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Learning versus Working; Factors Affecting Adolescent Time Allocation in Pakistan

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This paper explores how family, school and community factors influence adolescents' time allocation among market work, domestic work, learning and leisure. We model adolescents' time use in a multivariate framework, using explanatory variables characterising the household as well as labour demand, school access and school quality at the district level. This research shows that the amount of time children spend working, whether at home or in the market, is strongly correlated with household poverty, as proxied by an asset index. Consistent with the literature on the predictors of school enrolments of adolescents, the time spent on learning is also significantly lower among the poor. In Pakistan the Benazir Income Support Programme (BISP) census poverty score database, which includes information on household assets, would be a very promising tool to target efforts to increase children's time allocated to learning.

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I. INTRODUCTION

School enrolment rates of Pakistani adolescents remain among the lowest in Asia. Thus, in the Pakistani context, poverty reduction strategies addressing the long-term needs of children and youth must be centrally tied to the promotion of education and learning.[1] Unfortunately many current realities in the lives of Pakistani children and youth compete with the time required to acquire the knowledge and skills needed to break out of the poverty trap in which they find themselves. These include their families'

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[1]Recognising the need to improve social indicators, Pakistan's 2009 Poverty Reduction Strategy Paper adopts human development as a priority area with a particular focus on education, health, safe water and sanitation, population planning and gender equality.

economic circumstances, which may require children to assist the family either in income generating activities or in domestic chores (including taking care of siblings or the elderly), poor infrastructure that leads to excessive time spent in collection of basic necessities such as water and fuel for cooking and the lack of labour-saving appliances in the home and migration of a breadwinner. In addition, when schools are of poor quality or when educational expenses are excessive due to cost of transport, books, uniforms, private tuition or corruption among teachers, parents may question the value of schooling, with the result that some children never attend school and many drop out after a few grades. The trade-off between short-term pay-offs to child labour and potential long-term benefits to schooling becomes more pronounced when credit markets are unavailable to the poor, limiting their ability to optimise human capital investments in the long term.

In order for poverty reduction strategies to address barriers to school enrolment and retention as well as support effective learning (which often requires time after school for homework and possibly extra tutoring) the economic realities of children's lives within the context of their families and communities need to be more fully understood. The 2007 Time Use Survey (TUS), which can be linked at the district level to the Labour Force Survey fielded in the same year as well as the 2005 School Census, offers us the opportunity to explore some of these factors in depth.

In this paper, we explore the role of potentially critical family, school and community factors affecting how both younger and older adolescents allocate their time between four broad sets of activities—market work, domestic work, learning and leisure—highlighting the differences between males and females. The richness of the time use data allows us the opportunity for a fuller analysis of work and education decisions than is usually possible. This is particularly important in a context where many adolescents are not in school and where out-of-school children are not universally found to participate in either market (particularly true for girls) or domestic work (particularly true for boys). Not only is the enrolment rate among Pakistani adolescents relatively low by Asian standards but the gender gap in enrolment rates, even after some recent decline, remains one of the largest in the developing world. After a brief review of the literature and description of the data, we begin our data analysis with an overview of adolescent time use patterns by age, gender and urban/rural residence. We then model children's time use in a multivariate framework with explanatory variables characterising the household as well as labour demand, school access and school quality at the district level. Our goal in this descriptive analysis is to document the correlates of children's time use patterns, which would be relevant for policies that aim at alleviating both short-term and longer-term childhood poverty in Pakistan through reductions in child labour and increases in time spent learning.

II. REVIEW OF THE LITERATURE

There is growing evidence from around the world that parents' aspirations for their children's education are rising and that even illiterate parents increasingly recognise the value of education. In Pakistan, results from a rural survey conducted 13 years ago in 1997 in Punjab and KP found that a majority of parents thought that their boys should have more than a matric-level education (grade 10) and about a third of parents wished

for more than a matric education for their girls [Sathar, *et al*. (2000)]. Despite these aspirations, educational attainment levels in Pakistan fall short of these aspirations for a variety of reasons among which poverty and school quality are the most compelling.

There is a large literature documenting the positive association between parental income or wealth and children's educational participation and attainment [NRC/IOM (2005)]. In Pakistan, school attendance varies significantly by household economic status. Data from a nationally representative adolescent survey, collected a decade ago, show enormous percentage gaps among adolescents from households in the lowest wealth quartile and those from households in the highest wealth quartile [Lloyd, Mete, and Grant (2007)]. For 15-19 year old boys, the range was 31 percentage points in rural areas and 45 percentage points in urban areas. For girls, the range in attendance rates was 60 percentage points in rural areas and 50 percentage points in urban areas. Despite the evidence of high rates of return to educational investments in the form of future earnings, poverty and lack of access to credit prevent parents from making educational investments because the upfront costs are often too high both in terms of direct cash outlays (even in settings with free primary or basic education) and in terms of the indirect opportunity costs in the form of foregone family labour. Finally, in the Pakistan context, the volatile law-and-order situation and its negative effects on labour markets may add further uncertainty to what returns a child may enjoy to his/her education and skills in the long term.

School access and quality also affect children's school enrolment. Having a school nearby is critical, particularly for girls given parental concerns about protection and safety. Furthermore, even illiterate or poorly educated parents can sense when their children are not learning. Sawada and Lokshin (2001) found that in Pakistan, parents are more likely not to enrol their children if their local schools lack high-quality teachers. Lloyd, Mete, and Sathar (2005) found that enrolment, particularly for Pakistani girls, was affected by the share of local public school teachers who reside in the village (proxy for teacher attendance). Winthrop and Graf (2010) have drawn on a rich literature on education in Pakistan to highlight the need for educational reform, in particular improvements in school quality.

Other important factors affecting enrolment rates include parents' education, (particularly) father's occupation, family size, child health, and rural/urban residence. Parents' better education, fewer siblings, children's better health and urban residence result in higher enrolment rates and grade attainment and conversely lower rates of child labour. Lloyd, Mete, and Grant (2009) found that rural girls living in Punjab and KP were more likely to have dropped out of school from 1997 to 2004 if their mother has had an unwanted birth during the previous six years, indicating the impact of unwanted fertility and family size on children's educational outcomes.

In poor households, the opportunity costs of children's enrolment may be too high for parents given their need for help in the household and in the family business or farm. For example, in an assessment of the pilot phase of the implementation of a conditional cash transfer programme aiming to increase primary school attendance of poor children in three districts in Pakistan, World Bank (2009) found that the greatest barrier to meeting the programme conditions was "need child to help with work at home", that was stated by 75 percent of parents interviewed.

