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Intermittent Child Employment and Its Implications for Estimates of Child Labor

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Abstract

This paper uses longitudinal data from urban Brazil to analyze intermittency in children's work activity and the implications of this intermittency for estimates of child labor. We follow the employment patterns of urban children ages 10-16 during 4 months in their lives. Different waves of the panel cover most of the 1980s and 1990s, providing information on the work activity of thousands of children. We document a large decline in child employment in the 1990s. An analysis of transition rates in and out of employment for young workers shows relatively high volatility in urban employment, with both higher exit rates and lower entry rates responsible for the decline in child employment. One important implication of this volatility is that the proportion of urban Brazilian children who work at some point during a four month period is substantially higher than the fraction observed working in any single month; movements in and out of employment are "normal" rather than exceptional. We calculate an intermittency multiplier to summarize the difference between employment rates in one reference week vs. four reference weeks over a 4-month period. We conclude that intermittent employment is a crucial characteristic of child labor which must be recognized in order to adequately capture levels of child employment and identify child workers.

Introduction

In spite of growing concern about child labor in developing countries, very little is known about the movements of children in and out of the labor force, from day to day and from month to month. In order to make accurate assessments of the extent of child labor and create sound public policy, it is important to identify the extent to which child labor is characterized by long-term employment with high labor force attachment versus short-term employment spells with rapid movement in and out of the labor force. While the specific nature of child labor will undoubtedly vary with age, gender, region, and household circumstances, this paper is motivated by a concern that there has been insufficient recognition of how volatile and intermittent child labor can be. Media portrayals often focus on children working long hours and long weeks in steady year-round work in factories or sweatshops, reinforcing a view of child labor as relatively stable employment. Even in factory work, however, children may not be steady workers: one study has found a very high rate of child migration between garment firms in Bangladesh (Boyden and Myers 1995). Theoretical models of child labor (e.g., Basu and Van 1998, Basu 1999, Dessy 2000) tend to treat children as either working or not, without accounting for the potentially high degree of intermittency that may characterize children's work.

Case studies and fieldwork in small areas suggest, however, that much of children's labor force involvement is sporadic, opportunistic, quick-to-change, and often informal.[1] Cross-sectional surveys, which provide the bulk of our information about child labor, and which have the advantage of providing information on large samples of children, are not designed to measure transitions in and out of employment. These surveys capture only a snapshot of children's labor

[1] See, e.g., Reynolds (1991). Boyden, Ling and Myers (1998: 162) write that "neglecting children's work histories and careers can be misleading because the intensity of their work, their work schedules, and their activities and occupations are often quite variable even over short periods of time….Longitudinal research, then, is more likely to provide an accurate picture of the range, schedules, and intensity of work in different seasons or different phases of childhood…."

market experience, but their labor force measures encourage analysts (ourselves included) to draw sharp distinctions between children identified as workers at the time of the survey and those not employed at the time of the survey – much as analysts distinguish between economically active and inactive adults. These distinctions can be misleading for the potentially sizeable group of children who are intermittent workers.

If significant proportions of children work intermittently, there may be important implications for estimates of the proportion of children who work and the total numbers of child workers. Consider the International Labour Organization's estimates of the magnitude of child labor world-wide. The ILO's 1996 estimate of child laborers in less developed countries has been repeatedly cited and used in reports and documents (Anker 2000a, 2000b); the 2002 estimate and a follow-up estimate in 2006 are likely to be even more influential, given the increasing attention – and funding – being addressed to child labor programs and policies. According to the ILO (2002), there were 211 million child workers (ages 5-14) worldwide as of the year 2000. This declined to 191 million as of 2004 (ILO 2006). These estimates are based on national household survey estimates, from countries in each region of the world, of children who were employed during a reference week. In this paper, we show that many more children are identified as workers when panel data is used to identify those who are employed irregularly. We estimate "intermittency multipliers" to summarize the size of this effect. As an example, we apply these multipliers to the ILO's estimates for the year 2000. If intermittency in child employment were as prevalent world-wide as we find it to be in metropolitan Brazil, it is plausible that the number of child workers worldwide would be 365 to 409 million. That is, in this counter-factual case, asking children about

work in one week per month for four months in a row – instead of using only one reference week – would increase the ILO global estimate of economically active children by 72 to 94 percent.[2]

As discussed in the ILO report, the choice of a reference week to define work is made for a number of reasons, including maximizing comparability with previous estimates and with estimates made by many national statistical agencies. Given the available data and issues of comparability, the choice of a reference week to define work is probably the logical choice if one is to produce a singe estimate of child labor. (The most common alternative, a one-year reference period, is tainted by recall bias that is likely to be especially severe for children.) We propose, however, that given the highly intermittent nature of children's labor force activity, a measure based on activity in a single week may significantly understate the magnitude of child labor. In choosing a time period to measure child labor, it is important to consider the purpose of defining a "child worker." If the purpose is to count and identify characteristics of children at risk of employment-related hazards or exploitation, a reference-week-based definition seems too narrow; instead, a measure capturing employment in recent months in hazardous industries or occupations would identify children likely to take up those types of jobs again. If the goal is to increase human capital accumulation, it is worth noting that, depending on the school system, intermittent employment may take as great a toll on grade progression as regular employment. If the goal is to reduce the intensity of child work – for any of a number of reasons – it is important to have some understanding of the regularity of employment and its duration as well as hours worked in a reference week. Different combinations of work hours and job duration can have quite varied implications for the well-being of young people (Anker 2000b, Mortimer 2002, Mortimer and Johnson 1998). For most policy purposes, we argue that a reference period of one week is too short because it is unable to take account of the

[2] This calculation is discussed at the end of the paper and the calculations are detailed in Appendix Table D.

phenomenon of frequent labor force entries and exits among children. The greater the prevalence of intermittency, the greater the undercount of total child workers, broadly defined.

The choice of a reference period to measure child labor is ultimately a somewhat arbitrary matter of definition, with different definitions leading to different estimates of child labor. The choice of a longer time period over which to measure work activity must inevitably lead to higher estimates of employment for any age group. It could therefore be argued that there is nothing surprising in the findings we report below that estimates of child labor increase significantly when the reference period is expanded. We believe that it is important to examine the actual magnitude of this increase, however, and to understand how much intermittency there is in child employment. Our results from panel data indicate that child labor in metropolitan Brazil is highly intermittent, with this intermittency leading to a significant increase in estimates of child labor when the reference period is expanded from one month to four months. The effect of intermittency appears to much more important for child worker than for adult workers, suggesting that there is greater need to account for such intermittency in estimating employment rates.

