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The academic effects of after-school paid and unpaid work among 14-year-old students in TIMSS countries

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Abstract

What it means to be a ‘student’ varies within and between countries. Apart from the wide variety of school types and school quality that is experienced by young people, there also is, accompanying increased rates of school participation, a growing population of students who work part-time. The theoretical and actual consequences of student work have long been in dispute. This article reformulates the dispute as an empirical question that can be addressed using cross-national testing data and student background information from the Trends in International Math and Science Study (TIMSS). Drawing information from 20 countries with distinctive proportions of students who reported paid and unpaid work, this study first compares their academic achievement in each country. Next, regression analysis is used to control for students’ home resources, and estimates are made of the effects of work and the differences in these effects cross-nationally. Finally, hierarchical linear models are estimated in each country so as to control for school effects, and to take into account the fact that working students may be clustered in lower-achieving schools. The results show that work after school, whether paid or unpaid, never positively affects academic achievement. However, after controlling for home resources and school effects, work negatively affects achievement only in certain countries. The article concludes with a discussion of the ways to interpret international differences in the effect of students’ work.

Keywords

after-school work; teen employment; TIMSS; achievement; cross-national comparisons; unpaid work

Introduction

Education transmits inequality and social status not only through the differences that students attain in their levels and years of school attainment but, also, through the increasingly diverse and heterogeneous experiences of students as a result of differing school types, classroom track, and modalities of instruction. Because of these differences, what it means to be a ‘student’ today varies considerably across and within countries. Our purpose in this article is to extend research on the transmission of social status to an understudied component of the diversity of children’s educational experiences: the impact of the part-time, after-school employment by early adolescent students. Worldwide, the expansion

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of education and compulsory schooling has shifted the activities of children from work to school. However, not all children who become students do so by suspending economic activity. In many countries, populations of children have become students in addition to their being workers, and not as an alternative to work. Cross-nationally, many populations of children – and hence many students – continue to work even while they study. Historically, in some countries the roles of ‘student’ and ‘worker’ evolved in opposition to one another while, in other national contexts, gainful employment or unpaid home work has been viewed as an integral part of youth development and socialization. Ralph Turner (1960) characterized differences in views of student employment, evident in 1950s Britain and the USA, as manifestations of international differences in mobility systems.

In this article we discuss the work–achievement relation based on cross-national assessments of math and science proficiency by lower secondary school students, who are about 14 years old. Specifically, we examine the possible impact of work on their accumulated knowledge of math and science, recognizing that scores from a single-time-period assessment of these subjects will have resulted from accumulated school and work experiences over many years, and not only the economic activities of children at the moment of the exam. Despite this limitation, the data available from the Trends in International Math and Science Study (TIMSS) are very suggestive of several issues facing policy makers and analysts. Our research will have succeeded if we can develop the questions needed for future research into part-time student employment.

Policy context

In 1999 the International Labour Organization (ILO) presented, and most nations subsequently ratified, a landmark treaty regulating children’s employment. The ILO’s more restrictive 1973 treaty (Convention 138) flatly prohibited most child labor, but that Convention was ignored by many poorer countries where child labor was most pernicious. Convention 182 took a different approach. It called for the eradication only of the ‘worst forms’ of child labor, and work that children combine with schooling is not necessarily proscribed under this agreement. Just as its drafters had hoped, this flexibility has now enabled the Convention to be ratified by many nations where child labor remains widespread. The new policy environment presents a challenge and an opportunity to social scientists and education researchers. Convention 182 no longer assumes that early labor violates the rights or conflicts with the best interests of working children (as was implied by earlier ILO conventions, as well as the Convention on the Rights of the Child). Rather than to assume that early employment necessarily harms children, the new convention poses an empirical question: whether or not work impairs children’s education in a particular national context.

In the same year that the ILO adopted Convention 182, the TIMSS-1999 was fielded in many nations where child labor is viewed as problematic, as well as other nations where early employment is common but not generally seen as a problem. The 1999 student questionnaire asked 14-year-olds about their number of hours per week in paid after-school employment, as well as the amount of time they worked doing unpaid family chores. The questionnaire further asked children for information about their family educational resources

and parental educational attainment. Most importantly, the TIMSS included an internationally-comparable assessment of each student's math and science proficiency.

Drawing on these data, we can first ask whether the work-achievement relation varies across countries and policy contexts. Is work consistently associated with weaker academic achievement, or are there some nations where working students are found to be stronger academically? Such questions are important to the fields of education and social stratification because, while inequality of educational access has been reduced in many countries, inequality is still transmitted through unequal achievement. And differences in achievement may be caused, among other things, by the need for many children to work even as they attend school. In which countries does paid or unpaid work most impede academic achievement? In which countries does it least impede achievement? What can account for the cross-national variation in the size of these different effects? Are there policy instruments or school policies that could reduce that gap?

The present research extends our previous investigations based on TIMSS-1995 (Post and Pong 2000a, 2000b) to a more disparate set of nations, including several countries where the findings from our research could have important policy implications. We first describe the combination of work and schooling by students from a subset of TIMSS participant countries that reflected the High, Low, and Intermediate range of values for the percentages of students who worked, as well as the High, Low, and Intermediate range of values in student achievement. At one extreme, Singapore and Hong Kong have the lowest percentages of students who work, but the highest test scores. At the other extreme, the Philippines and South Africa have the greatest percentages of students who work, but the lowest test scores. Using 20 selected countries along this continuum, we illustrate the international relationship between different types of work and national achievement, as well as the relationships between mean school achievement and proportions of working students. Finally, using Ordinary Least Squares (OLS) regression analysis, we show the individual-level impact of paid employment in selected nations.

In most settings, students' work appears to be associated with lower math and science achievement. However, in certain countries gaps effects are smaller than others. These differences may be attributable to the fact that working students attend lower-quality schools than non-working-students. If this were the case, then the 'effects' of work might actually be the effects of unequal schools. In order to address this possibility, hierarchical linear models are estimated in each country so as to control for school effects, and to take into account the fact that working students may be clustered in lower-achieving schools. The results show no evidence in any country that work after school, whether paid or unpaid, positively affects academic achievement. To the contrary, in many cases the effect is likely to be a negative one. The TIMSS data also suggest that, after controlling for home resources and school effects, work negatively impacts achievement only in certain countries.