Standard household surveys tend to be unreliable for the measurement of child labour, thus (diary based) Time Use Surveys provide an opportunity to document the scale and implications of time spent on different activities including work and learning.[2] Highlighting this issue, Rustagi (2009) utilises Time Use Survey data from India to show that many more girls than boys are involved in not only unpaid work but also paid work. Mete (2013), analysing differences in children's work time between rural and urban areas in five countries, shows the extent to which children work more in rural areas where labour demands are high, with particularly large effects seen in the lowest GDP per-capita countries, in particular Pakistan.

In settings with limited infrastructure, the time demands of household chores may also leave little time for school. Koolwal and ven de Walle (2010) estimated for Pakistan that a one hour reduction in the time required to collect drinking water would increase girls' and boys' enrolment rates by 18-19 percent. Their analysis included data from nine countries and the estimated effects of water access for children were among the largest for Pakistan.

Children's participation in market work has been found to be strongly associated with poverty in a range of settings including Ivory Coast, Colombia, Bolivia, the Philippines, Ghana and Vietnam [Grootaert and Kanbur (1995); Grootaert and Patrinos (1999); Canagarajah and Coulombe (1997); Edmonds and Pavcnik (2001)]. A family's need for cash will trump their aspirations for their children's schooling if they are poor and if there are opportunities for children to participate in market work nearby, although emerging evidence suggests that relatively small cash transfers can have sizable effects on poor children's school enrolments and attendance [Edmonds and Schady (2012)]. While in some settings it is possible for children to both attend school and participate in market work, this combination of activities is rarely reported in Pakistan.[3]

Within this overall economic framework lie strong gender differences in educational participation and patterns of work that, while influenced by the factors mentioned above, also have a history that lies outside this framework reflecting the influences of culture and religion. A variety of factors have been identified in the literature as important in explaining gender differences in school enrolment and patterns of children's work that depend on the culture and religion. Lloyd, Grant, and Ritchie (2008) review the literature on adolescent time use in developing countries and present findings from the analysis of data sets from five countries where definitions of time use are comparable and separable into the four categories of time use described above. Two major gender patterns are universal only varying by degree from setting to setting. First, while adolescent boys and girls both spend time working, the type of work they do differs with boys spending more time on market work activities and girls on domestic work. Second, girls tend to work longer hours in total than boys when market work and domestic work are combined, leaving girls less time for leisure. These basic realities have implications for gender differences in enrolment. They also have implications for the extent of parental responsiveness to changes in opportunities and costs as they relate to the education of their boys and girls. For example, boys' enrolment is less dependent on

[2]Joyce and Stewart (1999) highlight a number of areas where time-use data would make important contributions, including valuation of nonmarket work, verification and interpretation of existing information, measurement of real income and well-being, education and training.

[3]In a nationally representative survey of adolescents in Pakistan fielded in 2001-2002, it was found that few adolescents combine work and schooling [Sathar, *et al*. (2003)].

the proximity of a school than girls' enrolment [Lloyd, Mete, and Sathar (2005)] and girls are more likely to be withdrawn from school with the arrival of a new sibling than boys [Lloyd, Mete, and Sathar (2009)]. In terms of the transition between domestic work to market work, Aslam, *et al.* (2008) find that it is not until girls in Pakistan complete matric that we begin to see the composition of their work time shift significantly away from domestic work and towards participation in market work.

III. THE DATA

The main data used for this analysis are drawn from the 2007 Time Use Survey undertaken by the Pakistan Bureau of Statistics—a first of its kind in Pakistan. The respondents who reported on their time use were drawn from a nationally representative sample of 19,380 enumerated households. Two individuals over the age of 10 were chosen from each household using a selection grid for all households with 3 or more eligible members to assure randomisation.[4] The final sample consisted of 37,832 individuals of whom 5860 were adolescent boys ages 10-19 and 5638 were adolescent girls of the same ages. The survey was conducted during all 4 quarters of the year so that seasonal variations in time use would be reflected in the data. Each respondent was asked about time use over the previous 24-hour period, in half an hour segments.[5] The time diary allowed for the recording of up to 3 activities in each of 48 time segments. The responses, which were open-ended, were subsequently coded using a detailed activity classification system. While interviews took place every day of the week, including days when schools were not in session or on holidays, fewer interviews took place on Saturday than on the other days of the week. For this analysis we restrict the analysis to weekdays and periods when schools were in operation.

We grouped the activities into four broad categories: (1) market work, (2) domestic work, (3) learning, and (4) leisure. As defined by the survey, the time spent in market work included employment for establishments regardless of location as well as self-employment or work for family business including either primary production activities or services for income and other production of goods.[6] Time spent in domestic work included household maintenance, management and shopping for own household, care for children, the sick, the elderly and disabled for own household and community service or help to other households. We broadened the definition of learning beyond that used in the survey to include not only a diverse list of activities grouped for the survey under learning (including general education, homework, studies and course review, non-formal education, additional study and courses, preparation for exams, work-related training, travel related to learning and exams, waiting for learning and other learning not elsewhere classified) but also several other activities including participation in arts, sports, reading, visiting library and accessing information by computer. Leisure included other non-work and non-learning activities such as participation in cultural or religious activities, sports, watching TV, etc. Personal care that includes sleep and personal hygiene is the residual category.

[4]In households with either one or two eligible members, all eligible members were interviewed.

[5]It is interesting to note than less a third of the sample had a watch. 42 percent of males had a watch but only 17 percent of females.

[6]The employment patterns of children who reside within households are captured here. The TUS instrument would not capture, for example, bonded labour arrangements where the child workers may be detached from their households.

Box 1

Comparison of Enrolment Rates from 2007 LFS with Education and Learning Participation Rates Derived from the 2007 TUS Data

The Time Use Survey data on participation in learning are broadly consistent with the school enrolment rates derived from the Labour Force Survey (LFS) data for the same age groups, as summarised by the table below, while as discussed previously the Time Use Survey data provide one an opportunity to work with a much more complete definition of child work. The questions included in the two surveys are not fully comparable, however, and thus some differences between the two surveys are expected. For example, since LFS inquires about school enrolment but not school attendance, one could expect higher LFS enrolment statistics as opposed to TUS participation rates that are more likely to reflect school attendance. On the other hand, the LFS school enrolment question is likely to capture primarily formal school enrolment (not enrolment in religious schools or participation in non-formal education), which could underestimate participation-in-learning relative to the TUS data. Variations in the quality of fieldwork may also explain some of the differences. In our data, the TUS statistics are comparable but always lower than LFS statistics (particularly when only time in formal school is counted) except in the case of the youngest girls using the broadest definition of learning. In addition, the gender gap among older adolescents is much greater using the TUS education participation rate suggesting possibly lower attendance rates in formal schooling among older girls.