This paper draws upon panel data to follow the labor force movements of urban Brazilian children ages 10-16 from month to month in the 1980s and 1990s, capturing their employment status at the time of each month's survey. We begin by reporting trends in youth employment from 1982 to 1999. We then present rates of entry into employment and rates of exit from employment, the two components of employment transitions. The paper concludes with evidence indicating that urban children's employment is often of short duration and intermittent. To our knowledge, this has never before been documented for a large, representative sample.[3] For children observed working at some point during a four-month period, the proportion who work all four months is

[3] The PME surveys are representative samples of six metropolitan regions in Brazil.

rarely as high as 50 percent, and for those under age 15 the proportion is usually below 25 percent. These results are robust in sensitivity tests that eliminate effects of the long school holidays. The implications of frequent entry and exit are summarized in an intermittency multiplier describing the extent to which child employment rates based on a reference week must be expanded if child labor estimates are to capture recent as well as current employment. For younger age groups these multipliers are often as high as two, indicating that a broader measure of child labor captures twice as many children as those identified in typical monthly surveys.

Data and Samples Used

For a country with reasonably high levels of average production and income, Brazil has had relatively high levels of child employment. This may be related to Brazil's high level of income inequality[4], or to the economic instability of recent decades. The country experienced rapid economic growth in the 1960s and 1970s, followed by a major recession in the early 1980s and continuing economic fluctuations that left per capita income in 1990 at about the 1980 level. Economic performance was better in the 1990s, but was again characterized by large fluctuations. Brazil is generally viewed as having under-performed in education relative to its level of income (Birdsall and Sabot 1996). The mean years of completed schooling among 25-29 year-olds in 1995, for example, was less than seven years (Lam 1999).

The *Pesquisa Mensal de Emprego* (PME) or Monthly Employment Survey, was created by Brazil's statistical agency (the *Instituto Brasileiro de Geografia e Estatística*, IBGE) to track employment and unemployment from month to month in six of Brazil's largest metropolitan areas. These cities are São Paulo, Rio de Janeiro, and Belo Horizonte in Southeast Brazil; Salvador and

[4] Deininger and Squire's (1996) compendium of inequality measures shows Brazil to consistently have one of the highest levels of income inequality in the world in recent decades.

Recife in Northeast Brazil; and Porto Alegre in Southern Brazil. The PME survey gathers standard demographic, schooling, labor force, and earnings information for each household member age 10 and over, for every interviewed household. Households are rotated in and out of short panels, such that a household will be interviewed once per month for four consecutive months, temporarily dropped out of the survey for eight months, then interviewed once per month for four more months. Thus, household members, ideally, can be tracked over a 16 month period. In the part of our analysis that draws upon the longitudinal dimension of the PME, however, we use only the first four consecutive-month interviews for each household. Household rotation panels overlap, so about 35,000 households are interviewed each month, including 4,500 to 7,500 households from each of the six metropolitan regions. These sample sizes are large enough to allow us to analyze boys and girls separately for each city, month, and year. For example, we observe, on average, about 190 girls and 190 boys age 14 in São Paulo and about 150 girls and 150 boys age 14 in Salvador in any given month.

Like many national employment surveys with rotating panel designs, the panel structure of the PME is designed primarily to reduce volatility in estimates of month-to-month and year-to-year changes in unemployment. The survey is not designed explicitly for purposes of analyzing longitudinal transitions of individuals. Dwellings, rather than households, are the focus of the sample design, and households only remain in the sample if they continue to reside in the dwelling that was originally included in the sample. Public release versions of the data are not designed for longitudinal analysis, although they do contain household identification numbers that make it possible to link households across sample months. Individuals within households must be linked using month and year of birth, a process that provides relatively straightforward matching for the

most individuals. We impose a set of filters on matches of both households and individuals across months, using variables such as gender, year of birth, month of birth, and education.

Given the absence of a direct focus on following households longitudinally, sample attrition is relatively high in the PME. As shown in Appendix Table A, about 82 percent of children age 10-16 who are observed in month 1 of a PME rotation group are also observed in months 2, 3, and 4, making them eligible for our analysis of intermittency. While this is relatively high attrition, we also show in Table A that those who remain in the sample differ very little from those who are missing for one or more months. For example, boys observed in all four months have a school enrollment rate of 89.2 percent and an employment rate of 14.4 percent in month 1, compared to an enrollment rate of 88.3 percent and an employment rate of 14.7 percent for all boys observed in month 1. Table A also shows that the fraction of children whose mothers have more than four years of schooling is virtually identical between the full sample of children observed in month 1 and the sample observed in all four months. While there many reasons to expect non-random attrition in a dwelling-based survey such as this, a large proportion of the attrition is truly random, resulting from issues such as changes in sample size and design and incomplete documentation of identification numbers. While we can never know how the lost observations would have behaved in terms of changes in employment, it is very reassuring that these lost observations were almost indistinguishable from the observations that remain in the sample based on the variables that were observable in month 1. Given the scarcity of panel data from developing countries, we believe the strengths of these data, with their large sample size, long time period, and detailed employment data, far outweigh the weaknesses, providing a rare look at the actual transitions made by children in and out of the labor force.

The PME was first fielded in the early 1980s, and this paper draws upon microdata for overlapping panels beginning in February 1982 and continuing through January 2000. Interviews conducted in each month of each year during this period are included in our sample. The questionnaire is remarkably consistent over this time period. We briefly describe the overall trends in child employment for the entire period. Much of the following analysis focuses on three cities during two time periods: São Paulo, Salvador, and Porto Alegre in 1982-84, at the beginning of the period, and in 1996-1998, at the end of the period.[5] We limit ourselves to a few metropolitan regions because we present many of our results graphically, to show trends. Our choices were made to show the diversity of children's experiences in Brazil's cities. São Paulo is by far Brazil's largest metropolitan area, with a 1996 population of 9.8 million; São Paulo and the southern metropolitan area of Porto Alegre (population 1.28 million in 1996) have strong labor markets and typically show relatively high child employment rates in cross-sectional surveys. Salvador, in contrast, is typical of the poorer Northeast, with relatively weak labor markets; its population was 2.2 million in 1996.[6] Any results we present that combine populations of different metropolitan areas are weighted by the inverse of the PME household sampling fraction for each area, so that our aggregate results are representative of the experience of the "average" household across these six largest metropolitan areas.