Research review and theoretical frameworks

Child labor is of a general concern to education policy analysts and researchers because the burgeoning global market for goods and services has brought the products of working

children to consumers in affluent nations. There is a broad consensus that children's education ought not to be sacrificed for short-term benefits of employment, despite a wide range of positions on the best way to regulate child labor (for reviews see Anker 2000; Basu 1999; Grootaert and Kanbur 1995). Less attention has been paid to the fastest growing population of working children – those attending school while working. Given this under attention, considerations of the consequence of child labor for societies and families should now focus on the educational outcomes for working students.

From one vantage point, children who allocate their time to paid employment thereby choose to obtain fewer of the skills that are valued by the school system. From this perspective, intensive employment interferes with academic success (McNeil 1983; Greenberger and Steinberg 1986; Marsh 1991; McNeal 1997, Tyler 2003, Marsh and Kleitman 2005). A contrasting view argues for the worth of early responsibility, independence and self-improvement as processes essential in the transition to adulthood. Early, hard work is thought to advance young people morally and socially. However, empirical support for the value of early employment has been uneven. Mortimer et al. (Mortimer and Finch 1996; Mortimer et al. 1996; Mortimer 2003) found that the jobs held by US adolescents contained many positive experiences. Researchers using the National Educational Longitudinal Study (NELS) have examined the subsequent grades of American 10th grade students who work for pay after school. Schoenhals, Tienda, and Schneider (1998) found no long-term detrimental consequence for students' subsequent self-reported grades.

Outside of the USA and especially in poorer countries, work performed by young people is not always age-segregated. Work may then offer children opportunities for adolescent socialization by working along side of adult role-models. In contrast to the deskilled tasks performed by adolescents in many post-industrial economies, student employment in poorer nations may foster their numeracy and literacy in ways that counter-balance the drain these jobs place on the child's time. Moreover, in several European nations, school-to-work linkages and formal apprenticeships provide a non-classroom route to vocational competence. This leads to the question: can work experiences in some countries actually promote cognitive growth more effectively than school experience? It seems indeed possible that in some situations employment – either paid or unpaid – benefits academic achievement. Despite this possibility, the few international studies where employment and achievement have been studied tend to find detrimental effects, even after controlling for family resources (Fuller et al. 1999; Heady 2000; Knaul 2000; Gunnarsson, Orazem, and Sanchez 2006; Lee and Staff 2007). There has been little research on the role of unpaid family work in promoting children's overall development or, more specifically, in helping or hindering their academic achievement. Many of the arguments applied to the advantages and disadvantages of paid employment can also be used to analyze unpaid chores. The chief difference from the perspective of education or labor policy, obviously, is that no countries have attempted to regulate the non-market work performed by children in their own homes.

Based on the foregoing literature, we have proposed a general theoretical framework for the study of after-school employment and family work. We understand that family structure and family resources directly help children achieve academic proficiency. But these resources

also help indirectly by influencing whether children will be full-time students, full-time workers, or combine both activities. If students do work then their families help decide whether children should work for pay outside the home or should work inside the home to support the family. But children, too, by the age of 14, often participate in the decisions over how to allocate their time. What is the role of the school in children's choices to allocate their time? Some researchers emphasize the messages students receive, in the form of grades. Students who receive low grades or who report other negative experiences in school may see work as a natural outlet. Other researchers suggest that parents of many children are likely to choose carefully which children to send to school. If parents seek to identify which children have the greatest talent for school learning and which children would be better served by part-time employment, then the resulting choices can influence the distribution of children between full-time and part-time schooling.

Regardless of the reasons that parents and students have for part-time work after school, we hypothesize that there will be consequences for academic achievement. There are two reasons for such a hypothesis. First, from the perspective of household economics, the time that students devote to employment, and the energy spent on work, detracts from the finite reserve of resources that students use for the development of their academic proficiency. Even when it is possible to control for the time spent on school homework, we would hypothesize that children who are working will have had less opportunity and less incentive for academic growth. Some types of work, however, are more compatible with academic success than others. Work that has flexible hours (as does most work done within the home) is less likely to conflict with the demands of schooling as compared to work with fixed hours outside of the home. From the perspective of a time budget, we would hypothesize that students who work at jobs for pay would have lower academic achievement when they work many hours each day, but that the impact on achievement would be smaller among children who work for pay for only a few hours.

There is a second reason to suspect that early incorporation into the workforce will affect academic proficiency, independently of the self-selection of less-proficient students as part-time workers. As young people develop their identities, they are oriented by the values of peers. Irrespective of the amount of actual time that students spend in school and on the job, those who engage in part-time work may see themselves differently than do students who focus only on school work. Students' self-conceptions are likely to depend on their associations with workers and with students. In work experiences where students find linkages between academic success and success on the job, then the after-school workers would have incentives to achieve greater academic proficiency. But if the work being done by students is felt to be irrelevant to success on the job, then students will have little incentive for academic achievement. From this perspective, working on a job (as opposed to working at home) affects students primarily via their identification with the roles of worker versus student. From this perspective, the net impact of working on a job would not derive primarily from the hours worked. Rather, it would result simply from the fact that students work. There would be no increasing effect on academic achievement of increased hours of employment. Furthermore, from this perspective we would expect much less impact of unpaid work in the home.

Relationships between the home, the school-work choice, and academic proficiency are dependent on the national context in which these relationships have developed. There are two ways in which the national context can affect these relationships. In economies which depend heavily on child labor, and where families must use the time resources of their children for meeting basic welfare needs, then children who are lucky enough to attend school will nevertheless have both opportunities and demands for part-time work. In such circumstances, the types of work that children do may include arduous and sometimes even dangerous physical labor. Thus, we should not expect that a simple indicator of the hours that children work after school will impact their academic development in the same way in every economy. The meaning of work hours would be quite different, for example, in the Netherlands and in Indonesia. In addition to international differences in the demands and opportunities for adolescent work that reflect the structure of production internationally, the political context can play a definite role. In some countries, work by adolescents is closely regulated, both formally by labor inspectors and also because of widely-accepted norms of what types of work are appropriate for young students. By contrast, little formal or informal regulation of adolescent workers occurs in other countries. Not only the rate of after-school work but also its meaning would be expected to be different between these two countries.