	10-14 Boys	10-14 Girls	*G/B 10-14*	15-19 Boys	15-19 Girls	*G/B 15-19*
Rural						
Enrolment (LFS)	77	54	*0.70*	42	24	*0.57*
Participation in Learning (TUS as defined in text)	69	56	*0.81*	35	21	*0.60*
Participation in Education (TUS, considers only time spent on formal schooling including home work, studies and course review)	68	49	*0.72*	34	16	*0.47*
Urban						
Enrolment (LFS)	87	84	*0.97*	56	54	*0.96*
Participation in Learning (TUS as defined on page 4.)	81	79	*0.98*	51	48	*0.94*
Participation in Education (TUS, considers only time spent on formal schooling including home work, studies and course review)	79	75	*0.95*	46	36	*0.77*

The TUS statistics are for normal weekdays.

In addition to detailed data on time use for each respondent, the Pakistan Time Use Survey also collects basic information on household characteristics. These data allow us to create a proxy for long-term wealth using an additive index of 20 household assets.[7] Other data gathered at the household level which captured features of the local community included travel time to fuel and water, whether or not the household had access to electricity and/or gas, whether or not a primary school and a secondary school were located within 30 minutes. Data on the household size, number of dependents, and sex and age of household head were also collected.

Since some of the factors impinging on time allocation decisions operate beyond the level of the family and household at the community level, we were interested in capturing relevant characteristics of the labour market. We relied on the national Labour

[7]Two separate indices were developed—one based on principle component analysis and one using a simple additive index ranging from 0-20 (scaled to vary between 0 and 1). The correlation coefficient between the two indices was .96 so we decided to stick with the simpler additive index which reflects the possession of any or all of the following items: sewing machine, washing machine, kerosene oil stove, electric/gas stove, pressure cooker, microwave oven, vacuum cleaner, refrigerator, telephone, mobile phone, TV, radio, car, clock, cable TV, computer, internet, cycle, motorcycle, VCR/DVD.

Force Survey (2007) for indicators of labour demand measured at the district level. Since the Labour Force Survey is not representative at the district level, we also used 2008-09 Pakistan Social and Living Standards Measurement Survey (representative at district level) to confirm the robustness of the findings. We considered two indicators of labour demand: (i) the district unemployment rate; and (ii) the share of the employed who are fully employed.[8] These two indicators turned out to be highly (negatively) correlated, with a correlation coefficient of 0.885; thus only district unemployment rate was used in the empirical models. The correlation coefficient between the unemployment rate by survey type was also high at 0.7.

In order to capture some aspects of the school environment at the district level, we used data from the School Census that was conducted in 2005. We recognise that things will have changed over the 2-year interval between the School Census and the 2007 surveys but we are assuming that these changes do not measurably affect the cross-district ranking of various measures of school quality. We created measures of school quality by averaging information across schools within a district. These measures include the student/teacher ratio (as a proxy for class size),[9] the proportion of students with drinking water at the school, and an index of the adequacy of classroom furniture, including tables and chairs for teachers, desks or benches for students as well as carpets and cupboards for students.[10] Because most but not all formal schools are single sex, we estimated separate school quality measures for primary and middle girls' schools, boys' schools and mixed schools as well as for secondary girls' schools, boys' schools and mixed schools by district.

IV. TIME USE PATTERNS AMONG ADOLESCENTS

The TUS allows us to explore a much fuller range of learning activities for adolescents than just participation in formal schooling (or what the survey labelled "general education"). This is important as it is precisely during adolescence that learning paths diversify with some adolescents following a more conventional path from primary to middle to secondary school within the formal system while others pursue non-formal learning alternatives including literacy and vocational training programmes as well as distance courses, computer training and self-education.

Table 1 presents enrolment rates from the Labour Force Survey (LFS) to provide a context within which we can interpret the time use data. In early adolescence at ages 10-14, we can see that roughly three quarters of the boys and only slightly more than 50 percent of the girls attend school in rural Pakistan. By later adolescence at ages 15-19, rural enrolment rates drop precipitously so that only 42 percent of the boys and 24 percent of the girls are still in school. The gender gap in rural enrolment remains extremely wide by international standards at 23 percentage points among those aged

[8]This was based on a compilation of involuntary reasons for underemployment including exogenous factors such as strike or lockout or layoff holiday, off season inactivity, bad weather, shortage of raw materials or fuel or other involuntary reasons.

[9]Some schools that were assessed as functional in the census did not report either the enrolment and/or the number of teachers. However, the percent of all schools with missing data on either enrolment or teachers represented less than 2 percent of all schools.

[10]The options available for the interviewer to choose for each element included: "according to requirements", "inadequate" or "not available".

Table 1

School Enrolment Among Adolescents by Sex and by Rural/Urban Residence (LFS 2007)

Age Group	10-14 Boys	10-14 Girls	10-14 Gender Gaps (Boys-Girls)	15-19 Boys	15-19 Girls	15-19 Gender Gap (Boys-Girls)
Rural	77	54	23	42	24	18
Urban	87	84	3	56	54	2

10, 14 and 18 percentage points among those aged 15-19. In urban Pakistan, the situation is very different. Over 80 percent of young adolescent boys and girls are enrolled in school and the gender gap is negligible. Again enrolment rates fall by 30 percentage points in later adolescence so that no more than a slight majority of boys and girls are attending school at ages 15-19.

Behind these data lie a more detailed and nuanced story about the daily lives of adolescents as revealed by their daily time use data as reported in the Time Use Survey. In Table 2 we show the percent of adolescents by age, sex and residence who participated in market work, domestic work and learning in the previous 24 hours as well as the mean number of minutes per day spent in each activity for those who reported any participation in that activity. As explained above, learning encompasses a range of activities beyond school attendance.