Observed children include all household members in the 10-16 age range, regardless of the child's relationship to the household head. Thus, children may be sons or daughters of the head

[5] Due to the structure of the overlapping panels, many more houseolds are rotated into the survey in even years than in odd years. To maximize sample sizes, tables focusing on data from the first four interviews do not include 1999 or January 2000.

[6] Some of our results also include metropolitan Rio de Janeiro (population 5.55 million in 1996) and Belo Horizonte (2.09 million), both in the Southeast, and the Northeastern metropolitan area of Recife (1.35 million).

(90.3%), other relatives of the head (8.3%), or non-relatives of the head such as *agregados*[7] and boarders (0.4%), domestic servants (0.5%) or relatives of domestic servants (0.1%). Our sample of 10-16 year olds also includes a small percentage of youth who are heads of households (0.1%) or their spouse (0.3%). Most of the analysis uses a subset (98.6%) of this sample that only includes sons, daughters and other relatives of the household head. Throughout this analysis, because children's activities change rapidly as they age, we report results for single years of age to the extent possible. Ages 14 and 16 are often highlighted: age 14 is, according to a number of International Labor Organization conventions, the upper limit for legally being a child in Brazil, so these ages are just below and just above that arbitrary cut-off line.

The employment question in the PME – *"O que fez X na semana passada?"* – translates to "What did X do last week?" where X refers to each member of the household over age 10. Typically a single adult respondent answers the questions for all household members. The interviewer reads the possible answers to this question – worked, didn't work but had a job, looked for a job, retired, student, domestic work, other – and stops at the first answer to which the interviewee responds in the affirmative. Thus, a child who worked and went to school should be classified as working since the interviewer reads this option first. School enrollment for each household member is recorded in a separate question unrelated to employment status during the "registration" portion of the interview, along with other non-employment questions such as date of birth, relationship to the head, and educational attainment. It is therefore possible to identify children who are both working and going to school. Throughout this paper, we will use the term "employed" to indicate that a person works in the labor force in the reference week of a particular

[7] *Agregados* are not clearly defined by any source. Foster-children seem to be included in this category, which includes a very small percentage of children.

month; it does not differentiate, for example, between employees and self-employed workers. We also note that the term "work" in its narrow sense of labor force work ignores the substantial amount of non-labor-force domestic work done by children.

We recognize that children do much work that is not captured by standard labor force surveys. Housework is rarely counted, so girls' contributions to family well-being is systematically neglected (Levison 2000, Levison, Moe and Knaul 2001). Moreover, surveys designed to capture adult work are not necessarily well-suited to measuring children's work, much of which takes place in the informal sector. Levison (1991) estimates that the standard Brazilian survey question on employment missed at least 29 percent of child employment in 1985. Finally, Knaul (1995) finds that parents systematically underreport child work to survey interviewers. For all of these reasons, we expect our estimates to underreport the labor force work of young people in Brazil.

Trends in Child Employment, 1982-1999

Child and youth employment has been declining in Brazil's cities for some time. To provide an overview of child activities in the 1980s and 1990s, Figure 1 shows the aggregate trends in employment and school enrollment for the six metropolitan areas covered by the PME. The top panel reports the percent of 14-year-old boys in school who are not employed, the percent who combine school and employment, those who work in the labor force and are not enrolled in school, and those who report neither activity; the bottom panel does the same for 14-year-old girls. The great majority of children are enrolled in school and do not work in the labor force, according to our data. Of those children who are employed, a substantial proportion are also in school. This is not surprising, as many schools operate in shifts lasting about 4 hours each. Children have many hours each day when they are not in classes. Still, the proportion employed becomes very small in later years. Among girls, almost as many fall in the "neither school nor employment" category.

Analysis of similar Brazilian cross-sectional data from 1985 shows that many of these girls are primarily engaged in domestic chores (Levison 1991).

Figures 2 and 3 show monthly employment rates for the entire period for 14 and 16 year olds, respectively. For comparability to later figures, these results are calculated for the subsample of sons, daughters, and other relatives of the household head. Each panel represents a different metropolitan area, while different lines are plotted for boys and girls. Some of the sample's month/sex/age groups have fairly small numbers of observations, leading to increased variability in these estimates of proportions employed.[8] We use 3-month moving averages to smooth this volatility in the remainder of the figures in this paper. The average plotted for March 1996 is thus the average of February, March and April 1996.

In each case, boys' employment rates are substantially higher than are girls', often double. Employment increases very rapidly with age in the teenage years; this is reflected by the elevated rates for 16-year-olds (Figure 3) compared to 14-year-olds (Figure 2). Both boys and girls show declines in percent working, in spite of considerable volatility and seasonal variation. The patterns vary across the cities. Salvador shows a fairly steady decline for both age and sex groups over the whole time period. In contrast, in São Paulo employment rates for all groups rose in the second half of the 1980s, peaking around 1987, before beginning to decline in the early 1990s. Porto Alegre, like São Paulo, shows evidence of a structural shift about 1990-1991, followed by declining employment rates for 14 and 16 year old boys and girls.

The different patterns of child employment in Salvador, São Paulo and Porto Alegre reflect, to some extent, the different labor markets of those cities. While we would expect more children to

[8] This is particularly true in the next section, where we further subdivide the sample by socioeconomic status (SES). The sample sizes get as low as 25 to 35 children for a particular city/month/sex/age/SES group.

seek work in the poorer Northeast, increasing the supply of child labor, actual employment is lower in Salvador than in São Paulo and Porto Alegre. Stronger labor markets in Southeastern and Southern Brazil apparently generate a greater demand for young workers. Table 1 reports the industries in which these young workers found employment in 1982-84, while Table 2 presents similar information for 1996-98. We rank-ordered the industries in which boys and girls are employed, for each sex. Although we present the ten industries most frequently reported by child workers, most children are clustered in a few industries in each city, which vary according to their age and sex. A few categories are common to almost all city/sex/age/year groups: boys and girls are frequently found in street vending, food sales, supermarkets, and food-related services. In addition, boys are often found in auto repair and construction, with older boys moving into the food production industry. For girls, domestic service provided to other households is by far the most common sector of employment, especially in Salvador. Although the share of children age 10-14 employed in the shoemaking industry in Porto Alegre has fallen by half by the latter period, shoemaking still ranks first for boys and second for girls in this metropolitan area.