Date description and bivariate analysis

Using the student-level files from each of the 20 selected TIMSS-R countries, we tabulated the scores of the first-plausible-value in math and science, for boys and girls. We then tabulated the mean scores depending on three states of possible paid employment and also for three states of unpaid household chores: none, one to three hours per week, and more than three hours per week (seen Appendix 1 for the full tabulations). These three categories aggregate the five categories that are available in the TIMSS-R data in order to create larger cell sizes. In most cases, there were clear differences in math and science achievement that are apparent in this bivariate analysis. In only one country (South Africa) did employed children achieve higher scores as compared to non-working children. In all other countries the reverse relationship is found.

Figure 1 offers an example of these findings, focusing on the math achievement of working and non-working boys. In general, the most negative impact of paid employment comes from self-reported work more than three hours each week. Work that is three hours or less each is usually associated with an intermediate level of achievement. Figure 1 further illustrates that some of the international variation in overall math achievement is associated with international differences in what children do besides attending school. That is to say, differences between countries are less pronounced if we focus only on children who are employed, or only on children who are not employed. For example, the mean math achievement in Hong Kong and Taiwan is far greater than in Russia or in the USA. But there are very small differences when comparing only employed boys in each country. In this sense, achievement difference can partly be explained by the different proportions of full-time students in each country.

The TIMSS data reveal clear associations at the national-level between the proportions of working students and overall achievement. Nations with greater proportions of working

students have lower overall math and science achievement. These negative associations are less evident for paid employment among girls than for boys, perhaps because rates of paid employment are so low in Muslim societies such as Indonesia, Turkey, and Tunisia. But the fact that girls rarely engage in paid employment in some countries does not mean girls are not working. In terms of non-compensated household or family farm work, the negative relationship is equally pronounced for girls and boys. Figure 2 illustrates this relationship. The sizes of the circles in Figure 2 are proportional to the sizes of school-aged populations in each country.

Figure 2 is useful in order to identify extreme and outlying national cases. It is particularly interesting that the Netherlands, which has high rates of self-reported student employment, also has high levels of math and science achievement. There is reason to suspect that the Netherlands, which has a coordinated advisory system linking students to work experiences, would manifest less-pronounced effects of employment on achievement than is the case in other countries where work is seen in opposition to schooling.

Multivariate analysis

In most countries, student rates of employment and unpaid chores are associated with family resources and opportunities. It is well known that home resources – represented by parental social status and educational resources – have direct effects on students' achievement even when students attend similar schools and when school resources are controlled in multivariate analysis. In addition to their direct effect, family resources can indirectly affect academic achievement through employment. Without controlling for students' family backgrounds, the effect of paid or unpaid work may be spurious. While the TIMSS provides only limited opportunities to control for family background, these controls do show the expected positive effects (see Appendix 2 for definitions and summary statistics of control variables).

We estimated an OLS regression model for the effect of working in a paid job (more than three hours per week) on the student's academic achievement. We estimated four separate models: math and science achievement for both girls and boys. In these models, the comparison group is children who worked three or less hours each week. Control variables included the child's age, an index of the number of books reported in the student's home, the highest level of education of the parent having most education, and a TIMSS-constructed index of the number of supportive educational items in the home. In addition, dummy variables for each country were also entered into the regression model, with the USA as the omitted reference country. The coefficients for these dummy variables show whether each country's achievement is greater or lesser than that of the USA. Finally, we estimated the interaction terms for working with each country, in order to test whether the effect of employment was greater or lesser than the effect found in the USA. The results of these regressions are reported in Table 1, and they are summarized in Figures 3 and 4.

Table 1 and Figures 3 and 4 indicate that Russia, the USA, Chile, and several other countries occupy an intermediate place in terms of the effect of employment on math and science achievement. It is noteworthy that students who were employed more than three hours per

week in several countries, including Canada and the Netherlands, fare much better in terms of achievement (as compared to non-employed children there) than did similarly-employed students in the USA, Russia, or other mid-range countries. At the other extreme, Taiwanese students who work are significantly more disadvantaged in relation to their non-working peers than are students working in the USA, Russia, and other mid-range countries.

We next estimated the individual-level effects of household chores on the math and science proficiency of boys and girls. The results of this analysis are presented in Table 2. Contrary to a hypothesis about the effect of work roles on employment, but consistent with a time-budget perspective, in the USA the effect of household chores is actually greater than is the effect of paid employment. One plausible reason for this is that children who are engaged in household chores do this work far more than the upper range of the TIMSS categorical response options (more than five hours weekly). That is, children who perform chores usually work more hours than do children who are paid to work outside of school. Apart from this difference there are two other important points to emphasize when comparing the findings reported in Tables 1 and 2. First, notice that the effect of chores for girls is no different than for boys. Girls who are not paid to work are likely instead to engage in unpaid chores. By contrast, boys who are not paid to work are more likely to have time to dedicate themselves to schooling. Finally, a third difference between the analysis of paid and unpaid work is that children engaged in chores in the USA are more disadvantaged than in any other country, as compared with children who are not thus engaged. The interaction terms of chores with each country are nearly all significantly positive. This finding can be represented graphically in Figure 3. Here we can observe how, among girls, the impact of chores varies cross-nationally. In some countries chores show no significant effect on achievement (Indonesia, Thailand, Malaysia, Philippines). In other countries there are strong negative associations (Netherlands, Czech Republic, USA).

In our previous investigations using 1995 TIMSS data, we did not take school effects into account. The findings reported in Table 1, which largely confirm the findings based on 1995 data in a smaller range of countries, may be spurious if low-achieving working students are concentrated in low-achieving schools. This will particularly be the case where employment is primarily in the agricultural sector, because in many countries rural schools under-perform compared to urban schools. Higher concentrations of working students could be found in the rural schools where achievement is lowest. To correct for this bias, we estimated a hierarchical linear model in each of the 20 countries, using the same variables specified in Table 1 but also controlling for the school effect on math and science achievement.