Table 2

Participation Rates and Average Minutes Spent Among Participants in Market Work, Domestic Work and Learning by Age, Sex and Residence (TUS 2007)

Age Group	10-14 Boys	10-14 Girls	15-19 Boys	15-19 Girls
Participation Rates				
Rural				
Market Work	37	32	67	49
Domestic Work	19	72	22	92
Learning	69	56	35	21
Urban				
Market Work	15	10	42	20
Domestic Work	21	58	25	87
Learning	81	79	51	48
Mean Minutes per Day for those who Participate in the Activity				
Rural				
Market Work	281	189	409	214
Domestic Work	70	182	104	279
Learning	378	351	383	339
Urban				
Market Work	329	163	490	177
Domestic Work	75	125	90	223
Learning	399	375	370	334

In terms of participation rates, we can see that, for boys in rural areas, roughly two-thirds report participating in learning activities in the 24 hours before the survey during the early adolescent years (10-14). Participation in learning activities among rural boys falls to only a third during the later adolescent years (15-19). While no more than a fifth of the boys report any domestic work activity in the previous day, participation in market work rises to roughly two-thirds in the later adolescent years (15-19). The biggest gender gap in participation rates in rural areas is in participation in domestic work with over 70 percent of younger girls (10-14) reporting domestic work in the previous day and 90 percent of older girls (15-19). A detailed exploration of the types of domestic work which are most commonly reported by adolescent girls includes time spent in food preparation including grinding, milling, culling, heating water and chopping wood, cooking, cleaning up as well as household cleaning and upkeep and the care and washing of clothes, and the care of children. Roughly a third of the younger rural girls participate in market work rising to nearly a half among older girls. However, those girls who do report participation in market work spend significantly fewer hours than boys on this activity. While older boys doing market work spend on average almost 7 hours daily, girls report an average of about 3 and a half hours of work. For those who report participation in learning activities, these are the most time consuming activities, averaging 6 to 6.5 hours daily.

In urban areas, the rates of participation in learning are much higher, particularly for girls with the result that we see almost no gender gap. To balance more time spent on learning, urban boys and girls report much less time spent in market work. Participation in domestic work remains highly feminised with only a fifth of the boys reporting participation in the previous day (the same participation rates as reported by rural boys) and participation rates for urban girls rising to almost the same level as reported by rural girls at 87 percent. However, urban girls who do domestic household work report fewer hours than the rural girls.

It is clear that learning activities encompass much more than formal school attendance which was defined by the TUS as participation in general education. As we can see in Table 3, there are strong pay-offs to taking into account learning activities at home. Learning at home encompasses homework, studies and course review related to general education, preparation for exams and additional study and courses. Significant time is spent at home on learning as a result of homework and exam preparation. Participation rates in informal education, which include not only enrolment in non-formal education programmes but also participation in arts, sports, reading, computer and library, is very low except among older urban adolescents where participation rates are 12 percent. A large percentage of younger adolescents (fewer girls than boys) report time in travel to school or "waiting for learning" and for those who report time in this activity, the time spent is roughly an hour. The category "other learning not elsewhere classified" appears to be quite important for younger adolescents and is likely to relate to religious education that many Pakistani children participate in on a part-time basis to learn the Quran. Roughly, a quarter of the rural boys and girls participate in "other" learning and roughly a third of the younger adolescents in urban areas. For those who report participating in this activity on the previous day, this unclassified learning activity consumes roughly an average of 2 hours daily. Table 3 does not include participation in work training which was reported by very few but, for the few who do participate, work training absorbs significant time particularly for older rural boys.

Table 3

Participation Rates and Mean Daily Minutes Spent Among Participants in Selected Learning Activities by Age, Sex and Rural/Urban

	Boys 10-14	Girls 10-14	Boys 15-19	Girls 15-19
Participation Rates				
Rural				
General Ed.	51	35	23	11
Home Work	48	41	26	16
Informal Ed.	1	1	2	2
Travel/Waiting	60	46	27	14
Other	24	21	7	4
Urban				
General Ed.	59	53	34	24
Home Work	60	61	35	32
Informal Ed.	4	4	12	12
Travel/Waiting	70	64	37	30
Other	36	30	10	10
Mean Minutes per Day for those who Participate in the Activity				
Rural				
General Ed.	293	286	291	294
Home Work	91	107	130	150
Informal Ed.	92	63	103	84
Travel/Waiting	63	62	70	61
Other	122	109	154	151
Urban				
General Ed.	279	278	269	282
Home Work	97	115	140	151
Informal Ed.	102	62	82	70
Travel/Waiting	70	67	68	68
Other	122	107	125	125

V. EMPIRICAL FRAMEWORK

An heuristic model to illustrate the key concepts of interest is offered by Edmonds (2007) briefly summarised here. In this utility maximisation framework Y is income from parents' labour supply, M is child's work outside of household at wage w, E is education and e is direct schooling costs, H is value obtained from the input of child's time, P is play/leisure. Thus the first component of the utility function considers purchased inputs and also input of the child's time, while the second component of the utility function captures the value attached to child's future welfare that is a function of time allocated to education and play/leisure.

$$\max_{E,P.M.H.} u(F(Y + wM - eE, H), R(E, P)$$

Subject to $E + P + M + H = 1$, $E \geq 0$, $M \geq 0$, $H \geq 0$

It is useful to highlight two implications of this framework here. Labour market conditions (through parental earnings and wage rates that apply to child work) are explicitly part of the model. Indeed, not only the adult wages are likely to have an impact on child labour but also the sectoral distribution of labour, the skilled versus unskilled labour supply mix, unemployment and underemployment rates etc. It is possible to further model such relationships, for example allowing child labour to be a substitute to unskilled adult labour [Doepke and Zilibotti (2005)]. In our empirical model we are able to take into account district level unemployment rates, via merging TUS data with LFS and PSLM data as discussed earlier. Also, education quality is implicitly included since the value that parents attach to children's time spent on learning will depend on the quality of schools. By merging TUS data with school census data, we included district level school-characteristics variables in the model.

The reduced form equations that we estimate are:

$$T_i = \beta_{1i}X_1 + \beta_{2i}X_2 + \beta_{3i}X_3 + \varepsilon_i$$

Where T_1,T_2, T_3 and T_4 are time (minutes) spent on market work, domestic work, learning and leisure in the previous 24 hours respectively. The vector of explanatory variables, X_1, includes the household head's age and its square; the household head's gender; an asset index as a proxy for household wealth; urban residence dummy; number of children as a percent of all household members; child's gender, age and its square. The district level unemployment rate and school characteristics are captured by X_2 and X_3 respectively.

VI. MULTIVARIATE RESULTS

Multivariate tobit models are used for the estimation, since not all children report spending time on three of the four categories of interest (all observations have non-zero time values for the leisure category). This approach also allows each equation's error term to be correlated with other error terms, which provide useful information on the extent to which children who spend time on one activity are more (or less) likely to spend time on another activity, after taking into account the effects of explanatory variables. Tables 4 and 5 present the results.

