High Hopes and Low Budget: An Empirical Investigation on the Impact of Differential School Investment in Khyber Pakhtunkhwa, Pakistan

Emaan Siddique
Advisor: Professor Edward Miguel

University of California, Berkeley

***Abstract*— Since the Pakistan Tehreek-e-Insaf (PTI) won the majority of seats in the Provincial Assembly of Khyber Pakhtunkhwa (KPK) in 2013, the party has received widespread acclamation for improving public education within the province. However, there is weak evidence to support whether these policies have had an immediate effect on educational outcomes. Using difference-in-differences estimation, this study attempts to assess the extent to which investment in primary public schools has affected enrollment rates and educational attainment in rural KPK. Surprisingly, cities that received high rates of investment following the PTI's election did not experience a statistically significant change in enrollment rates or educational attainment.**

I. Introduction

A. The Pakistan Tehreek-e-Insaf

The Pakistan Tehreek-e-Insaf (PTI) is a centrist Pakistani political party that was conceived in 1996 by Imran Khan. In 2013, the PTI captured the majority of seats in the Provincial Assembly of Khyber Paktunkhwa (KPK). Since then, the party has been widely acclaimed for its progressive policies related to public education, healthcare, and women's rights. According to an article published by The Economist (2017), the PTI "has certainly made schools more appealing: the party has appointed 40,000 more teachers, rebuilt institutions blown up by the Taliban and furnished others with toilets and electricity. Teacher absenteeism has fallen." Such acclamations have likely contributed to the increased support for the party nationwide, as well as to the election of Imran Khan as Prime Minister in 2018.

Prior to the 2018 national election, Khan and his party were widely celebrated for engaging in good governance, which stands in sharp contrast to Pakistan's history of widespread corruption. In a survey conducted by the Pew Research Center (2009) on Pakistani public opinion, 71% of respondents stated that corruption posed one of the biggest problems in the country, outranked only by crime, terrorism, economic turmoil, and the illegal drug epidemic. Hence, any effort by government officials to improve the provision of public goods is met with overwhelming approval from the Pakistani public.

B. Khyber Pakhtunkhwa

As of 2017, KPK had a population of approximately 30.5 million, with around 81% of the population residing in rural regions (Pakistan Bureau of Statistics 2017). KPK predominantly consists of Pashtuns, an ethnic minority that is frequently discriminated against in other regions of Pakistan. This sentiment is especially prevalent in Karachi, one of the largest cities in Pakistan, where the growing Pashtun presence is commonly associated with "increasingly violent competition for land, jobs, and economic control of the city" (Chadda 2000). Considering that opportunities for social mobility are limited for Pashtuns outside of KPK, the PTI's reforms can play an important role in providing Pashtuns with valuable opportunities to accumulate human capital.

As demonstrated in Table I, of Pakistan's four major provinces, KPK receives the least amount of federal funding per capita. All tables and figures can be found in Appendix A. In 2018, KPK received funding equivalent to 23,552 PKR (204 USD) per person, which is significantly less than that of other provinces. Hence, given the extent to which KPK is financially constrained, it is imperative that provincial governments not only lobby for additional sources of funding, but also maximize the efficiency of their existing allocations. In essence, there is no room for political corruption in KPK as the burden of corruption will be disproportionately experienced by individuals who are already marginalized in the national sphere.

In 2010, the National Assembly of Pakistan passed the 18th Constitutional Amendment, which mandated that the state provide "free and compulsory education to all children of the age of five to sixteen years in such manner as may be determined by law" and "remove illiteracy" within the "minimum possible period" (Senate of Pakistan 2010). The Constitutional Amendment simultaneously enhanced provincial autonomy, resulting in the onus of provisioning free and compulsory education to fall onto provinces such as KPK. As a result, since 2010, the KPK Elementary & Secondary Education Department has been forced to increase their operating capacity in a relatively short time span while resources remain limited.

C. Motivation

While the PTI claims to have improved access and quality of public schools, there is no definitive evidence to validate these assertions. The aforementioned article by The Economist (2017) also noted that "the PTI's claim that about 100,000 students have chosen to switch from private to public schools is based on dodgy data." The fact that no research has been conducted to estimate the causal impacts of the

party's policies on the lives of KPK's citizens further probes skepticism regarding the party's efficacy.

These contrasting views on the PTI's effectiveness motivated me to conduct an in-depth econometric analysis on the impact of the party's policies. An econometric analysis yielding statistically significant results would provide useful insights about the party's efficacy. More specifically, I became interested in assessing the extent to which investment in public schools has affected short run educational outcomes. In the context of this study, educational outcomes refer to school enrollment rates and educational attainment.

To date, there has been little research conducted on how school quality affects educational outcomes in Pakistan. While this limited literature includes research on rural regions besides KPK and KPK in general, there has been no specific research conducted on the rural regions of KPK. Much of this existing literature also fails to present a convincing causal argument. Considering that rural KPK has been largely disregarded in this literature despite the availability of data on the region, I was further motivated to conduct an impact evaluation exclusively in these marginalized regions.

The primary question of interest is as follows: to what extent has the PTI's investment in public primary school infrastructure affected educational outcomes in rural KPK? To answer this question, a difference-in-differences (DID) estimation technique is used to compare the difference in educational outcomes for cities that received high rates of investment before and after 2013 to the difference in educational outcomes for cities that received low rates of investment. To further understand the implications of this policy on KPK's marginalized citizens, I also conduct a separate analysis restricting the sample to female respondents only.

Considering the amount of attention the PTI has received for its work in KPK, I initially hypothesized that cities receiving high intensity investment would experience improved educational outcomes relative to cities receiving low intensity investment. If this hypothesis is supported, then this study may have important implications in terms of demonstrating the potential of good governance, thereby incentivizing constituents to participate in representative democracy. However, the results of this study suggest that differential investment in school infrastructure has had no immediate effect on educational outcomes. Despite popular opinion regarding the PTI's capability, this specific policy has not been proven successful in achieving the party's desired outcomes.

The remainder of the paper is organized as follows: Section II consists of the literature review, Section III provides a more detailed overview of the data, Section IV explains the methodology and empirical strategy, Section V covers the main results and discussion, Section VI discusses potential limitations, and Section VII presents the conclusions and implications of this study.