Table 3 presents the results of this exercise. There are several noteworthy findings from the hierarchical linear model analysis. First, there is again support for the conclusion found in our earlier studies, based only on individual-level analyses, that paid employment usually has negative consequences for boys. There are fewer countries where paid employment has negative effects for girls. The reasons for this difference may reflect the fact that when girls are not working they more frequently engage in unpaid chores than do boys. Thus, the omitted or reference group is different for girls and boys. Another possibility is that the type of work done by girls may be less exhausting than in the case of boys. Or, it may simply be that girls are more mature and are better able to organize their time. Apart from this

confirmation of earlier analysis, there are important differences to note between Table 3 and the results seen in Table 1 and Figure 3. Notice that the extreme negative effect of employment in Singapore and Indonesia is very attenuated, and is not statistically significant in the case of Singapore. This probably reflects the rural–urban difference in Indonesia, and the activity-segregated school assignment of children in both countries. That is, the negative effect seen previously in Table 1 and Figure 3 partly reflects the low school achievement of schools in which working children are concentrated. In general the effect of paid employment is less pronounced after taking school effects into account. However, the USA still shows negative effects for boys and girls in both math and science. The most detrimental consequences of paid employment are found in Taiwan and Romania. In Canada and the Netherlands, by contrast, the effect of working is nil once we control for both family resources and for the effects of the school.

Summary and directions for future research

Advocates who seek to eliminate child labor seldom focus on student populations, since working students are not usually engaged in the worst forms of employment, as defined by ILO Convention 182. However, although combining work with schooling may not threaten children's physical safety, it may nonetheless have serious consequences for children's future welfare if it leads to lower achievement and lower occupational attainment. After-school work may thus become an important element in the transmission of inequality. Where and why does work play such a role? To address that larger comparative education question, in this article we have provided a cross-national assessment of the ways that work affects proficiency in math and science, two subjects that all countries consider important elements of their curriculum. Contrary to the view that work can enhance student motivation and performance in academics, there is no evidence that paid or unpaid employment helps students. There also is indirect support for a time-budget (as opposed to social role) interpretation of the effect of employment. If work affected achievement primarily because working students interacted with full-time workers and not with students, then we would expect that work in the hours that students spend working in the home would be less detrimental than working in the labor market. The TIMSS data reveal that unpaid work has similar effects to paid work. It seems likely that students who work, whether for pay or as a family obligation, necessarily devote less time to their studies. We also find that schools themselves are part of the work–achievement relationship. Working students tend to be clustered in particular schools. Full-time students who are free of work obligations also attend similar, higher-performing schools. After taking school effects into account through the hierarchical linear model we find more modest effects of working per se. And, yet, we also find that the effects of employment persist in 17 out of 20 countries for boys, and in 11 out of 20 countries for girls.

Major areas of research must be developed in order better to interpret the associations we have found between work and achievement. The overarching question to be addressed is why working students fare so differently in different countries. As compared with their peers who are full-time students, why do paid working students have so much lower scores in Taiwan, South Africa, Indonesia, and the Philippines than they might in Romania, the USA, the Netherlands, and Chile? Why is the association between achievement and unpaid work

among girls in Hong Kong, Taiwan, Singapore, and many other countries have far less pronounced than the negative relation found in the USA and the Netherlands? We must also account for the evidently larger effect of unpaid work in the Netherlands than the effect of paid employment.

Clearly, one way to approach these questions is to highlight the vast differences in the types of work that students perform in these countries, in their reasons for working, and in the identities of the working students. To reiterate, not only the rate of after-school work but also its meaning would be expected to differ cross-nationally. How are paid or unpaid students seen by other non-working students? Is there a negative stigma about working for pay? Do these workers see themselves as poor students? And what are the major differences in the motives behind student's work in each country? The answers to these questions are context-specific, and are likely to vary cross-nationally. For example, it is well known that most families in Hong Kong and Taiwan have the resources to forego the benefits of paid and unpaid labor by their children. The comparatively small percentages of children working in these societies (5–6%) are exceptional, and are likely to be those who already are low achievers. For this reason, even after taking school effects into account in the hierarchical linear model analysis (Table 3), work is negatively associated with math and science achievement. A different example is the case of Indonesia, where 29% of 14-year-old boys are working for pay after school. Indonesia suffered through a devastating decline in living standards during the 1990s, resulting in a need even for the relatively well-off families to place sons in the workforce in order to contribute to the household economy. The negative effects of this reallocation of children's time has already been found by Indonesian researchers to have adversely affected school completion and attainment. Poverty has compelled many Indonesian boys to enter relatively time intensive and even hazardous working environments (Agus, Suryahadi, and Sumarto 2005). In this context, it is not surprising that – even when controlling for school-level effects – employment has a negative impact on boys' knowledge of math and science.

In addition to this line of questioning about social context, comparativists have an equally-important avenue for further inquiry. We need better information about the school systemic factors that account for the international differences apparent in the TIMSS. If we can identify the systemic and policy factors associated with these differences, then we also may uncover the reasons why the experiences of students working in particular countries shape academic achievement in the forms that they do. Which nations and which school systems impose sanctions – in the form of low grades or inflexibility in assignments – on children who work for pay (or are unpaid) at the age for 14? How are working students viewed by their teachers? Which school systems officially are more flexible in assignments to working students? How often are working students absent from school because of their jobs? For example, the Netherlands is well known to facilitate the transition between its schools and the labor market, and sponsors many job-training programs. Could this explain the comparatively benign effect of employment on academic knowledge in the Dutch case? Addressing these questions requires future studies of after-school work that probe in-depth the situations of working students within each country. In the meantime, we believe there is evidence to support a broader perspective on the regulation of youth employment than one concerned only with children's physical safety. Although safety concerns must come first

and foremost, even work that is otherwise safe may have deleterious consequences for academic achievement and, ultimately, children's welfare as they reach adulthood.