We produced similar rankings for boys and girls by occupation, which we do not include because of their redundancy. A few points, however, are especially interesting. “Unspecified manual labor” is in the top ten occupations for boys 10-14 and 15-16 in each time period. Being a messenger or “office boy” is also common for males. In the later time period, 3-5 percent of employed boys 10-16 in São Paulo and 15-16 in Porto Alegre are “packers,” doing canning, bottling or bagging; this occupation is likely to correspond to the food production industry category. Girls 10-16 are packers in both time periods in São Paulo; in Porto Alegre, this is a top-10 occupation for girls only in the earlier time period. Surprisingly, “primary school teacher” is among

the top occupations for 15-16 year old girls, especially in 1982-84. For example, 129 girls in Salvador are reported to be primary school teachers (not aides, which are in a different category).

In developing countries, working children are generally assumed to be poor children. This assumption is not unreasonable for younger children engaged in labor market work; it becomes problematic for older children, as they move into adulthood. Analysis of child work status by socioeconomic status (SES) is important in order to understand the structure of child work and its role in the lives of more or less privileged children and their families. As a simple measure of socioeconomic status we divide the sample into those above and below the median per capita household income.[9] From this point on, we restrict our sample to the 98.6 percent of children who are sons, daughters or other relatives of the household head. We use the term "mother'' loosely: The "mother" in this analysis is the female head or spouse of the head, while the 10-16 year olds in the analysis are the sons, daughters, and other relatives of the head. Some sons and daughters of male heads are stepchildren of the head's current spouse, for example.

Figure 4 shows the proportions of 14-year-old boys and girls who are employed when we divide the sample into those above and below median per capita household income. For both boys and girls we see that children in lower-income households are roughly twice as likely to be employed as children from higher-income households during the 1980s. As employment rates have fallen, however, they have fallen more rapidly for the children in the lower income group, leading to a large reduction in the gap between the two SES groups. By the end of the 1990s the

[9] Only the income of adults is used in the calculation of household income, in order to help separate the income measure from the child labor decision. In results not shown we have also used mother's education as a proxy for the socioeconomic status of the household, classifying children whose mothers have four or more years of schooling as the high SES group. This has the advantage that it may be a better measure of long-term household resources, being less sensitive than income to short-run volatility. The comparisons of children in high and low SES groups when mother's education is used as the measure of SES lead to results that are very similar to the results shown here using per capita household income.

employment rates for children from lower-income households are only slightly higher those for children from higher-income households. Similar patterns hold for 16-year-old boys and girls (not shown). Further information is required to determine what combination of factors have led to this change. Suspects include increasing demand for education by children of less-educated parents, greater availability of school openings, increased quality of public schools, and/or declining demand for youth labor, especially in jobs traditionally held by lower SES children.

Measuring Employment Transitions: Entry and Exit Rates

For any given level of employment, there are always people moving into jobs and people leaving jobs. A decline in overall employment levels may occur because fewer people start new jobs, because those who start working tend to leave their jobs more quickly, or both. In this section, we take advantage of the longitudinal feature of the PME data to analyze employment entry and exit rates for children in an attempt to better understand the trends described above.

Our measure of the rate of entry into employment is the number of individuals who move from non-working in month 1 to working in month 2, divided by the number of individuals who were non-working in month 1. The exit rate is defined analogously as the number of individuals who move from working in month 1 to non-working in month 2, divided by the number of individuals who were working in month 1. For 14-year-olds in São Paulo in the early 1980s, the probability that a boy who is not working in month 1 is observed working in month 2 is about 10 percent; the corresponding entry rate for girls is about 5 percent. The probability that a working boy leaves employment by the next month is around 25 percent, with fairly similar estimates for girls' exit rates.

Measurement error is an obvious issue affecting our estimated entry and exit rates. There are a number of measurement issues to consider, some of which could overstate and some of which

could understate the amount of movement in and out of employment. One problem is simply inaccurate reports of children's employment in one or more months, a problem that may be exacerbated by the fact that the reports are provided by adult respondents who may themselves change from month to month. An inaccurate report in one month may produce false transitions in or out of employment across several months. Poterba and Summers (1986) use re-interview surveys to show that reporting errors on employment states in panel data exaggerate the transitions into and out of employment for adults in the United States. Biasing our estimates in the other direction is the fact that we only observe employment in one reference week of each month. Our measures may underestimate movements in and out of the labor force if there are movements in weeks other than the weeks included in the survey. It is not possible to estimate the net effect of these offsetting potential biases. While there is undoubtedly error in the estimates of intermittency, just as there is error in the underlying estimates of employment in any one month, these unique estimates provide a starting point for understanding the dynamics of children's employment patterns. As we will see below, there are strong trends in employment transition rates over time as well as significant differences by age and sex. So while the transition rates may be measured with error, there is clearly a large component that is picking up an important component of child labor.

Duryea, Lam and Levison (2001) describe how entry and exit rates are related to each other and to the percent of the population employed. Two important points are worth emphasizing. The first point is that systematic differences in employment between population groups or changes over time in the level of employment can be linked to differences in entry rates or exit rates. In comparing males and females, for example, we can ask whether the higher employment rates for males result from higher probabilities of entering employment, from lower probabilities of leaving employment, or some combination of the two. The second point is that some differences in entry

rates or exit rates may result simply from differences in the overall level of employment. In general, there will be a tendency to observe higher entry rates and lower exit rates among groups with higher levels of employment, although this tendency may be offset by other factors. For example, adult men ages 30-49 in metropolitan Belo Horizonte, a group with employment rates over 90 percent, had entry rates between about 0.40 and 0.68 in 1982-98. Entry rates for women, who have employment rates closer to 50 percent, were only between 0.15 and 0.40, a result that might be expected given the fact that women on average will be less likely to be on the margin of entering employment.