Regressions were run separately for younger and older adolescent girls and younger and older adolescent boys. Household variables include the head's age, whether or not the head was female, the percent of dependents in the household, and an index of household assets. The school variables included a measure of school access assessed at the household level (whether or not a primary school or a secondary school was within 30 minutes' travel time of the household) and sex-specific measures of school quality more objectively assessed at the district level. Measures of school quality for primary and middle schools are introduced as potential determinants of time use among younger adolescents and measures of school quality for secondary schools as determinants of time use for older adolescents. Other community variables measured by the household data include whether or not the household has electricity, and indices to measure the household's distance to fuel and water. Measures constructed at the district level capture various aspects of school quality and labour demand as described in the data section above.

Table 4

Multivariate Tobit Estimates of Time Use Patterns for Children Aged 10 to 14

	Girls 10-14				Boys 10-14			
	Market Work	Domestic Work	Learning	Leisure	Market Work	Domestic Work	Learning	Leisure
HH head's age	0.8891	–0.1659	–0.0286	–0.4693	0.1786	–0.7164*	–0.4098	–0.0347
Female-headed HH	–23.03	–15.90	45.47*	–15.12	–17.50	–7.94	51.87***	2.64
Household Possessions Index (0-1)	–325.21***	–219.28***	484.27***	22.38	–418.54***	–49.64*	335.21***	–1.68
Percent of dependents in HH	0.3718	0.467	–0.347	–0.2479	1.6141**	–0.0765	–0.8117	0.0491
Urban dummy	–47.42**	13.51	21.41	–18.17*	11.77	11.44	–7.21	–1.00
Primary school within 30 minutes	–75.77*	–53.09*	69.94*	37.19	–106.23**	–33.33	113.96**	–21.73
Distance to fuel (0 to 5)	81.87***	56.41***	–79.31***	–7.57	70.71***	19.20	–61.45***	0.92
Distance to water (0 to 5)	64.37**	–6.38	–30.85	–8.34	35.04	–4.02	–48.31	14.28
HH has electricity	–113.53***	–1.83	98.00***	3.41	–86.52***	34.89**	46.60*	15.69
Province: Sindh	–37.41	–32.43**	–126.48***	84.05***	22.72	32.76***	–146.00***	41.04***
Province: N.W.F.P. (KP)	15.70	61.90***	–138.79***	1.27	60.57*	33.49*	–13.85	–27.66*
Province: Balochistan	34.13	28.74	–113.81***	–5.15	–13.95	87.30***	–52.90	–10.43
Proportion girls primary schools with drinking water	68.98	176.56***	–160.68*	–75.24**				
Girls primary school furniture index	–263.65*	–12.53	199.24	31.64				
Student/teacher ratio: primary school for girls	–0.57	–1.69***	0.4869	0.5725				
Proportion boys primary schools with drinking water					33.79	2.16	31.46	–28.85
Boys primary school furniture index					–178.3	–72.40	203.24**	84.16
Student/teacher ratio primary school for boys					–0.0557	0.6881	–1.89**	–0.1385
District unemployment rate, %	–1.19	–4.97	11.56**	–2.15	–3.99	1.45	–4.27	4.04
Constant	110.10	99.15*	24.60	214.90***	171.60	–89.45*	175.68*	236.68***
σ_1	5.4001***				5.6193***			
σ_2	5.0942***				4.6633***			
σ_3	5.6153***				5.4726***			
σ_4	4.8425***				4.8610***			
$P_{marketw\_domesticw}$	0.0893***				–0.0591*			
$P_{marketw\_learning}$	–0.4205***				–0.7003***			
$P_{marketw\_leisure}$	–0.1463***				–0.3135***			
$P_{domesticw\_learning}$	–0.6375***				–0.1578***			
$P_{domesticw\_leisure}$	–0.1148***				0.0768**			
$P_{learning\_leisure}$	–0.4438***				–0.4164***			
N	1947				2155			

*** Statistically significant at 1 percent level; **Statistically significant at 5 percent level; * Statistically significant at 10 percent level.

Table 5

Multivariate Tobit Estimates of Time Use Patterns for Children Aged 15 to 19

	Girls 15-19				Boys 15-19			
	Market Work	Domestic Work	Learning	Leisure	Market Work	Domestic Work	Learning	Leisure
HH head's age	0.5992	–1.9917***	1.8967*	0.2773	–0.7231	–1.6933***	–0.2276	0.2201
Female-headed HH	–25.18	–9.24	74.16**	–8.07	–67.91*	–30.325	18.73	22.58
Household Possessions Index (0–1)	–344.05***	–190.34***	752.47***	86.89***	–563.15***	78.61	516.19***	129.06***
Percent of dependents in HH	–1.28**	2.12***	–2.22**	–0.41	2.01**	–0.1441	–1.68	–0.3654
Urban dummy	–70.74***	–18.71	32.86	5.85	–8.92	33.03*	3.39	–0.54
Secondary school within 30 minutes	–58.59***	9.14	34.21	3.63	60.56**	–25.39	–61.26*	–9.34
Distance to fuel (0 to 5)	39.12	20.79	–40.97	–9.66	13.74	75.45***	–87.26**	15.43
Distance to water (0 to 5)	36.27	–5.44	–44.95	–1.38	–21.57	–1.27	4.70	–7.18
HH has electricity	–84.20***	1.51	32.11	34.54**	–84.96***	37.41	67.24	33.27**
Province: Sindh	–27.34	–25.09*	–22.93	52.46***	—2.648	–15.69	–64.15**	47.18***
Province: N.W.F.P. (KP)	–9.89	32.17	–98.74**	0.8896	–58.59	27.53	110.81***	26.53
Province: Balochistan	36.96	–9.90	–53.40	–10.37	–18.58	35.45	–74.55	30.02
Proportion girls secondary schools with drinking water	149.08**	–78.07	–105.59	22.69				
Girls secondary school furniture index	–228.44***	108.35*	229.66	–108.75**				
Student/teacher ratio secondary school for girls	1.40	0.58	–1.71	–0.36				
Proportion boys secondary schools with drinking water					134.25	–53.43	–284.26*	–54.06
Boys secondary school furniture index					–339.57**	14.54	50.05	18.88
Student/teacher ratio secondary school for boys					3.38	–3.95	–3.37	–2.30
District unemployment rate, %	–8.49	–3.17	13.64*	1.48	–1.83	–3.59	–7.68	6.37*
Constant	138.94*	380.91***	–428.47***	142.13***	401.42**	–55.95	233.75	182.88***
σ_1	5.4399***				5.7770***			
σ_2	5.1751***				5.1060***			
σ_3	5.8289***				5.8512***			
σ_4	4.8226***				4.9410***			
$P_{marketw\_domesticw}$	–0.2187***				–0.2075***			
$P_{marketw\_learning}$	–0.1491***				–0.9167***			
$P_{marketw\_leisure}$	–0.3279***				–0.4646***			
$P_{domesticw\_learning}$	–0.6751***				–0.0647*			
$P_{domesticw\_leisure}$	–0.1255***				0.0725*			
$P_{learning\_leisure}$	–0.3709***				–0.1440***			
N	1672				1614			

*** Statistically significant at 1 percent level; **Statistically significant at 5 percent level; * Statistically significant at 10 percent level.