References

- Agus, Priyambada; Suryahadi, Asep; Sumarto, Sudarno. Working paper. SMERU; Jakarta: 2005. What happened to child labor in Indonesia during the economic crisis: The trade-off between school and work.
- Anker, Richard. Working paper. IPEC; Geneva: 2000. Conceptual and research frameworks for the economics of child labor and its elimination.
- Basu, Kaushik. Child labor: Cause, consequence and cure, with remarks on international labor standards. *Journal of Economic Literature*. 1999; 37:1083–119.
- Fuller, Bruce; Dellangelo, Lucia; Strath, Annelie; Santana, Eni; Bastos, Barretto; Maia, Mauricio Holanda; Socorro, Kelma; deMatos, Lopes; Portela, Adelia Luiza; Vieira, Sofia Lerche. How to raise children's early literacy? The influence of family, teacher, and classroom in Northeast Brazil. *Comparative Education Review*. 1999; 42:1–35.
- Greenberger, Ellen; Steinberg, Laurence. When teenagers work. New York: Basic Books; 1986.
- Grootaert, Christiaan; Kanbur, Ravi. Child labor: An economic perspective. *International Labour Review*. 1995; 134:186–203.
- Gunnarsson, Victoria; Orazem, Peter; Sanchez, Mario. Child labor and school achievement in Latin America. *The World Bank Economic Review*. 2006; 20(1):31–54.
- Heady, Christopher. Evidence from Ghana. Innocenti working paper no. 79. UNICEF Innocenti Research Centre; Florence: 2000. What is the effect of child labor on learning achievement?.
- Knaul, Felicia Marie. Age at entry into the labor force, schooling, and returns to human capital in Mexico. Paper presented at the meetings of the Population Association of America; Los Angeles. 2000.
- Lee, Jennifer C.; Staff, Jeremy. When work matters: The varying impact of work intensity on high school dropout. *Sociology of Education*. 2007; 80:158–78.
- Marsh, Herbert. Employment during high school: Character building or a subversion of academic goals? *Sociology of Education*. 1991; 64:172–89.
- Marsh, Herbert; Kleitman, Sabina. Consequences of employment during high school: Character building, subversion of academic goals, or a threshold? *American Educational Research Journal*. 2005; 42:331–69.
- McNeal, Ralph B. Are students being pulled out of high school? The effect of adolescent employment on dropping out. *Sociology of Education*. 1997; 70:206–20.
- McNeil, Linda. Lowering expectations: The impact of student employment on classroom knowledge. Washington, DC: National Institute of Education; 1983.
- Mortimer, Jeylan. Working and growing up in America. Cambridge, MA: Harvard University Press; 2003.
- Mortimer, Jeylan T.; Finch, Michael, editors. Adolescents, work, and family: an intergenerational developmental analysis. Thousand Oaks, CA: Sage; 1996.
- Mortimer, Jeylan; Finch, M.; Owens, T.; Shanahan, M. Work experience during adolescence. *Journal of Vocational Education Research*. 1996; 19:39–70.
- Post, David; Pong, Suet-ling. Employment during middle school: The effects on academic achievement in the US and abroad. *Educational Evaluation and Policy Analysis*. 2000a; 23:273–98.
- Post, David; Pong, Suet-ling. International policies on early adolescent employment: An evaluation from the US and TIMSS participant nations. *International Journal of Educational Policy, Research, and Practice*. 2000b; 2:153–70.
- Schoenhals, Mark; Tienda, Marta; Schneider, Barbara. The educational and personal consequences of adolescent employment. *Social Forces*. 1998; 77:723–62.
- Tyler, John H. Using state child labor laws to identify the effect of school-year work on high school achievement. *Journal of Labor Economics*. 2003; 21:381–408.

Appendix 1

Table A1

Percentage after-school work and achievement of non-working and working children: paid employment for boys.

	Percent working after school				Math score (<i>bsmmat01</i>)				Science score (<i>bsssci01</i>)			
	No work	1-3 hours	> 3 hours	Row total	No work	1-3 hours	> 3 hours	Total mean	No work	1-3 hours	> 3 hours	Total mean
Australia	73	15	12	100	533	524	511	529	555	560	522	552
Bulgaria	81	11	8	100	522	489	480	515	538	499	498	531
Canada	57	26	18	100	538	532	529	535	541	544	536	541
Chile	74	11	16	100	413	391	370	404	446	429	397	437
Czech Republic	66	20	14	100	538	525	505	531	562	546	550	557
Hong Kong	95	3	2	100	588	545	510	585	540	488	481	537
Hungary	78	14	8	100	544	515	501	536	574	543	528	566
Indonesia	71	12	17	100	422	387	355	406	459	429	411	447
Malaysia	84	10	6	100	522	500	495	518	504	471	479	499
Netherlands	54	24	23	100	549	537	533	542	560	555	546	556
Philippines	44	34	22	100	366	334	330	347	377	324	314	345
Romania	76	11	12	100	489	433	441	477	491	455	439	480
Russia	89	7	4	100	538	520	500	535	551	526	514	548
Singapore	93	2	5	100	609	574	555	605	583	512	505	577
South Africa	58	21	21	100	285	288	297	288	249	274	264	257
Taiwan	94	3	3	100	592	532	514	588	586	528	508	582
Thailand	52	27	21	100	476	462	453	467	496	480	464	485
Tunisia	71	14	15	100	468	441	434	459	445	426	426	440
Turkey	83	5	13	100	444	402	409	438	446	417	411	441
USA	64	18	17	100	517	509	481	509	535	533	493	528

Table A2

Percentage after-school work and achievement of non-working and working children: paid employment for girls.