We document above that child employment rates trended down over the 1980s and 1990s. Here we consider the components of that change. Have entry rates fallen, exit rates increased, or both? Because we observe relatively few entries and exits per city/month/sex/age group, in spite of observing many children, the figures below describing entry and exit rates combine data from all six metropolitan areas covered by the PME. Figure 5 shows that entry rates have trended down throughout the 1980s and 1990s for both 14-year-old boys and girls, in spite of considerable volatility. In the 1980s, the probability that a non-employed boy began working in any given month fluctuated between 6 and 12 percent, roughly; for girls, this probability fluctuated around 5 percent. In the 1990s, boys' and girls' entry rates fall—for the first time, fewer than 5 percent of 14-year-old boys move into employment in some months, and girls' entry rates become consistently below 5 percent. Boys and girls show similar patterns of peaks and troughs in entry rates (although girls' are more muted), implying that they are responding to labor market conditions. For example, the first

trough corresponds roughly with the onset of economic crisis in the early 1980s, suggesting a pro-cyclical pattern of child employment.[10]

Exit rates for 14-year-olds are shown in the bottom panel of Figure 5. It is notable that boys' and girls' exit rates are much more similar to each other than are their entry rates. The probability that an employed child stops being employed in any month is 20-30 percent in the 1980s and increases to roughly 30-40 percent by the late 1990s. Again, a structural shift seems to occur in the early 1990s.

Figure 6 presents entry and exit rates for 16-year-old boys and girls. Entry rates are higher and exit rates lower for 16-year-olds compared to 14-year-olds of the same sex. As was the case for 14-year-olds, entry rates for 16-year-olds are roughly twice as high for boys as for girls in all periods, with substantial declines in entry rates in the 1990s. As for 14-year-olds, the exit rates for boys and girls have very similar levels. The similarity between exit rates for boys and girls means that once employed, boys and girls are equally likely to leave a job (or, more precisely, become non-employed) in any particular month. Duryea, Lam and Levison (2001) show that, under certain assumptions, similar exit rates imply that boys and girls spend approximately the same amount of time at jobs (that is, employment duration is similar). Whatever motivates a move out of employment, the reasons lead to similar patterns for boys and girls. In contrast, the difference in entry rates by sex suggest that there may be different sets of incentives and disincentives for girls and boys to become employed. A higher demand for boys' labor is reflected by their higher wages (e.g., Levison 1991), while girls tend to be assigned household and child care responsibilities that can conflict with paid work. Lower rates of entry into employment imply that girls' time in non-

[10] Using 12 years of the annual household survey for Brazil (the PNAD), Duryea and Arends-Kuenning (2002) demonstrate that employment rates of 14-16 year olds in urban areas increase as local wages increase, after controlling for household income.

labor-force activities (such as school and household work) is more steady, while boys' time in such activities is more intermittent.

Analysis of boys' and girls' entry and exit rates by metropolitan region (not presented here) show that entry rates (by sex) are similar across regions, suggesting some regional patterns in socioeconomic constraints and incentives; exit rates, on the other hand, vary more across regions. Again, one might conclude that labor demand plays an important role in explaining regional differences.

Children's rates of entry into and exit from employment vary with their socioeconomic status. Figure 7 shows entry and exit rates for 14-year-old boys from higher-income and lower-income households, where, as above, we use median per capita household income as the threshold. The top panel shows that entry rates are consistently higher for children in the lower SES group. The lower SES group is up to twice as likely to enter the employment state in many months of the 1980s; this gap narrows significantly in the 1990s. For example, the probability of a lower SES 14-year-old boy entering employment in any given month was about 12 percent in early 1982, compared to about 5 percent for a higher SES boy. Similar patterns hold for 14-year-old girls and 16-year-old boys and girls (not shown), although the previously observed pattern of lower entry rates for girls and 14-year-olds is maintained.

The bottom panel of Figure 7 shows that in contrast to entry rates, exit rates are not clearly differentiated by socioeconomic status. Rates for the higher SES group show more volatility, but this is explained by the smaller number of observations of employed children in this group (since children must be employed in order to exit employment). Thus, poorer children are more likely to begin jobs than are better-off children. Once employed, however, children in the upper SES group

are no more likely to stop being employed than are children in the lower SES group. Both SES groups repeat the overall pattern of a fall in entry rates and an increase in exit rates in the 1990s.

Evidence on Employment Intermittency

The evidence presented above concerning labor force entry and exit rates implies that many boys and girls move in and out of employment. That is, they appear to have low rates of labor force attachment, at least at these young ages. However, it is impossible to discern from the entry and exit rates whether most employed children have similar patterns of intermittent employment, or whether some children are steady, long-term labor force workers while others move in and out very frequently. Our final analysis, summarized in Tables 3 and 4, sheds more light on these and related questions. Recall that our sample for this analysis includes only children for whom we have information for all of the first four (consecutive) months of each interview cycle. We now analyze employment patterns across the four-month time period.

Table 3 includes various kinds of employment rates and employment transition rates for three age groups (10-12, 13-14, 15-16) of children in metropolitan Salvador, São Paulo, and Porto Alegre, in the years 1982-1984. Table 4 includes the same information for the period almost 15 years later, 1996-1998. Rates for boys are presented in the top panel of each table, while those for girls are in the bottom panel. Standard errors for the estimated employment rates are presented in Appendix Tables C and D. The top row in each panel reports the percentage of the sampled children who are "never employed" during the reference week of four consecutive monthly interviews.[11] The great majority of 10-12 year olds fall into this category. Boys in Salvador have the lowest percentage in this category: 86 percent in 1982-84 and 95 percent in 1996-98. All other

[11] Of course, children who are counted as "never employed" by this measure may have been employed before the four-month period in which they were interviewed, or they may have been employed during weeks other than the four reference weeks during the four-month period.

city/sex/age groups are at 91 to 96 percent in the early 1980s, and 97 to 99 percent are never employed in the 4-month period by 1996-98. The big transitions that happen in the teen years are reflected in the lower rates of "never employed" for 13-14 year olds, and the even lower rates for 15-16 year olds. In each case, more girls than boys are "never employed." The estimates in Tables 3 and 4 show large differences between the early 1980s and the late 1990s, and the relevant sample sizes are large enough that such differences are statistically significant. The decline in employment for older children is quite dramatic. For example, 59 percent of the girls 15-16 had not been employed during at least one of four months in São Paulo in 1982-1984; by 1996-1998 this had risen to 76 percent. For 15-16 year-old boys in São Paulo, the percentage of those not employed in the four-month interval rose from 37 to 59 percent.