II. Literature Review

There is a substantial economics literature on the effect of differential investment in school infrastructure on human capital accumulation. For instance, Duflo (2001) studies how a large-scale program of school building in Indonesia from 1973-1978 affected long run educational attainment and labor marked outcomes for individuals in high intensity vs. low intensity program regions. Studying this policy retroactively, Duflo utilizes data from the 1995 Indonesia census, and establishes a causal link between the number of schools built in an individual's region of birth with their years of educational attainment and long run labor market outcomes. Although all regions underwent large-scale school construction during this period, Duflo exploits the program design by distinguishing whether individuals lived in "high intensity" or "low intensity" regions, and whether they received primary education before or after the policy implementation. This enables her to utilize a DID strategy to assess the effect of increased school building on human capital accumulation. My research contributes to this literature by using a similar DID identification strategy to understand how large-scale school infrastructure improvement in Khyber Pakhtunkhwa (KPK) as of 2013 has affected enrollment rates and educational attainment at the city level.

There have been a number of studies focused on how school quantity and quality affects student outcomes at various time periods and settings in Pakistan. Ali, Ali, and Ghani (2010) examine how the role of the private sector in education has affected the quality and quantity of schools in KPK from 1998-2005. Their study primarily uses data from the Education Management Information System of the KPK Education Department. Although their paper does not use econometric methods to identify a causal effect of the private sector on school quality and quantity, it does provide an overview of the state of private schools and their potential to increase human capital in KPK. Their study concludes that from 1998-2005, there was a 185.7% increase in the number of private schools, and a 378.61% increase in number of students from 1998-2010 in KPK. Although the majority of these schools were found to have qualified teachers and reasonable student-teacher ratios, private schools remain inaccessible to the majority of Pakistanis due to the high cost of schooling. While Ali, Ali, and Ghani find that most private schools in KPK are high quality, contributing to their high demand, my study aims to understand how such variations in the quality of public primary schools affects measures of enrollment rates and educational attainment.

Alderman, Orazem, and Paterno (2000) study how school characteristics affect the decisions of poor households when deciding between public vs. private schooling. To study the effect of factors such as household characteristics, school proximity, tuition, and student-teacher ratio, the authors collect data from a random subset of 50 low-income neighborhoods in Lahore, Pakistan, which constitutes 1,000 households and 273 schools. The authors employ a logit maximum likelihood estimation and find that parents strongly consider school quality when deciding between public and private education. In particular, factors such as high student-teacher ratios in public schools were found to increase the demand for private schooling among poor households. In the context

of low-income neighborhoods in Lahore, the study concludes that poor household schooling choices are particularly sensitive to tuition, proximity, and quality. While Alderman, Orazem, and Paterno detect a significant correlation between student-teacher ratios and schooling choices in one city in the Punjab province, my study aims to identify a more precise causal estimate of how improvement in school quality affects enrollment rates and educational attainment in KPK.

Behrman et al. (1997) assess how individual, household, school, and district characteristics along with student-teacher ratios and teacher quality affect test scores. The authors use data from the International Food Policy Research Institute, which had data on randomly selected panel of rural households from the following districts: Attock, Punjab; Dir, North West Frontier Province; Badin, Sindh; Faisalabad, Punjab. Hence, the authors were able to conduct an OLS regression of test scores on the aforementioned factors that may affect schooling effectiveness. This analysis leads the authors to conclude that student exposure to teachers and teacher quality have significant effects; while, the availability of educational resources and physical infrastructure have little effect on test scores, leading them to believe that there may be efficiency gains from reassessing schooling inputs. While Behrman et al. use data from one major city from three of Pakistan's four main provinces, my study will utilize panel data from each of the KPK province's 24 cities from 2005-2016 (with the exception of 2009).

A later study by Behrman, Ross, and Sabot (2008) assessed the returns of improved school quality and quantity on labor market outcomes. Using the aforementioned data from Behrman et al. (1997), who collected information on a randomly selected panel of rural households, the authors conduct an OLS regression of student test scores on schooling attainment, school quality, and individual characteristics. In this setting, the authors find that factors such as ability, distance to school, and parental educational attainment have a statistically significant effect on labor market earnings. They also find that cognitive achievement has statistically significant correlations with ability, schooling attainment, student-teacher ratio, and teacher quality. While Behrman, Ross, and Sabot conclude that school quality and quantity are both "potential means of increasing the productivity and earnings of the labor force," my study aims to understand the extent to which school quality affects enrollment rates and educational attainment.

While there exists a substantial literature on how school quality affect educational outcomes, my research will contribute to this body of research across several dimensions. Firstly, my study exploits the design of the PSLM survey in a unique manner. Given that the PSLM surveys a random subset of households across Pakistan, I have restricted the dataset to KPK and aggregated at the city level. Repeating this process for PSLM surveys from 2005-2015 (excluding 2009) allows me to create a panel dataset at the city-year level, which includes 24 cities across 10 years. Additionally, while many of the aforementioned studies on Pakistan exploit the design of existing datasets and conduct an OLS regression to assess how school quantity and quality affect human capital accumulation, my study is more focused on assessing a specific intervention.

Using data published in the KPK Annual School Census, I was able to determine whether a city received high or low levels of investment in school infrastructure following the supposed introduction of the policy in 2013. Using DID estimation, I identified the causal effect of such investment on enrollment rates and educational attainment given that the parallel trends assumption holds. In the context of this study, the parallel trends assumption holds if high and low intensity cities exhibit similar trends in educational outcomes prior to the PTI's rollout of the policy in 2013. Conclusively, my study contributes to the existing literature as it assesses how investment in schools affects the educational outcomes of individuals living in KPK.

III. Data

A. Variables of Interest

1) School Enrollment Rates: To determine school enrollment rates and educational attainment, data was aggregated at the city level using the Pakistan Social and Living Standards Measurement Survey (PSLM). The PSLM is conducted annually across Pakistan by the Pakistani Bureau of Statistics, collecting socioeconomic data on a random subset of the population at the individual and household level.