Table 6 provides sample means and standard deviations for all the household, school and community variables used in the multivariate models. While time spent on learning exceeds time spent in other activities among younger adolescents, this is no longer true among older adolescents at which point girls spend the most time on average on domestic work and boys spend the most time on average on market work.

Table 6

Sample Means and Standard Deviations for the Variables in Multivariate Tobit Models

	Girls 10–14		Boys 10–14		Girls 15–19		Boys 15–19	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Time spent: Market Work (min)	47.36	110.74	89.16	180.51	90.51	147.21	268.52	265.82
Time spent: Domestic Work (min)	107.24	140.04	11.51	32.33	238.26	175.41	17.11	56.77
Time spent: Learning (min)	261.33	228.66	330.47	212.83	113.62	204.74	179.81	231.31
Time spent: Leisure (min)	213.21	132.76	244.13	131.70	196.60	129.09	229.54	144.29
HH head's age	46.12	11.02	45.84	10.66	48.84	12.10	49.12	11.09
Female-headed HH	0.10	0.30	0.08	0.27	0.09	0.28	0.09	0.29
Household Possessions Index (0-1)	0.24	0.16	0.25	0.17	0.27	0.17	0.27	0.17
Percent of dependents in HH	13.82	13.18	13.55	13.25	11.18	12.42	9.32	11.93
Urban dummy	0.35	0.48	0.35	0.48	0.38	0.49	0.41	0.49
Primary school within 30 minutes	0.97	0.16	0.97	0.18	0.97	0.17	0.98	0.15
Secondary school within 30 minutes	0.65	0.48	0.65	0.48	0.68	0.47	0.70	0.46
Distance to fuel (0 to 5)	0.43	0.40	0.44	0.40	0.41	0.40	0.40	0.41
Distance to water (0 to 5)	0.07	0.20	0.08	0.22	0.07	0.21	0.06	0.19
HH has electricity	0.92	0.27	0.90	0.30	0.93	0.25	0.92	0.27
Province: Sindh	0.24	0.43	0.27	0.44	0.26	0.44	0.30	0.46
Province: N.W.F.P. (KP)	0.15	0.36	0.12	0.32	0.14	0.34	0.12	0.32
Province: Balochistan	0.04	0.19	0.05	0.22	0.03	0.17	0.05	0.21
District unemployment rate, %	2.34	2.15	2.26	2.03	2.44	2.13	2.41	2.09
Proportion girls primary schools with drinking water	0.74	0.12	–	–	–	–	–	–
Girls primary school furniture index	0.32	0.07	–	–	–	–	–	–
Student/teacher ratio primary school for girls	36.65	11.29	–	–	–	–	–	–
Proportion boys primary schools with drinking water	–	–	0.75	0.16	–	–	–	–
Boys primary school furniture index	–	–	0.30	0.08	–	–	–	–
Student/teacher ratio primary school for boys	–	–	42.12	11.85	–	–	–	–
Proportion girls secondary schools with drinking water	–	–	–	–	0.93	0.10	–	–
Girls secondary school furniture index	–	–	–	–	0.41	0.09	–	–
Student/teacher ratio secondary school for girls	–	–	–	–	10.44	4.47	–	–
Proportion boys secondary schools with drinking water	–	–	–	–	–	–	0.92	0.08
Boys secondary school furniture index	–	–	–	–	–	–	0.37	0.08
Student/teacher ratio secondary school for boys	–	–	–	–	–	–	8.15	2.14

On average, households score about .25 on the household wealth index which ranges from 0 to 1, indicating that they possess no more than 5 of the 20 possessions included in the index. While no more than 6 to 8 percent of households are situated near drinking water, almost all households have electricity (over 90 percent), slightly less than half have nearby access to fuel. Almost all households live within 30 minutes of a primary school and roughly two thirds on average live within 30 minutes of a secondary school but for the secondary school access indicator, the standard deviation is large suggesting that the proximity of a secondary school is highly variable, with sizable differences between rural and urban areas.

Our three indicators of school quality show considerable variation within districts suggesting that district averages for school quality may not fully capture school quality effects even when district averages vary substantially, which they do. Ninety percent of the variance in school quality takes place within rather than across districts.

Household Wealth: We will begin our discussion of the results with the household variables and we can see immediately that the most important variable associated with adolescent time use is the economic status of the household as measured by the index of up to 20 durable household possessions. Figures 1 and 2 illustrate the critical importance of household wealth in children's participation in certain activities such as learning, as well as time spent on these activities, using projections based on the multivariate tobit estimates (Tables 4 and 5). The projections involve setting all the right hand side variables, other than the household wealth index, to their average values and then projecting the variation in time use predicted by the models at each level of the household wealth index, ranging from 0 for households with no household assets to 1, for households having all 20 assets. About 66 percent of households in our sample have scores of 0.3 or less.