We argued above that intermittent employment by child workers is an important phenomenon whose existence has been difficult to discern using standard cross-sectional employment surveys. The next rows of each panel in Tables 3 and 4 provide strong evidence supporting this argument. The "average percent employed each month" gives the employment rates that are observed using only the reference week in a given month – as in a standard, cross-sectional, employment survey. The "percent employed at least 1 month" out of the four consecutive months reports the proportion of the observed children who could be considered labor force workers by this broader measure of "employed recently." The difference between these two measures is evidence supporting our argument. For example, although the average monthly employment rate for boys ages 10-12 in Salvador in 1982-1984 is 7 percent, the proportion employed at least one month (or "employed recently") is double that, at 14 percent. The rates are also approximately double for

boys ages 10-12 in the other cities as well as in the later period. [12] For older groups of boys in all periods and cities, the percentage employed recently is 7 to 15 percentage points higher than the traditional monthly employment rate. Girls show a similar pattern of large differences in the proportion employed each month and the proportion employed recently. For example, while the monthly employment rate for girls ages 15-16 in Porto Alegre for the later period is 15 percent, the percentage of girls who were employed at least one of the four months is 23 percent. Overall, this evidence supports the contention that a substantial proportion of young workers are missed by standard cross-sectional employment surveys.

Do these patterns hold when children are differentiated by socioeconomic status? The answer is clearly yes. Both SES groups show levels of recent employment that are substantially higher than their respective monthly employment rates. The levels of recent employment for children in households below the median per capita household income ("low SES") have the highest employment rates reported in Tables 3 and 4. Although employment rates are lower for children from higher-income households, the percent employed in at least one month is often twice as high as the standard monthly employment rate for that group.

The difference between child employment rates based on a reference week and child employment rates based on a longer reference period – and thus capturing part of the phenomenon of frequent transitions in and out of employment – can be summarized by an "intermittency multiplier." If we observe an average monthly employment rate of 10 percent and a "recent employment" rate of 20 percent, the value of the multiplier is two.[13] The intermittency multiplier

[12] As can be seen in Appendix Tables B and C, the standard errors for these estimates are relatively small. For example, the standard error for the estimate of 7.1% employment for boys age 10-12 in Salvador is 0.55%.

[13] We use the term "monthly employment rate" since that is the standard way of reporting employment and unemployment using the PME. Specifically, the measures capture, on the one hand, whether or not the child was reported to have worked in one reference week of one specific month or, on the other hand, whether or not the child was reported to have worked in any of four reference weeks over four consecutive months.

is, thus, the factor by which the monthly employment rate must be multiplied in order to obtain the recent employment rate. Tables 3 and 4 present intermittency multipliers for each age group with a breakdown for low and high SES groups. We see in Table 3 that the intermittency multiplier for boys age 10-12 in Salvador in the 1982-84 period was 2.02, a value that is fairly similar to those for the two separate SES groups. If applied to an estimate of the total number of children working, this multiplier means that an estimate based on a single weekly employment question would need to be multiplied by two to approximate the number of children who worked at some time during the four-month period. For older youth the multiplier is lower, around 1.3 to 1.5 for 15-16 year-olds. This multiplier will be discussed in further detail below.

The last nine rows of each panel in Tables 3 and 4 describe the employment patterns of those 10-12, 13-14, and 15-16 year olds who are employed in the reference week of at least one month of the first four months of each interview cycle ("recently employed"). Since employment is relatively rare, especially among younger children and in the later time period, the number of children analyzed in these rows is occasionally small enough to be problematic, in spite of our very large samples. This is most serious in the case of 10-12 year olds in 1996-1998, where the sample sizes for those observed working are often well below 100.

Among children who are employed, Table 3 shows that even 10-12 year old children who are employed spend a substantial number of hours working, averaging about 30 hours per week when employed. According to Tables 3 and 4, average weekly hours in employment increase steadily with age, up to approximately 40 hours per week for 15-16 year olds. In 1982-1984 girls of all ages worked on average as many or more hours than their male counterparts. Girls' hours exceed those of boys by the greatest margin for 13-14 year olds in Salvador, probably reflecting the

intensity of domestic work by girls employed as maids. By 1996-1998, however, average hours worked by girls and boys are very similar.

The next four rows in each panel of Tables 3 and 4 address the issue of employment intermittency and labor force attachment in greater detail. The repeated interview structure of the survey allows us to measure the nature of employment attachment for those children who have been employed at least once in four months. We report the percentage of child workers who are employed during one month (not necessarily the first month) of the four months in the interview series, those who are employed during any two of the four months (not necessarily consecutive), those who are employed during any three of the four months, and those employed during the reference week in all four months. The four measures add to 100 percent within each city/sex/age/years group.

The percentages of children employed for one, two, three and four months demonstrate some interesting patterns that vary across age groups. The simplest pattern is for 10-12 year olds in Salvador and São Paulo, where there is a reasonably steady pattern of declining percentages employed going from one to four months of employment. In many cases we observe that, conditional on being employed, more children work during either one month or four months than two or three months. Perhaps it takes young people a considerable amount of trial-and-error to find a position that will turn into a steady job.

One obvious question is what proportion of child workers are observed working in all four months, the kind of labor force attachment that would be typical of adult workers. The proportion of children who were employed all four months is always half or fewer of the children observed working during at least one month. For example, 30 percent of ever-employed boys ages 13-14 are employed for all 4 months in Porto Alegre for 1996-1998. While it is has been long established

from cross-sectional data that employment rates increase with age, Tables 3 and 4 demonstrate that employment intermittency generally falls with age, or, conversely, labor force attachment increases with age. For instance, in São Paulo 4 percent of employed girls ages 10-12 work all 4 months in 1996-1998, but 23 percent of 13-14 year olds and 36 percent of 15-16 year olds do so. The levels are different for girls in other cities and for boys, but the general pattern of increasing work attachment with age is observed.[14]

As we already observed in the figures, boys have higher employment rates in all periods, cities and age groups. Tables 3 and 4 show that the percentage employed recently ("employed at least 1 month") is also higher for boys everywhere and at all ages. In general, recently employed boys are more likely to be employed all four months than recently employed girls. There are a few exceptions. In the earlier period, presented in Table 3, ever-employed girls ages 13-14 and 15-16 in Salvador are more likely than ever-employed boys to work all 4 months. In the later period employed girls ages 13-14 in all three cities, as well as 15-16 year old girls in Salvador, are more likely than boys to be employed all four months. This is likely related to the high prevalence of domestic work for girls.