Using the PSLM, I was able to aggregate educational outcomes for individuals ages 4 to 19 at the city-year level, thereby creating a panel dataset. The reason this data was subset as such in an effort to capture the immediate effect of primary public school investment on the school-age population. This dataset consists of 240 city-year observations, comprising of 24 cities in KPK for the years 2005 to 2016 (with the exception of 2009).

2) Other Socioeconomic Indicators: The PSLM was also used to aggregate relevant control variables at the city-year level, which include literacy rates, employment rates, home ownership rates, and income per capita. The purpose of including these variables is to control for preexisting socioeconomic conditions that could affect enrollment rates and educational attainment. While I was able to calculate these covariates for the vast majority of city-year observations, due to missing values I interpolated 2013 employment and income and extrapolated 2015 home ownership values.

3) Basic Facilities Index (BFI): To determine the rate of change in investment in public primary schools, I used data from the KPK Annual School Census (ASC). The ASC is published by the KPK Elementary & Secondary Education Department, providing information on investment in basic school infrastructure at the city level. In this context, basic infrastructure refers to whether a school has access to water, electricity, toilets, and/or a boundary wall. For each of these four measures, the proportion of public primary schools in a city with access to a given facility was derived. Averaging these four proportions led to the construction of the Basic Facilities Index (BFI), which measures the access to basic

facilities in public primary schools in a given city, ranging from 0 (low access) to 100 (high access).

Considering that the PTI was elected into office in 2013, I assessed the rate of change in BFI between 2013 and 2018 and found that on average cities experienced a 20.5% increase in BFI. I then characterized cities with above median rates of change in BFI as those receiving high intensity investment, and those with below median rates of change in BFI as low intensity. For the purpose of the empirical strategy, high intensity investment cities will be considered "treated" by the policy, while low intensity investment cities will be considered the comparison group.

B. Descriptive Statistics

This study consists of 240 city-year observations, including 24 cities for the years 2005 to 2015 (with the exception of 2009). Prior to 2013, on average, 55% of rural KPK's population aged 4 to 19 were enrolled in school. Within this sample, average educational attainment was 4.81 years. On average, 87% of school-going individuals in this sample attended public institutions. Estimated annual income per capita in these cities averaged 90,413.88 PKR (857 USD). Despite relatively low average literacy rates (39%), these cities had high employment rates (96%) and home ownership rates (89%).

Figure 1 visualizes the geographic variation in the treatment status of cities across KPK. Table II further provides comparative statistics on high intensity ("treatment") and low intensity ("comparison") investment cities prior to the PTI's election. These statistics illustrate that these groups were relatively similar along most measured dimensions. By these estimates, comparison cities had significantly higher BFI and employment rates. The differences in educational attainment, enrollment rates, literacy rates, public school attendance, home ownership, and estimated income per capita were not as drastic across the groups. Considering that the comparison group had higher initial BFI, this may have contributed to lower levels of investment in basic facilities following 2013.

IV. Methodology

A. Identification Strategy

In the context of this study, difference-in-differences (DID) estimation identifies the causal effect of investment by comparing the difference in the educational outcomes of the treatment group before and after 2013 to that of the comparison group. DID estimation is made possible by panel data, which requires having data on comparable entities across a specified unit of time. As mentioned previously, aggregating PSLM data led to the construction of a panel dataset, consisting of repeated observations of 24 cities in KPK across 10 years.

The main assumption of this empirical strategy is that, in the absence of the differential investment in public primary schools, the trends in the educational outcomes of the treatment and comparison groups would evolve similarly. In other words, if the treatment had a significant effect on educational outcomes in KPK, then we would expect to see a deviation in trends following 2013. This assumption thus requires that, prior to implementation, the treatment and comparison groups exhibit parallel trends. While these parallel trends must have similar rates of change, they are permitted to have level differences. Figure 2 demonstrates the parallel trends in mean school enrollment rates, and Figure 3 displays the parallel trends in mean educational attainment across cities in KPK. Figures 4 and 5 are identical to Figures 2 and 3, respectively, but are restricted to female respondents.

$$Y_{ct} = \alpha_c + \beta_t + \delta D_{ct} + \gamma X_{ct} + \epsilon_{ct}$$

The outcome variable Y_{ct} represents the city-year educational outcome of interest (i.e. enrollment rates or educational attainment). α_c represents city fixed effects, which control for variation across cities. β_t denotes year fixed effects, which control for variation in outcomes that occur over time. D_{ct} is a dummy variable indicating whether a city received high intensity investment in the post-period. The post-period is defined as the years following the election of PTI in KPK, which include 2014 and 2015. While the pre-period is the period from 2005 to 2013 (excluding 2009).

δ represents the DID estimator, which captures the effect of high intensity investment on educational outcomes following the election of the PTI. X_{ct} is a vector that includes relevant controls that are time-varying at the city level, including the literacy rate, employment rate, and estimated household income. ϵ_{ct} represents the disturbance term, which was clustered at the city level to control for unexplained variation in outcomes that are correlated across time.

V. Results and Discussion

The main empirical finding of this study is that, regardless of the intensity of investment in public primary schools, on average, all cities experienced similar changes in educational attainment and enrollment before and after 2013. Thereby, nullifying the initial hypothesis that cities receiving increased funding would exhibit improved educational outcomes following 2013.

A. Educational attainment

The coefficient on the DID estimator *Treated x Post 2013* in Table III, Column 1a and Table IV, Column 3a indicate that differential investment in public primary schools did not directly improve educational attainment in treated cities. More specifically, this implies that the difference in the educational attainment of the treatment group before and after PTI's election was around 0.227 years less than that of the comparison group. As shown in Table IV, Column 3a, the magnitude of this decrease was larger when comparing female educational attainment in treatment and control cities at around 0.37 years. When including additional socioeconomic covariates, as in Table III, Column 1b and Table IV, Column 3b, differential investment appears to have had

no effect on educational attainment at all. Instead, these Columns suggest that literacy rates across cities have a more identifiable impact, suggesting that each 10% increase in literacy accounts for a 0.18 to 0.27 year increase in educational attainment within a city.