Fig. 1. Estimated Participation by Household Wealth

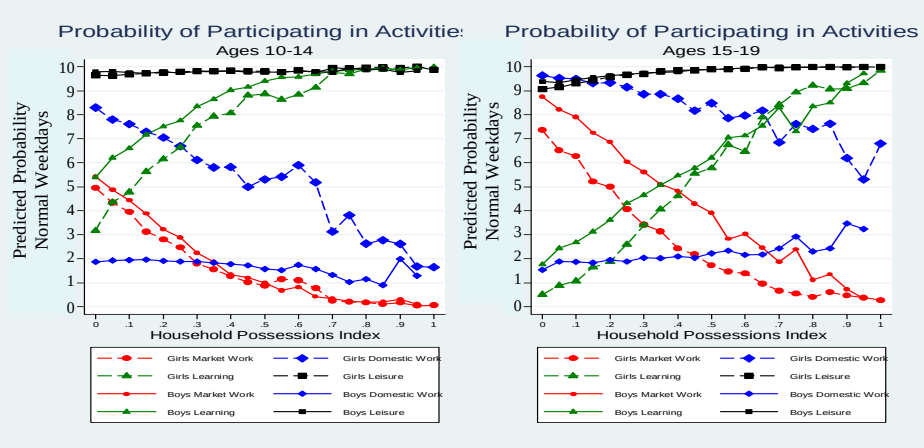
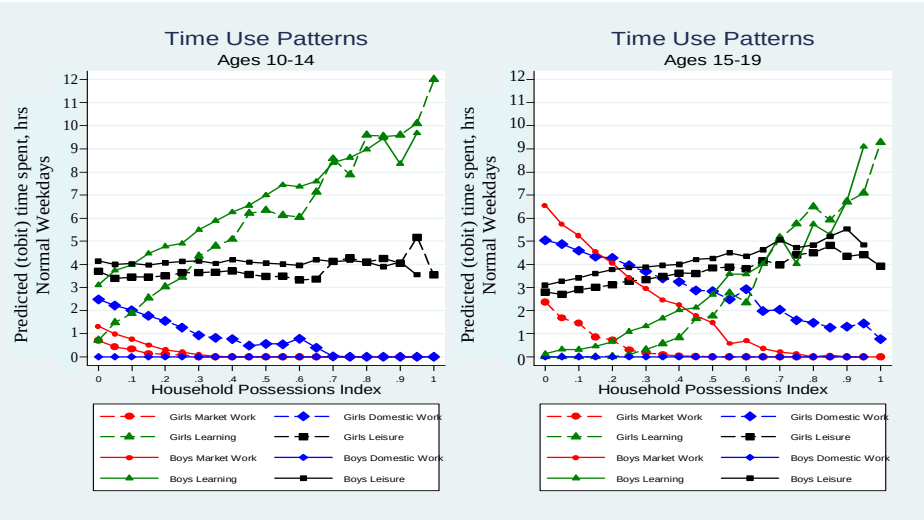


Fig. 2. Estimated Time Use Patterns by Household Wealth



The likelihood that a 10-14 year old living in the poorest households will participate in a *learning activity* is somewhere between 30 percent (for girls) and 55 percent (for boys). Even those who report a learning activity spend only 1 hour (for girls) or 3 hours (for boys). In contrast, almost all children from wealthier households with a household possessions index of 0.7 or above participate in learning, with small differences for males and females. For this wealthier group, the estimated time spent on learning related activities on a school day is around 8 hours for both boys and girls. Similar patterns can be observed for the 15 to 19 age group. In fact, if anything, the differences between the poorest and wealthiest children are starker for this age group.

Figure 2 suggests a household possessions index set at around 0.3 (indicating households with 6 of the 20 possessions listed) might be a cut-off point for targeted policy interventions aiming to increase time spent on learning, since at or below that cut-off point children are estimated to spend less than 4 to 5 hours of learning (on a normal school day). At that cut-off point, girls are particularly disadvantaged. To give some perspective on what this proposed cut-off might mean, the national safety net programme -the Benazir Income Support Programme (BISP) utilises a poverty-score index similar to the one used here[11] to identify the poorest households, covering 15 to 20 percent of households in Pakistan. The trends documented here suggest that this programme's database can be very beneficial in identifying children who are disadvantaged in terms of schooling, but they also reveal that (to the extent that resources allow) a much more generous eligibility cut-off point can be considered for education sector interventions, such as conditional cash transfers.

The probability of the poorest 10-14 year olds' participating in *market work* is quite high at around 50 percent for both males and females, while the odds of market work is close to 0 for those with a household possessions index of 0.7 or more. Having said that, even for the poorest, the time spent on market work is estimated at no more than 1 hour per day for this group on average. However, for the poorest 15 to 19 year olds, the odds of participating in market work are at 90 percent for boys and over 70 percent for girls; who spend over 6 hours and 2 hours per day on this activity respectively. For the 15 to 19 year olds too, the wealthiest children basically do not participate in market work.

The gender differences are most pronounced for time spent on *domestic work.* Even though boys may report carrying out some domestic work, time spent on that activity remains negligible at around 0 hours for both age groups. Over 80 percent of the poorest girls between ages 10 and 14 carry out domestic work, spending about 2.5 hours per day on this activity. The likelihood of domestic work declines to about 20 percent for the wealthiest girls, similarly average time spent on this activity converges to 0 as wealth increases. Almost all poor girls in the 15 to 19 age group report doing domestic work, interestingly even over 50 percent of the wealthiest girls also report the same. The estimated time spent is over 5 hours for the poorest girls and about 1 hour for the wealthiest.

[11]The BISP poverty scorecard, a proxy means test instrument, considers selected household possessions as well as other household characteristics such as the schooling of household head, ownership of livestock and land.

All children report spending time in *leisure* activities. The gender differences are small, with boys spending about 30 minutes more time on leisure than girls regardless of household wealth. Wealth effect is not visible for the 10-14-age group, but the wealthiest 15 to 19 year olds spend about 2 hours more time on leisure compared to the poorest children.

Household Composition: The variables in this category are the household head's age, female-headed households' head dummy and percentage of dependents in the household. All these variables are clearly endogenous, thus some caution needs to be exercised for interpreting their correlations with children's time use patterns (the main findings for other explanatory variables are not affected if these variables are excluded from the model). The estimated coefficients for *household head's age* are mostly not statistically significant at 10 percent level, with the exception of a robust negative relationship with time spent on domestic work. Even then, a 10 year increase in the household head's age is linked to somewhere between 7 minutes to 20 minutes less time devoted to domestic work, which is a relatively small effect. As the percentage of dependents in the household increases, boys (both age groups) become more likely to participate in market work, while older girls (ages 15 to 19) spend more time on domestic work. Thus in order to deal with the dependency burden, parents put boys to work and older girls assume child and elderly care duties. Finally, children in *female headed households* spend significantly more time on learning: 10 to 14 year old boys and girls spend 51 and 44 minutes more on learning, while for the 15 to 19 year olds the corresponding statistics are 18 and 74 minutes (although in this case the estimate for boys is not statistically significant at 10 percent level). Also, older boys in female-headed households are less likely to participate in market work. These effects, after controlling for household wealth and other characteristics, are consistent with previous research showing that women are more child-oriented in their decisions about household resource allocation than men.

Schooling Environment: Schooling environment variables included measures of availability of primary and secondary schools within 30 minutes, average student/teacher ratios in the district for specific types of schools including girls' schools, boys' schools and mixed schools, the percent of schools in the district with drinking water on the premises, and an index of furniture which was averaged across schools in the district. As girls could attend an all-girls' school or a coed school, the characteristics of both were included in the regressions for girls and the same was true for boys. The characteristics of primary or middle schools were aggregated for the regressions for younger adolescents and the characteristic of secondary schools were aggregated for the regressions for older adolescents.