	Percent working after school				Math score (<i>bsmmat01</i>)				Science score (<i>bsssci01</i>)			
	No work	1-3 hours	> 3 hours	Row total	No work	1-3 hours	> 3 hours	Total mean	No work	1-3 hours	> 3 hours	Total mean
Australia	78	11	10	100	525	523	512	524	533	532	526	532
Bulgaria	88	7	4	100	519	498	505	517	519	483	496	515
Canada	60	23	17	100	532	531	521	530	528	537	519	528
Chile	86	6	8	100	400	365	366	395	419	387	393	415
Czech Republic	84	12	4	100	515	507	493	513	522	507	508	519
Hong Kong	98	1	1	100	584	557	551	583	525	491	506	524
Hungary	90	6	4	100	531	513	470	527	547	520	499	543

	Percent working after school				Math score (<i>bsmmat01</i>)				Science score (<i>bsssci01</i>)			
	No work	1–3 hours	> 3 hours	Row total	No work	1–3 hours	> 3 hours	Total mean	No work	1–3 hours	> 3 hours	Total mean
Indonesia	88	5	6	100	406	380	346	401	429	403	370	424
Malaysia	93	5	2	100	524	483	503	522	489	448	471	487
Netherlands	60	21	19	100	537	540	532	537	534	537	535	535
Philippines	55	28	17	100	376	343	342	361	386	326	330	360
Romania	89	7	4	100	486	446	410	481	482	454	384	476
Russia	93	5	2	100	534	517	526	533	529	514	533	529
Singapore	96	1	3	100	604	596	552	603	562	539	490	560
South Africa	67	18	15	100	276	270	270	274	238	247	228	238
Taiwan	95	2	3	100	587	517	482	583	568	511	483	564
Thailand	62	22	16	100	481	462	450	472	490	471	459	481
Tunisia	85	8	7	100	443	396	412	437	419	396	412	417
Turkey	95	2	2	100	439	380	381	436	439	399	389	437
USA	72	14	14	100	502	504	493	501	511	518	496	510

Table A3

Percentage after-school work and achievement of non-working and working children:
unpaid household chores, boys.

	Percent working after school				Math score (<i>bsmmat01</i>)				Science score (<i>bsssci01</i>)			
	No work	1–3 hours	> 3 hours	Row total	No work	1–3 hours	> 3 hours	Total mean	No work	1–3 hours	> 3 hours	Total mean
Australia	12	81	7	100	509	537	476	529	529	558	503	551
Bulgaria	13	66	21	100	494	520	510	515	525	534	526	531
Canada	10	83	7	100	517	539	504	535	519	543	536	540
Chile	13	72	15	100	402	407	377	402	435	442	404	435
Czech Republic	8	84	8	100	518	535	491	530	552	558	546	557
Hong Kong	27	71	2	100	579	587	558	585	529	540	508	536
Hungary	7	77	16	100	555	545	486	536	578	574	521	566
Indonesia	2	80	18	100	332	410	396	406	370	452	434	447
Malaysia	5	78	17	100	506	517	514	516	500	499	496	498
Netherlands	16	79	4	100	529	547	507	543	543	561	512	556
Philippines	9	58	33	100	301	358	340	347	300	355	340	345
Romania	9	65	25	100	458	484	460	475	466	488	461	479
Russia	6	82	12	100	504	536	510	531	507	551	520	545
Singapore	25	69	6	100	616	602	584	605	601	568	571	577
South Africa	12	60	28	100	276	297	273	288	242	271	233	257
Taiwan	16	78	6	100	569	595	557	588	568	586	567	582
Thailand	4	85	11	100	444	469	469	468	467	486	481	485
Tunisia	16	66	18	100	458	462	446	458	445	441	431	440

	Percent working after school				Math score (<i>bsmmat01</i>)				Science score (<i>bsssci01</i>)			
	No work	1-3 hours	> 3 hours	Row total	No work	1-3 hours	> 3 hours	Total mean	No work	1-3 hours	> 3 hours	Total mean
Turkey	30	61	9	100	447	437	399	436	443	440	418	439
USA	13	78	9	100	488	517	463	509	504	536	483	528

Table A4

Percentage after-school work and achievement of non-working and working children:
unpaid household chores, girls.

	Percent working after school				Math score (<i>bsmmat01</i>)				Science score (<i>bsssci01</i>)			
	No work	1-3 hours	> 3 hours	Row total	No work	1-3 hours	> 3 hours	Total mean	No work	1-3 hours	> 3 hours	Total mean
Australia	10	85	6	100	520	527	471	523	511	536	500	532
Bulgaria	7	69	24	100	493	520	510	516	490	520	509	515
Canada	6	86	8	100	519	531	517	529	509	529	535	528
Chile	8	73	19	100	384	396	381	392	401	418	398	413
Czech Republic	2	90	8	100	525	516	473	512	549	521	491	519
Hong Kong	20	77	3	100	586	583	573	583	519	526	513	524
Hungary	2	82	16	100	563	535	477	527	564	551	498	543
Indonesia	1	74	25	100	306	400	404	400	299	426	421	423
Malaysia	3	72	25	100	526	523	516	522	502	489	479	487
Netherlands	9	85	5	100	533	541	480	537	528	539	478	535
Philippines	9	56	35	100	307	368	362	360	310	364	362	359
Romania	7	70	23	100	484	490	443	478	465	486	445	475
Russia	2	84	14	100	514	531	516	529	512	527	508	524
Singapore	20	71	9	100	625	599	577	602	592	552	543	559
South Africa	16	57	27	100	237	289	264	274	194	261	220	239
Taiwan	10	82	8	100	595	584	557	583	578	564	554	565
Thailand	2	81	16	100	497	472	466	471	488	483	467	481
Tunisia	7	68	25	100	432	438	426	435	420	418	411	416
Turkey	15	72	13	100	455	437	390	433	444	438	400	434
USA	8	83	9	100	489	508	451	501	497	516	461	509

Appendix 2

Table A5

Means and standard deviations of selected variables, by country.