As was the case with enrollment rates, the *Treated* coefficient in Table III, Column 1a and Table IV, Column 3a imply a statistically significant difference in the educational attainment of the treatment and comparison group prior to 2013. These results imply that treatment cities attained 0.128 more years of schooling relative to comparison cities in the pre-period. This preexisting discrepancy between the groups may explain why relatively higher investment in better educated cities proved to be ineffectual. As demonstrated in Table IV, Column 3a, this difference was considerably greater when restricting observations to female respondents at around 0.506 years. However, controlling for socioeconomic variables reveals that there may be no significant difference in enrollment rates of treatment and comparison cities prior to 2013. As mentioned previously, the results of Table III, Column 2b and Table IV, Column 4b imply that variation in enrollment across cities are likely explained by city literacy rates instead.

In Table III, Columns 1a and 3a, the coefficients on *Post 2013* are undoubtedly the largest and most statistically significant point estimates. This implies that comparison cities in KPK attained 1.7 to 2 fewer years of schooling in the post-period relative to the pre-period; thereby, suggesting that they were better off prior to 2013. Table IV, Column 3a indicates a greater disparity in change experienced by women in comparison cities of around 2.2 to 2.9 years; thereby suggesting that female educational attainment has decline severely following 2013.

B. School enrollment rates

As demonstrated in Table III, Columns 2a and 2b, the impact of differential investment, captured by *Treated x Post 2013*, on enrollment rates throughout KPK is statistically indistinguishable from zero. Table IV, Columns 4a and 4b also find no effect when observations are restricted to female respondents. These results imply that cities that received high intensity investment, following the election of the PTI, did not experience a significant change in enrollment relative to low intensity investment cities.

While the coefficients on *Treated x Post 2013* were unexpected, Table III, Column 2a reports statistically significant results for the *Post 2013* variable. As *Post 2013* represents the change in the enrollment rates of the comparison group in the periods before and after 2013, these results from Column 2 imply that, on average, the comparison group experienced an increase in enrollment rates at around 22% in the period after 2013 relative to the period prior. Table IV, Columns 4a and 4b, also find that this difference is nonexistent when restricting the sample to female respondents. Surprisingly, although comparison cities received less funding following 2013, they exhibited greater marginal returns in terms of enrollment.

However, controlling for socioeconomic covariates reveals that there may be no significant difference in enrollment rates before and after 2013. Table IV, Columns 4a and 4b, find that this difference is nonexistent when restricting the sample to female respondents. In fact, the results of Table III, Column 2b and Table IV, Column 4b imply that variation in enrollment across cities is explained by income per capita instead. More specifically, these results imply that for every average increase in income per capita of 100,000 PKR (953.289 USD) a city experiences, enrollment increases by about 10%.

The coefficient on *Treated* in Table III, Columns 2a and 2b are also statistically significant. Since *Treated* represents the difference in the enrollment rates of the treatment and comparison groups in the years 2013 and before, the statistically significant coefficient on *Treated* in Table III, Column 2a suggests that the treatment group had higher levels of enrollment prior to 2013. More specifically, Table III, Column 2a and 2b imply that, on average, treatment cities had enrollment rates that were around 19.2 to 24.7% higher than comparison cities at baseline. Table IV, Columns 4a and 4b find a greater difference of around 25.4 to 31.9% when restricting the sample to female respondents. Considering that treated cities had higher enrollment rates to begin with, they appear not to have achieved substantial marginal returns as a result of increased funding.

Assuming zero coefficients on *Treated x Post 2013*, it can be concluded that the PTI's differential investment affected the enrollment rates within treatment and comparison groups the same. As demonstrated by the large and significant point estimates on *Treated* across Columns, the identifiable impact on enrollment rates seems to be driven by being classified a "treated" city.

C. Discussion

Given the amount of attention the PTI has received for its work in KPK, it was initially hypothesized that the treatment group would experience improved educational outcomes relative to the comparison group following the party's election. The results of this study, however, imply that these groups experience equivalent trends in educational outcomes after 2013. To reiterate, the main empirical finding of this study is that, regardless of the intensity of investment in public primary schools, on average, all cities experienced similar changes in educational trends before and after 2013. This result is particularly surprising as it nullifies the initial hypothesis that cities receiving increased funding would exhibit improved educational outcomes following 2013.

Although my results imply that differential investment in public primary schools cannot be directly attributed to an increase in educational outcomes, there is a possibility that the party's election may have indirectly contributed to these observed improvements. According to the International Growth Center (2015), since 2013, KPK's "political governance structure has consolidated, financial flows led by remittances have strengthened and the economy has grown at 4.5% per annum in this period." Consequently, improved

economic outcomes within the province may be correlated with a greater emphasis on the importance of education. This hypothesis is consistent with previous research that finds that the returns of primary education are highest in regions with initially poor economic conditions (Psacharopoulos 1985).

VI. Limitations

By demonstrating the parallel trends assumption and constructing a strongly balanced panel dataset, I have attempted to ensure the validity of the DID model applied in this study. Additionally, by including various socioeconomic variables as part of the standard DID specification, I have attempted to further control for factors that may affect educational outcomes at the city-year level. Despite these attempts at omitting bias within my study, there are a number of limitations that must be taken into consideration when interpreting the results.

A. Data Accessibility

In the context of this study, having access to panel data at the individual-year level would have been preferable in terms of estimating more disaggregated impacts. Utilizing a similar specification on individual level data would have likely enabled me to determine the average effect of differential investment on a larger sample size, thereby increasing the statistical power of my results. However, since the PSLM surveys a random subset of the population each year, individual outcomes were instead averaged across cities to make a DID estimation possible.

In addition, although the pre-period comprises 8 years of data (192 observations), the post-period only encompasses 2 years (48 observations). This is in large part attributed to the lack of PSLM data published after 2015. While there appear to be dramatic improvements in provincial school educational outcomes between 2013 and 2014, these rates seem to slow down substantially between 2014 and 2015. Until data is made available for the years following 2015, there is no way of determining the long run impact of differential investment.

Additionally, having data on the monetary amount spent on public primary schools across cities in KPK would have improved the identification of the treatment and comparison group. However, since this data is not publicly available, instead the ASC was used to calculate the BFI for the purpose of determining these groups.