Adolescents spend more time learning and less time working when schools are nearby. The presence of a primary school is associated with 70 minutes' more time spent on learning for girls and 114 minutes' more time spent on learning for boys. Surprisingly, for 15 to 19 year olds school availability is not correlated with more time spent on learning.[12]

[12]We also experimented with alternative specifications where availability of both primary and secondary schools were considered. The combined effect of the presence of both primary and secondary school for 10 to 14 year olds on learning is over 100 minutes per day. For 15 to 19 year old girls, the availability of school coefficients were not statistically significant at 10 percent level.

The index of the extent to which the classroom is properly furnished has the expected and large effect, associated with about 200 minutes increase in time devoted to learning for 10 to 14 year olds (for older children the coefficient estimates are positive but they are not statistically significant at 10 percent level). The student/teacher ratio is statistically significant (at 5 percent level) in only one of the four specifications, the one for 10 to 14 year old boys. The effect is in the expected direction, but small in magnitude: the doubling of student/teacher ratio is estimated to reduce time allocated to learning by less than 5 minutes only. Finally, the proportion of schools with drinking water is negatively correlated with time spent learning in 3 out of 4 specifications, which is puzzling.

Other community characteristics considered are availability of electricity, distance to fuel and water, urban and province dummies, and district unemployment rate. The presence of electricity in the household has a positive association with time spent on learning and a strong negative association with time spent on market work, possibly because electricity makes it easier to do school work at home in the evenings but also because access to electricity might be capturing other features of the community that are not included in the model. A greater distance-to-fuel reduces time spent on learning and increases time spent working, particularly market work time. The estimated coefficients for distance-to-water on learning are not statistically significant in our specifications.

Urban residence is associated with 47 minutes less time spent on market work for 10 to 14 year old girls (statistically significant at 5 percent level) and 71 minutes less market work for 15 to 19 year old girls (statistically significant at 1 percent level). The province-dummies are also often statistically significant and large in magnitude. In particular, 10-14 year old girls in KP are estimated to spend 138 minutes less on learning compared to their counterparts with similar household, community and school characteristics in Punjab. The corresponding statistic for Balochistan is spending 113 minutes less on learning when compared to Punjab; and 126 minutes less compared to Sindh.

Finally, the higher the district unemployment rate, the less time spent on market-work in all models. This effect is never statistically significant at 10 percent level though. The district unemployment rate is associated with increased time allocated to learning by girls (statistically significant at 5 percent level), as well as increased leisure time for 15 to19 year old boys (statistically significant at 10 percent level).

After taking into account this set of explanatory variables, we need to know if children who spend more time on certain activities more or less likely to spend time on other activities?

The last rows of Tables 4 and 5 provide the correlation coefficients among the error terms of the four tobit time use equations that are estimated, to illustrate the extent to which children who spend time on one activity (e.g., market work) are more likely to spend time on another activity (e.g., learning), after taking into account the effects of explanatory variables. A robust finding that emerges from this analysis is that a child who spends more time on any one of the activities is less likely to spend time on another activity. In particular, those who do either domestic or market work are significantly less likely to spend time on learning. The trade-off between time spent on domestic work and learning is particularly severe for girls. There are two

exceptions to this rule, however. First, boys who spend more time on leisure are also more likely to spend time on domestic work. Second, 10 to 14 year old girls who spend more time on domestic work are also likely to spend more time on market work.

VII. CONCLUSIONS

This research shows that the amount of time children spend working, whether it be at home or the market, is strongly correlated with household poverty (as proxied by an asset index) in Pakistan. Consistent with the literature on the predictors of school enrolments of adolescents, time spent on learning is also significantly lower among the poor. The national safety net programme, BISP, has completed a nationwide census of households in Pakistan to collect poverty-score information, which includes information on household assets. This database would be a very promising tool to target efforts to increase children's time allocated to learning.

Our analysis, when combined with impact evaluation results on the effectiveness of Pakistan Bait-ul-Mal's pilot conditional cash transfer programme, also reveals that a much more generous eligibility cut-off point (compared to BISP's current eligibility threshold for unconditional cash transfers) can be considered for supplementary education sector interventions such as conditional cash transfers. The findings from the pilot conditional cash transfer programme in Pakistan not only support the need to compensate the poorest households for their children's time that would be used for labour as opposed to learning, but also suggests that a small additional amount to the base unconditional cash transfer might be sufficient to increase school attendance of children from most households (but the poorest of the poor, who would require full compensation of the value of the child's time to forego work).[13]

Considering the increased responsibilities of provinces in the delivery of health and education services after the passage of the 18th constitutional amendment, financing of such complementary programmes are likely to be through provinces, which in turn would need to consolidate existing ad hoc social protection interventions to free up resources for targeted programmes. It seems there may be pay-offs to providing larger benefits for girls' school attendance, especially in KP and Balochistan where, even after taking into account the effects of other explanatory variables in our model, girls remain at a significant disadvantage in terms of time devoted to learning.

This analysis also shows, by allowing for correlations among the four time-use equations, that those who do market or domestic work are significantly less likely to spend time on learning after controlling for other explanatory variables to capture household and community characteristics. The trade-off between time spent on domestic work and learning is particularly severe for girls.

Such demand-side conditional cash transfers would need to be a part of a comprehensive set of actions, including the implementation of regulations to discourage child employment especially in industries where employment conditions tend to be risky and unsafe. Labour market regulations would not have any direct effect on domestic work

[13]As discussed previously, World Bank (2009) reports 75 percent of poor parents interviewed indicating "need child to help with work at home" as the most important barrier to meet the conditional cash transfer programme's school attendance requirements.

undertaken by girls, however, which is very much determined by household conditions including the fertility trends and dependency ratio. In this paper we only noted the correlation between dependency ratio and girls' time spent on domestic work, which is consistent with the causal effects associated with the arrival of an unexpected/unwanted sibling identified elsewhere using panel household survey data from Pakistan [Lloyd, Mete, and Grant (2009)].

Finally, this analysis provides some evidence suggesting that parents also consider the schooling environment when they make decisions about children's time use; for example there is a relationship between better-furnished schools and children's time spent on learning.

The time-use effects of other indicators that we considered are either small (e.g., student/teacher ratio) or in the "wrong" direction (availability of water in school). Thus while this study provides some evidence that suggests school environment might be a potential important factor to consider for understanding time use decisions, causal effects are yet to be studied carefully with adequate survey instruments that survey households over time and ideally take advantage of random variations in school characteristics.

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