	Number of students in each country	Age of the student in years (<i>bsdage</i>)		Education level of most-educated parent, scale 1–5 (<i>bsdgedup</i>)		Amount of books in child's home, scale 1–5 (<i>bsbgbook</i>)		TIMSS index of education items in the home (<i>bsdgpsa</i>)		TIMSS index of time student spends studying (<i>bsdgosti</i>)		Test language is not the main one spoken in home (<i>bsbglang</i>)		School is in an isolated or a rural community (<i>bcbgcomm</i>)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Australia	3652	14.26	0.50	2.55	1.44	3.89	1.10	1.18	0.38	1.95	0.63	0.11	0.32	0.10	0.31
Bulgaria	3267	14.79	0.57	1.97	1.05	3.63	1.31	1.79	0.40	2.30	0.71	0.12	0.32	0.25	0.43
Canada	8711	14.03	0.47	2.07	1.37	3.66	1.17	1.22	0.41	2.06	0.64	0.09	0.29	0.19	0.39
Chile	5898	14.35	0.84	2.76	1.14	2.58	1.19	1.79	0.40	2.10	0.69	0.06	0.24	0.19	0.40
Czech Republic	3448	14.40	0.45	2.31	1.15	3.76	0.97	1.57	0.50	1.94	0.61	0.02	0.14	0.21	0.41
Hong Kong	5156	14.24	0.84	2.83	1.13	2.42	1.21	1.43	0.50	1.75	0.72	0.20	0.40	0.04	0.20
Hungary	3149	14.44	0.55	2.01	0.99	3.79	1.17	1.52	0.50	2.33	0.61	0.01	0.10	0.30	0.46
Indonesia	5842	14.57	0.86	2.78	0.99	2.24	1.04	1.94	0.24	2.36	0.67	0.72	0.45	0.42	0.49
Malaysia	5577	14.36	0.37	2.60	1.12	2.70	1.11	1.72	0.45	2.62	0.55	0.39	0.49	0.42	0.49
Netherlands	2890	14.21	0.53	2.79	1.44	3.40	1.22	1.06	0.23	2.11	0.50	0.14	0.35	0.27	0.45
Philippines	6593	14.07	1.16	2.15	1.02	2.00	1.11	1.89	0.31	2.40	0.62	0.89	0.31	0.21	0.41
Romania	3273	14.81	0.49	2.37	1.17	2.94	1.25	1.89	0.32	2.43	0.70	0.08	0.27	0.05	0.21
Russia	4328	14.10	0.51	2.15	1.28	3.55	1.10	1.81	0.39	2.42	0.61	0.06	0.24	0.36	0.48
Singapore	4966	14.35	0.48	2.56	1.12	2.91	1.15	1.25	0.43	2.52	0.62	0.73	0.44	0.00	0.00
South Africa	7601	15.48	1.90	2.75	1.20	2.03	1.18	1.92	0.27	2.29	0.72	0.77	0.42	0.50	0.50
Taiwan	5772	14.20	0.36	2.22	0.94	2.86	1.30	1.39	0.49	1.88	0.75	0.33	0.47	0.12	0.33
Thailand	5727	14.46	0.57	3.16	1.05	2.41	1.10	1.92	0.27	2.36	0.63	0.28	0.45	0.53	0.50
Tunisia	5042	14.78	1.16	2.78	1.02	2.48	1.18	1.77	0.42	2.50	0.64	0.12	0.32	0.25	0.43
Turkey	7982	14.22	0.78	2.75	0.82	2.41	1.10	1.92	0.27	2.50	0.60	0.08	0.27	0.06	0.24
USA	8776	14.18	0.56	2.10	1.26	3.48	1.25	1.26	0.44	1.99	0.66	0.10	0.29	0.24	0.43

Figure 1.
Math achievement and boys' paid employment in 20 countries.

Figure 2.
International relationship between mean achievement and proportions of girls and boys performing paid and unpaid work.

Figure 3.
Individual-level associations of paid employment on math and science achievement for boys.

Figure 4.
Individual-level associations of unpaid household chores on math and science achievement for girls.

Table 1

OLS regression analysis of math and science achievement: impact of paid employment, country, and the interaction of employment and country effects.

	Boys		Girls	
	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)
Child's age	-16.08**	-13.65**	-18.66**	-15.37**
Parent's educational attainment level	9.67**	11.50**	11.41**	12.09**
Number of books in home	14.74**	15.38**	13.36**	14.41**
Amount of educational items in home	26.19**	30.78**	31.78**	34.39**
Child is employed for pay more than 3 hours each week (versus 3 hours)	-26.22**	-34.15**	-11.30**	-16.94**
Country (omitted reference country=USA)				
Australia	19.24**	24.25**	24.09**	21.70**
Bulgaria	22.24**	19.08**	40.80**	28.74**
Canada	18.45**	2.70	23.64**	11.84*
Chile	-67.47**	-50.04**	-66.21**	-53.78**
Czech Republic	31.44**	35.22**	27.82**	24.76**
Hong Kong	99.15**	33.69**	113.01**	46.22**
Hungary	30.07**	38.41**	38.56**	43.08**
Indonesia	-44.46**	-23.35**	-46.51**	-30.53**
Malaysia	35.58**	0.07	55.04**	12.00*
Netherlands	32.34**	25.95**	39.80**	27.00**
Philippines	-121.12**	-134.28**	-95.95**	-97.71**
Romania	8.84	25.84	27.26**	11.86
Russia	32.39**	28.02**	47.01**	35.54**
Singapore	107.32**	61.98**	117.15**	65.77**
South Africa	-155.75**	-203.15**	-157.47**	-198.16**
Taiwan	89.38**	64.30**	99.65**	72.04**
Thailand	4.64	9.31	26.23**	28.31**
Tunisia	-9.51*	-47.73**	-17.21**	-46.34**
Turkey	-29.71**	-42.26**	-24.02**	-29.93**
Interaction of employment with country				
Australia	-3.02	-5.10	4.82	16.30**
Bulgaria	-11.72	-2.15	2.20	1.83
Canada	20.40**	27.09**	4.31	8.99
Chile	5.25	3.18	-0.31	13.82
Czech Republic	-3.85	21.14*	7.97	19.70
Hong Kong	-16.08	9.61	14.83	30.31

	Boys		Girls	
	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)
Hungary	0.82	5.47	-34.87**	-10.39
Indonesia	-23.52**	4.43	-23.94*	-19.69
Malaysia	5.96	19.01*	-2.99	5.70
Netherlands	20.05**	28.70**	5.66	17.07*
Philippines	13.00	7.58	-2.76	-11.24
Romania	-5.60	-7.52	-48.16**	-55.62
Russia	-0.18	4.45	-3.40	15.00
Singapore	-5.01	-19.07**	-24.08**	-37.46**
South Africa	32.33**	38.08**	12.26	9.81
Taiwan	-40.64**	-32.25**	-67.21**	-38.57**
Thailand	16.16**	16.72*	-4.09	3.25
Tunisia	14.59**	35.71**	-2.77	23.49**
Turkey	4.16	12.42	-34.94**	-18.62
Total number of students	45,676	45,676	48,209	48,209
Number of school clusters	2482	2482	2503	2503
Intercept	745.95**	738.40**	783.14**	746.86**
R ²	0.48	0.48	0.50	0.49

Note: Robust standard errors are calculated to correct for clustering of students in schools.