B. Sample Size Variation

As demonstrated in Figures 2 and 3, both the treatment and comparison groups experience significant variation in educational outcomes overtime. This is likely a result of the PSLM's sample size variation, which can be attributed to differences in sampling methods over the years. A larger sample size guarantees more precise mean educational outcomes, explaining the positive correlation between sample size and magnitudes of the aggregated means.

C. Baseline Imbalance

Table II presents the characteristics of treatment and comparison cities before the PTI's election in 2013. The two groups appear to be relatively similar across multiple socioeconomic dimensions. Between 2005 and 2013, it appears the comparison group had substantially higher average BFIs and employment rates. Although these level differences are not in direct violation of DID assumptions, they may explain why comparison cities experienced below median rates of investment after 2013. Thus, some intervention independent of differential investment may have driven these developments in educational outcomes in comparison cities after 2013.

D. Undetermined Mechanisms

Following 2013, both the high and low intensity investment regions demonstrate a drastic enhancement in educational outcomes independent of investment, suggesting the effect of other unaccounted interventions. The possibility that the deviation in parallel trends is caused by factors other than differential investment is a potential weakness to this identification strategy. For instance, the 18th Constitutional Amendment – which devolved the responsibility of providing free education to provinces – may have resulted in less well documented methods to improve the state of education in KPK. Considering that cities were not arbitrarily assigned to receive high or low intensity investment, there is a possibility that the trends in educational outcomes may have been affected by other related mechanisms. However, acquiring information as to how funding allocation was determined could be useful in terms of understanding these undetermined mechanisms.

E. External Validity

Given the specificity of the setting and policy evaluated, the findings of this study are likely not applicable in other contexts. This is emphasized by Duflo (2001), who found that individuals in Indonesia living in regions with higher school construction rates received increased schooling over their lifetimes. If, for instance, this study had concluded that the treatment group experienced improved educational outcomes, then it would have greater external validity.

VII. Conclusion, Implications, and Further Research

A. Conclusion

The initial motivation behind this study was to understand the extent to which the PTI has had an effect on the lives of people in KPK. More specifically, this study focuses on how differential investment in public primary school infrastructure, facilitated by the party, has affected educational outcomes in KPK. Using DID estimation, I find that high intensity investment facilitated by the PTI has had no detectable effect on educational outcomes. This result is especially interesting as it contradicts popular belief on the efficacy of the PTI's targeted policies. Following 2013, on average, cities across KPK experienced declining rates of

educational attainment that appears unrelated to differential investment. Among those most severely affected by this decline are female respondents. Considering that the PTI had already been elected during this period, it is difficult to determine whether these changes can be directly attributed to the party's intervention. As of now, the party's involvement in affecting educational outcomes in KPK after 2013 is still unclear.

B. Implications and Further Research

Given that this study only considers two years of post-period data, further research extending this analysis is needed to determine the extent to which these results hold. Additionally, researchers interested in evaluating the impact of the PTI's governance are strongly encouraged to seek individual level panel data as part of their analysis. Since 2013, the party has institutionalized various progressive reforms aimed at improving the state of public education, healthcare, and women's rights in KPK. Further empirical analysis of such policies is not only crucial to assessing their efficacy, but also imperative to determining how best to allocate KPK's limited annual budget.

REFERENCES

Alderman, H., P. Orazem, and E. Paterno. 2000. "School Quality, School Cost, and the Public/Private School Choices of Low-Income Households in Pakistan." *The Journal of Human Resources* 36:304–26. doi:10.2307/3069661.

Ali, Z., A. Ali, and F. Ghani. 2010. "Expansion of Private Public Schools in Khyber Pakhtunkhwa and Policy Imperatives: A Case Study of Peshawar." *The Dialogue* 5:91–102. doi:10.13140/RG.2.2.30300.33923.

Behrman, J., S. Khan, D. Ross, and R. Sabot. 1997. "School Quality And Cognitive Achievement Production: A Case Study For Rural Pakistan." *Economics of Education Review* 16:127–42. doi:10.1016/s0272-7757(96)00045-3.

Behrman, J., D. Ross, and R. Sabot. 2008. "Improving Quality Versus Increasing The Quantity of Schooling: Estimates of Rates Of Return From Rural Pakistan." *Journal Of Development Economics* 85:94–104. doi:10.1016/j.jdeveco.2006.07.004.

Chadda, Maya. 2000. *Building Democracy in South Asia: India, Nepal, Pakistan.* London: Lynne Rienner.

Duflo, Esther. 2001. "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment." *American Economic Review* 91:795–813. doi:10.1257/aer.91.4.795.

International Growth Center. 2015. *Reclaiming Prosperity in Khyber-Paktunkhwa: A medium term strategy for inclusive growth.* https://www.theigc.org/wp-content/uploads/2015/04/Ikram-et-al-2015-Working-paper-Full-report1.pdf.

Ministry of Finance, Government of Pakistan. 2018. *Budget in Brief.* Islamabad. http://www.finance.gov.pk/budget/Budget_in_Brief_2018_19.pdf.

Pakistan Bureau of Statistics. 2017. *Provisional Summary Results of 6th Population and Housing Census-2017.* http://www.pbs.gov.pk/content/provisional-summary-results-6th-population-and-housing-census-2017-0.

Pew Research Center. 2009. "Growing Concerns about Extremism, Continuing Discontent with U.S." https://www.pewresearch.org/wp-content/uploads/sites/2/2009/08/Pew-Global-Attitudes-Pakistan-Report-August-13-2009.pdf.

Psacharopoulos, George. 1985. "Returns To Education: A Further International Update and Implications." *Journal of Human Resources* 20:583–604. doi:10.1080/09645290420002 39140.

Senate of Pakistan. 2010. *Constitution (Eighteenth Amendment) Act, 2010.* Islamabad. http://www.pakistani.org/pakistan/constitution/amendments/18amendment.html.

The Economist. 2017. "Imran Khan's Party Improves Services In Pakistan's Wildest Province." https://www.economist.com/asia/2017/06/08/imran-khans-party-improves-services-in-pakistans-wildest-province.

