure more effective teachers.

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