As has been documented by Levison (1991) and Barros et al. (1996), employment rates for older children and percentages of child workers employed for all four months are higher in the cities offering better labor market opportunities – São Paulo and Porto Alegre – than in cities with poorer prospects – Salvador. For example, the monthly employment rate for 15-16 year old boys is

[14] One notable exception is the similarity of work attachment for 13-14 year olds compared with 15-16 year olds in Porto Alegre, especially in the later period. This may be due to the dominance of the shoemaking industry in that metropolitan area. We find that children ever-employed in shoemaking have much more stable employment than children in other industries: for employed 13-14 year olds, 50 percent of boys in shoemaking and 42 percent of girls were employed during all four months in 1996-98, compared to 26 and 31 percent, respectively, for boys and girls working in other industries. Moreover, among employed 13-14 and 15-16 year olds, the proportions with jobs in shoemaking are greater for ages 13-14 than 15-16 (by sex) in both time periods.

15 percent in Salvador compared to approximately 29 and 25 percent in São Paulo and Porto Alegre, respectively, in 1996-1998. The employment rate for girls is also about twice as high in the other cities as in Salvador. For the youngest group of boys, however, monthly employment rates and ever-employed rates are higher in Salvador, suggesting that these boys are pushed into the labor force by poverty.

Overall, the large amount of variation in these measures by city/sex/age group implies that different definitions of "child worker" will be very sensitive to the population studied and to the interval used in defining employment. The longer the period considered for "employed recently," the greater will be the potential discrepancy with the traditional cross-sectional employment rate. The fact that these measures differ so much from the standard measure and from each other when only considering a four month period implies that longer reference periods could result in even more children being counted among those labeled "child workers" (recall bias aside).

The final three rows in each panel of Tables 3 and 4 address transitions in and out of employment. Since we observe four consecutive months, it is possible for any given child to move between being employed and not being employed (or vice versa) up to three times. The statistics presented here tell, for those employed at least one month, what percentage had one, two or three transitions. With the omitted category of zero transitions, these measures sum to 100 percent for each city/sex/age/years group. These transition measures provide perhaps the most convincing evidence of employment intermittency. Although relatively few young workers made three transitions in one four-month period, the majority of 10-14 year olds made one or two transitions. One exception is Porto Alegre where this proportion is as low as 44 percent (13-14 year old boys in 1982-84); in most of the cases, over two-thirds of ever-employed 10-14 year olds made one or two

transitions. Again we see that transitions decline with age, but well over one-third of the ever-employed 15-16 year olds in this analysis made one or two transitions in the four month period.

It would be reasonable to hypothesize that many urban children become employed at the end of the school year, work during the long holidays, and then quit when the next school year begins. Is there a structural reason driving our intermittency results? To address this question, we created a sub-sample including only children whose first four consecutive months of interviews fall entirely within the school year. The sensitivity analysis thus compares results for children interviewed between March and November (inclusive) with results for the previous (full-year) sample. We re-created Tables 3 and 4 for this school-year-only sample but do not present them, because they report very similar results to the original Tables 3 and 4. Changes due to ending or starting a school year explain a very small fraction of observed movements. This is also borne out in a sensitivity analysis of Table 5, discussed below.

Intermittency Multipliers

The intermittency multipliers shown for the separate cities in Tables 3 and 4 demonstrate the large discrepancies that may be observed between a single snapshot estimate of child employment rates and a broader measure that captures short-run movements in and out of employment. Table 5 presents similar intermittency multipliers for the combined six metropolitan areas included in the PME survey. The multipliers are calculated by age, sex, and socioeconomic status for the time periods of 1982-84 and 1996-98. A number of patterns can be seen in Table 5. Consider the top panel of Table 5, calculated using the full-year sample. First, as noted in Tables 3 and 4, the intermittency multipliers decrease with age. This is consistent with all of our evidence showing that intermittency is more important for younger children than for older youths and, presumably, adults. For 10-12 year olds, multipliers are in the neighborhood of 2.0. Second,

multipliers for girls are almost always higher than those for boys. In other words, correcting employment estimates for intermittency will have a bigger effect on estimates for girls than on those for boys. Third, as child employment levels decline over time, the intermittency multipliers increase. All of these patterns are consistent with an underlying negative relationship between standard employment rates and intermittency.

The second panel of Table 5 presents intermittency multipliers calculated for the school-year-only sub-sample. Totals for 1982-84 scarcely differ between the two samples. In 1996-98, the school-year-only sub-sample has slightly lower multipliers than does the full-year sample. As employment becomes a rarer event for children and youth, school transitions may explain more – but still a very small fraction – of transitions in and out of employment.

It might be argued that children who work intermittently differ in some important characteristics from those whose work patterns are stable and not intermittent. In particular, are intermittent child workers just working a few hours, to earn a bit of spending money? We calculated average hours worked in the reference week for children employed for one, two, three, or four months. Children employed during three or four months tended to work more hours per week than those employed during one or two months, but all groups averaged at least 20 hours per week – often closer to 30 hours.

The high levels of intermittency that we estimate for child workers can be better appreciated if placed in the context of comparable estimates for adult workers. The fact that the multipliers drop significantly as we move from 10-12 year-olds to 15-16 year-olds suggests that multipliers for adult workers are likely to be even smaller. Although it is outside the scope of this paper to analyze intermittency of adult workers in detail, exploratory analysis indicates that intermittency over a four-month period is much lower for adults than the estimates we show here for children. For

example, comparable estimates for women aged 25-34 (a group we might expect to have relatively high intermittency) in São Paulo in 1982-84 indicate that 52 percent of women were working in any given month over a four-month period, while 62 percent of women worked at some point over the entire four-month period. This implies an intermittency multiplier of 1.2 – that is, the total number of women working at some point over the four-month period is 20 percent higher than the number observed working in one single month. While this is a difference that is well worth taking into account in studies of women's labor force activity, it is much smaller than the intermittency multipliers of 1.9 and 2.1 that we estimate for 10-12 year-old boys and girls, respectively, in the same period. Estimates for other adult groups and other time periods give a similar picture. While expanding the time period must always lead to higher estimated employment rates, since there is some degree of intermittency among all groups, the levels of intermittency observed for children are much larger than those for adults. While our estimates of child labor can often double when we use a four-month period rather than a single reference week, our estimates of adult employment only increase by 10 percent to 30 percent, even among groups who might be expected to exhibit frequent work transitions.[15]