VIII. Appendix A: Figures and Tables

TABLE I: Pakistan Federal Budget Allocation by Province

Province	Budget Allocation per capita (PKR)
Punjab	34,557.118
Sindh	39,657.277
KPK	23,552.087
Balochistan	68,074.605

Source: Ministry of Finance, Government of Pakistan (2018)

FIG. 1: Regions of KPK Affected by PTI Education Policies

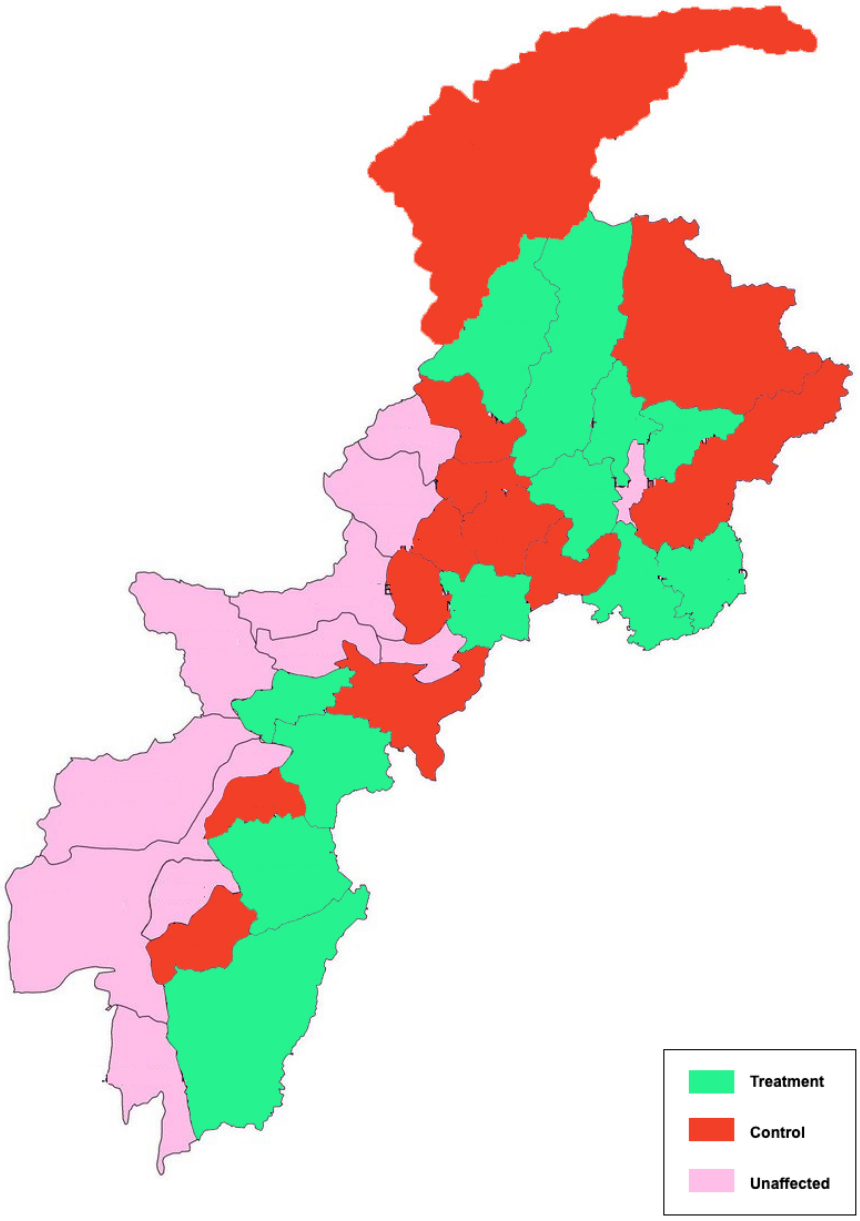

TABLE II: Average Characteristics of Treatment vs. Comparison Groups (2005-2013)

	All	Treated	Comparison	Difference	t-test
Years of education	4.81	4.75	4.87	-0.12	-0.607
	(1.53)	(1.55)	(1.51)		
Total enrollment rates	0.55	0.56	0.55	0.01	0.552
	(0.14)	(0.15)	(0.13)		
Basic Facilities Index (0-100)	70.67	60.83	76.96	-16.13	-7.065***
	(19.36)	(16.88)	(18.45)		
Literacy rate	0.39	0.39	0.38	0.01	0.701
	(0.11)	(0.12)	(0.10)		
Employment rate	0.96	0.95	0.97	-0.02	-2.717***
	(0.06)	(0.07)	(0.04)		
Home ownership rate	0.89	0.90	0.89	0.01	1.107
	(0.07)	(0.07)	(0.07)		
Estimated income per capita (PKR)	90,413.38	88,095.39	92,731.37	-4,635.98	-0.950
	(37,786.88)	(37,241.66)	(38,378.72)		
Proportion in public schools	0.87	0.86	0.88	-0.02	-1.336
	(0.12)	(0.13)	(0.10)		
Observations	192	96	96		

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

FIG. 2: Mean school enrollment rates in KPK (2005-2015)