* Significant at 0.05 level;

** significant at 0.01 level.

Table 2

OLS regression analysis of math and science achievement: impact of unpaid chores, country, and the interaction of chores and country effects.

	Boys		Girls	
	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)
Child's age	-14.13**	-12.22**	-14.97**	-12.55**
Parent's educational attainment level	-9.97**	-11.24**	-11.30**	-12.49**
Number of books in home	12.96**	14.34**	12.80**	13.53**
Amount of educational items in home	-27.71**	-25.65**	-29.24**	-28.13**
Child reports >3 hours chores each week (versus 3 hours)	-45.09**	-42.35**	-45.73**	-44.93**
Country (omitted reference county=USA)				
Australia	28.66**	36.77**	28.56**	32.22**
Bulgaria	23.77**	20.80**	37.62**	28.31**
Canada	12.42**	1.50	17.18**	6.90
Chile	-65.18**	-46.70**	-68.71**	-52.28**
Czech Republic	64.45**	68.49**	59.96**	54.96**
Hong Kong	105.07**	42.17**	115.01**	51.10**
Hungary	43.40**	54.06**	45.76**	52.04**
Indonesia	-46.99**	-20.79**	-50.56**	-30.54**
Malaysia	39.25**	5.86	56.35**	17.13**
Netherlands	40.91**	44.00**	49.56**	42.77**
Philippines	-119.15**	-135.42**	-100.31**	-103.34**
Romania	17.48**	0.50	29.92**	14.48**
Russia	37.95**	32.60**	46.71**	35.07**
Singapore	106.85**	62.79**	116.43**	67.56**
South Africa	-147.55**	-188.23**	-155.84**	-191.49**
Taiwan	94.90**	72.19**	101.38**	75.62**
Thailand	8.80	11.60	24.79**	29.01**
Tunisia	-7.72*	-42.33**	-22.81**	-47.43**
Turkey	-29.22**	-43.45**	-25.23**	-31.58**
Interaction of chores with country				
Australia	-13.63	-9.42	6.90	18.13
Bulgaria	38.58**	36.65**	38.51**	38.02**
Canada	18.45*	32.75**	24.25**	33.21**
Chile	24.60**	13.82	35.38**	28.65**
Czech Republic	-6.99	20.21	-1.52	20.90*
Hong Kong	17.24	10.66	39.14**	32.27**

	Boys		Girls	
	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)	Math (<i>bsmmat01</i>)	Science (<i>bsssci01</i>)
Hungary	2.01	4.48	5.12	9.83
Indonesia	38.74**	34.04**	52.06**	42.96**
Malaysia	37.20**	33.43**	39.53**	34.35**
Netherlands	13.58	-0.06	8.04	8.06
Philippines	41.14**	43.75**	51.63**	50.80**
Romania	29.11**	29.04**	18.55**	25.76**
Russia	29.75**	24.06**	35.16**	33.73**
Singapore	24.56**	37.22**	20.67**	30.31**
South Africa	31.63**	13.06	31.95**	20.16**
Taiwan	13.72	27.24	18.60**	34.20**
Thailand	51.45**	42.82**	41.65**	32.76**
Tunisia	34.96**	37.05**	43.52**	45.77**
Turkey	11.29	30.03**	10.01	19.57**
Total number of students	48,304	48,304	49,850	49,850
Number of school clusters	2488	2488	2503	2503
Intercept	721.56**	705.13**	728.14**	697.92**
R ²	0.54	0.52	0.57	0.54

Note: Robust standard errors are calculated to correct for clustering of students in schools.

* Significant at 0.05 level;

** significant at 0.01 level.

Table 3

Hierarchical linear model estimates of the effect of paid employment for more than three hours per week on first plausible value of math and science achievement.

	Boys		Girls	
	Math	Science	Math	Science
Australia	-19.33**	-34.20**	-14.46**	-16.13**
Bulgaria	-16.20*	-19.27*	-14.70*	-18.65*
Canada	-5.99*	-5.38	-4.42	-6.56*
Chile	-9.16*	-20.52**	-5.27	0.18
Czech Republic	-27.45**	-12.19*	-6.53	2.57
Hong Kong	-28.40**	-21.32*	-15.81	-10.99
Hungary	-11.98	-17.89*	-36.69**	-23.44*
Indonesia	-20.44**	-9.22*	-3.69	-0.26
Malaysia	-10.20*	-4.94	3.07	9.13
Netherlands	-1.38	2.01	-1.48	3.19
Philippines	1.50	-2.99	-2.18	-8.33
Romania	-29.03**	-35.65**	-47.57**	-54.77**
Russia	-11.19	-9.84	-6.29	-0.32
Singapore	-5.20	-12.53*	3.54	1.86
South Africa	6.36	-10.84*	-5.64	-18.80**
Taiwan	-53.00**	-54.75**	-69.21**	-53.83**
Thailand	-4.21	-16.06**	-0.95	-7.41*
Tunisia	-18.64**	-8.50*	-11.27*	4.20
Turkey	-21.08**	-23.62**	-41.28**	-35.03**
USA	-20.20**	-29.51**	-13.02**	-21.04**

Note: Equation also includes control variables for student's age, education level of most educated parent, number of books in home, and indicator of educational resources in the home.

* Significant at 0.05 level;

** significant at 0.01 level.