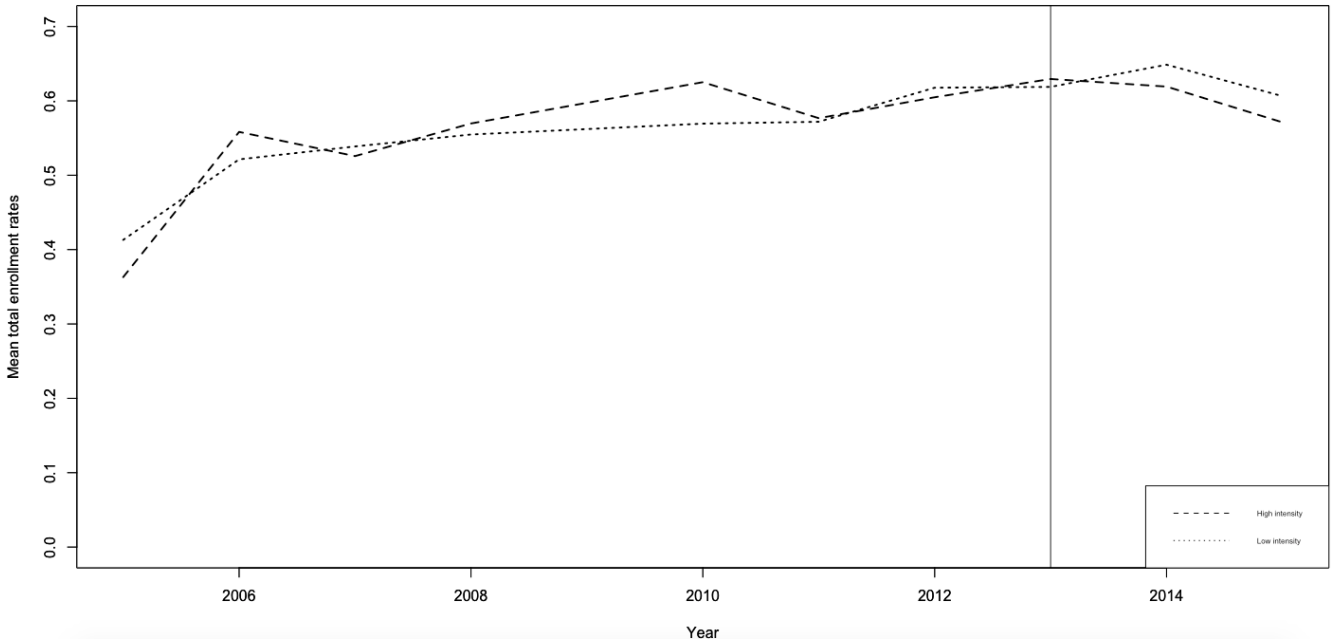

FIG. 3: Mean educational attainment in KPK (2005-2015)

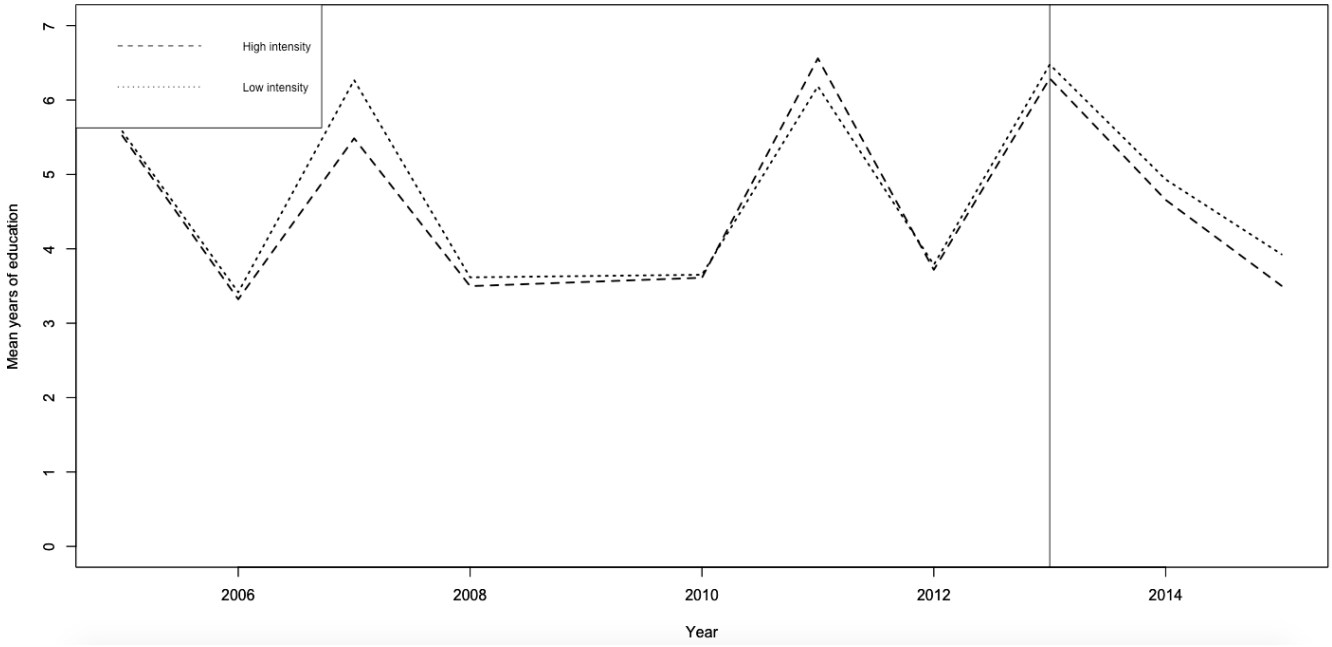

FIG. 4: Mean school enrollment rates in KPK (2005-2015) for female respondents

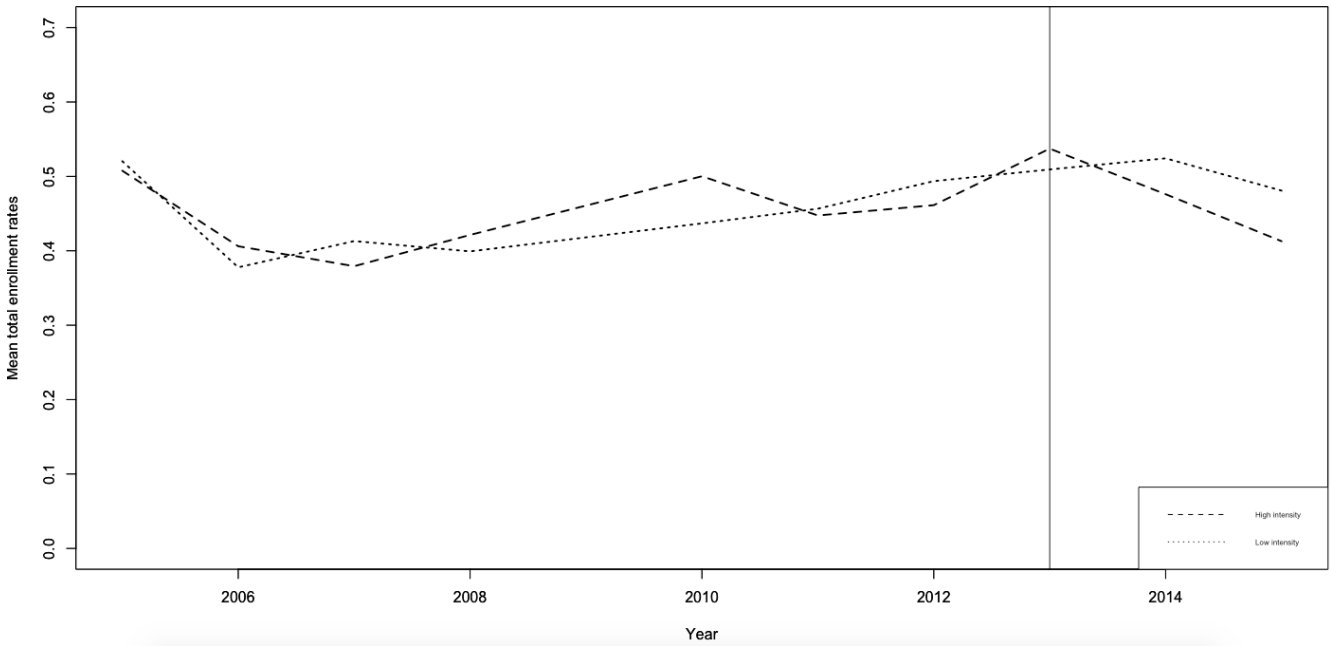

FIG. 5: Mean educational attainment in KPK (2005-2015) for female respondents

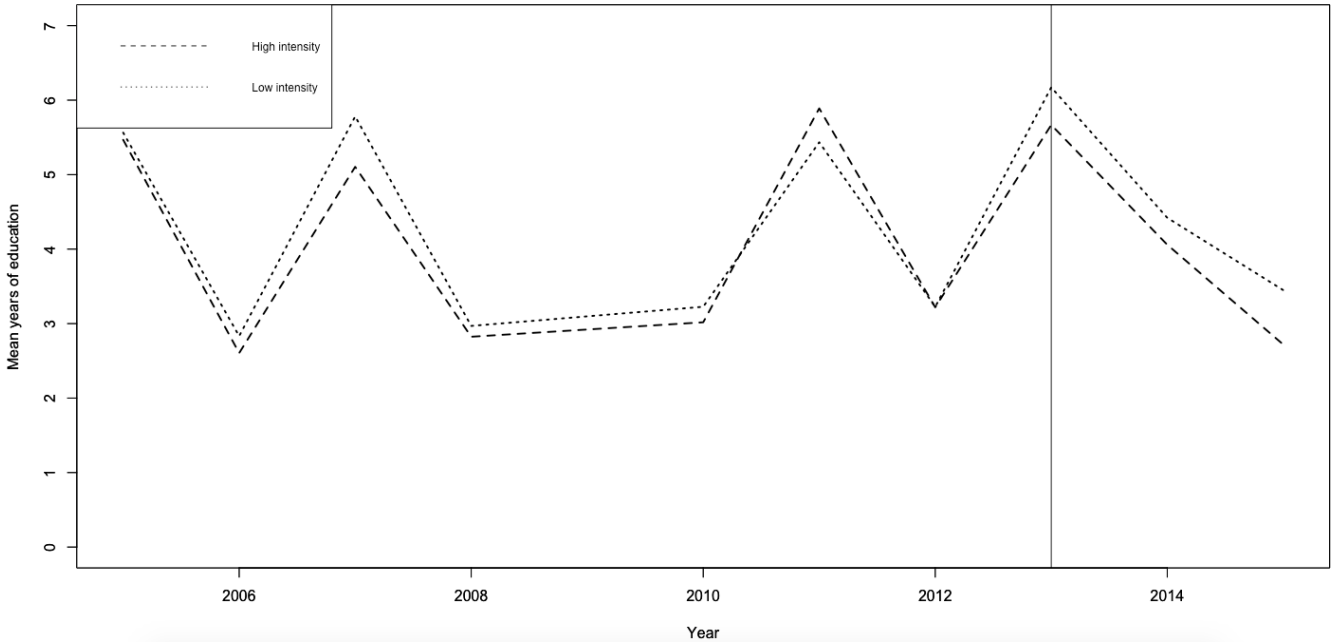

TABLE III: Impact of Differential Investment on Educational Outcomes

	(1a) Years of education	(1b) Years of education	(2a) Enrollment	(2b) Enrollment
Treated	0.128***	-0.399*	0.247***	0.192***
	(0.0177)	(0.155)	(0.00557)	(0.0318)
Post 2013	-1.722***	-1.996***	0.220**	0.0936
	(0.207)	(0.317)	(0.0680)	(0.0843)
Treated x Post 2013	-0.227*	-0.124	-0.0382	-0.0299
	(0.0887)	(0.113)	(0.0278)	(0.0258)
Literacy rate		1.794**		0.134
		(0.626)		(0.134)
Home ownership rate		-0.960		0.0288
		(0.918)		(0.158)
Employment rate		0.364		0.114
		(1.272)		(0.0981)
Income per capita (PKR)		0.000000604		0.000000921***
		(0.00000225)		(0.000000242)
Constant	6.139***	6.224***	0.281***	0.0846
	(0.180)	(1.315)	(0.0513)	(0.168)
N	240	240	240	240

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE IV: Differential Investment on Educational Outcomes of Female Respondents

	(3a) Years of education	(3b) Years of education	(4a) Enrollment	(4b) Enrollment
Treated	0.506***	-0.296	0.319***	0.254***
	(0.0294)	(0.201)	(0.00723)	(0.0411)
Post 2013	-2.247***	-2.857***	-0.0347	-0.180
	(0.269)	(0.388)	(0.0872)	(0.103)
Treated x Post 2013	-0.370*	-0.209	-0.0648	-0.0555
	(0.147)	(0.173)	(0.0362)	(0.0334)
Literacy rate		2.726**		0.155
		(0.791)		(0.172)
Home ownership rate		-0.485		-0.00434
		(0.981)		(0.210)
Employment rate		0.792		0.150
		(1.209)		(0.149)
Income per capita (PKR)		0.00000245		0.00000106**
		(0.00000293)		(0.000000318)
Constant	6.145***	5.107***	0.401***	0.191
	(0.211)	(1.281)	(0.0662)	(0.216)
N	240	240	240	240

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$