There must be some relationship between our intermittency multiplier, as we have defined it, and the overall employment rate. For example, if 75 percent of some population group is working, it would obviously be impossible to have an intermittency multiplier of 2.0 for that group. Figure 8 summarizes the relationship between intermittency multipliers and the cross-section estimate of employment. The figure presents a scatter plot of the observed intermittency multipliers in each month against the average employment rate, disaggregated by sex and age

[15] Note that these estimates of labor force transitions for adult women also suggest that the high transition rates for children are not simply the result of imprecisely measured employment rates leading to spurious transitions. The employment rates of all household members are presumably measured with error, but transition rates for children are several times higher than those estimated for adults.

group. In order to give a better idea of where in "multiplier space" our observed multipliers lie, the upper and lower bounds of the multiplier are included in the figure, as well as a simulated multiplier when employment is randomly assigned across children over a four month period. The lower bound of the multiplier is one, corresponding to the case where a given amount of employment is concentrated among as few children as possible. That is, all employed children must be employed in each of four sequential monthly interviews. The lower bound is invariant to the average employment rate.

The upper bound of the multiplier is a function of the average employment rate, and the shape of this function will depend on the length of the panel. Since we observe children for four consecutive months, the multiplier can never be greater than four. This is the case when a given amount of employment in the last four months is spread as evenly as possible across all children, so that no more than a quarter of them are observed to be working in each of the four months. For average employment rates above 25 percent, however, more than a quarter of all children must work in each month, no matter how evenly the work is spread. Thus, the upper bound of the multiplier falls when average employment exceeds this level. In the limit, the upper bound converges to one. For longer panels, the upper bound of the multiplier will increase, and its interpretation will change accordingly.

The series labeled "simulated multiplier" in Figure 8 is the outcome of a simulation where employment is allocated randomly across all children over a four-month period. For example, if there are 100 children observed over four months and the average percent employed during any month is 10 percent, then the simulation randomly assigns 40 ($= 100 \times 4 \times .1$) months of employment across the 400 observed child-months. Figure 8 plots ten replications of the simulation for each one percentage point increment of average employment. At high levels of employment, random

employment yields a multiplier very close to the upper bound, since randomly allocating many months of employment across the population will result in most children employed in at least one month. The variance of the multiplier increases at lower average employment rates since accidental concentration of multiple months of employment among some children causes large changes in the multiplier. Put differently, since the simulation assumes that employment is uncorrelated across months for a given child, random variation will produce some cases where it is possible to spread the work more evenly, especially at lower employment rates. In order for the multiplier to reach the upper bound, employment must be *negatively* correlated across months for a given child.

Not surprisingly, our estimated multipliers fall well below the "random assignment" benchmark, indicating that employment is positively correlated across months. Figure 8 also illustrates that the average employment rate explains much of the variation in the multiplier. The lower average employment rates we observe for girls, younger children, and higher-SES groups are strongly associated with higher intermittency multipliers for those groups. Essentially, lower employment rates leave a greater percentage of the population available for entry into employment in any given month.

Policy makers and activists emphasize the *numbers* of child workers in particular contexts, yet the numbers that experts generate rarely correspond to the concept of "child laborer" being used. Intermittency multipliers provide a simple yet powerful tool for understanding the prevalence and patterns of the phenomenon of child labor. The past few years have seen a proliferation of programs to reduce labor force work among children and youth. Examples include PETI in Brazil and PAI in Costa Rica (Duryea and Morrison, 2002; Legovina and Regalia, 2001; Yap, Sedlacek and Orazem, 2001). However, as governments and international organizations have designed and

expanded these programs, it is likely that they have underestimated the necessary resources, especially for girls and children under 15.

Implications for Estimates of Child Laborers Worldwide: A Counter-factual Exercise

As an illustration of the implications of intermittent employment on the overall estimate of child labor, we use our estimated intermittency multipliers to adjust the ILO's estimate of the number of child workers worldwide in the year 2000. The details of the ILO estimate are provided in ILO (2002). The ILO estimates are based on questions about employment in a reference week in 29 national household surveys. These counter-factual estimates are used to produce estimated numbers of working children by world region, sex, and age group. Since the measure of employment used by the ILO is identical to our one-month measure of employment (that is, it is based on work reported in a single reference week), it is interesting to consider how much larger the number of child workers in the world would be if the estimate had been based on a four-month period (with panel data) and if the relationship between estimates using a single reference week and estimates using a four-month period were the same as we observe in urban Brazil.

Applying our intermittency multipliers for 1982-84 and 1996-98 to the ILO estimates, we produce two of many possible revised counts of the total number of child workers worldwide in 2000. Our primary assumption is that multipliers for metropolitan Brazil are positively correlated with unobserved (and perhaps unobservable) "global" multipliers by age and sex. An additional assumption is necessary because we do not observe 5-9 year olds in the PME. Their employment levels are certainly lower than those of 10-12 year olds, implying greater intermittency. To be conservative, however, we apply the multipliers for 10-14 year olds to the numbers of 5-9 year olds, by sex. Appendix Table D shows the details of our calculations. Since our intermittency multipliers range from 1.7 to almost 2.0, they have a large impact when applied to estimates of

worldwide child labor. These adjusted estimates imply that the worldwide number of child workers age 5-14 would range from 364 to 409 million if work were measured over a four-month period rather than a single reference week. While these estimates are speculative, requiring the strong assumption that the pattern of work intermittency in the rest of the world is similar to that of metropolitan Brazil, we believe the estimates are instructive about the sensitivity of child labor estimates to the period of observation. Similar exercises could be done using many of the ILO's SIMPOC surveys, which include measures of work over a 12-month period in addition to the measure using a single reference week, although recall bias issues would become more severe. Although the SIMPOC data do not permit the kind of detailed analysis of work transitions as we have presented here, our results suggest that the highly intermittent nature of children's work calls for close attention to the impact of reference period on estimates of child labor. Different types of estimates may prove to be useful for different policy and programmatic purposes.

Conclusions

A variety of evidence constructed using panel data from metropolitan Brazil shows that the employment of 10-16 year old boys and girls declined in the 1990s, compared to the 1980s. Both lower rates of entry into employment and higher exit rates from employment are responsible for the decline of the 1990s. Although boys and lower-SES children are employed to a greater extent than girls and higher-SES children, the employment gap by socioeconomic status narrowed in the 1990s. By all appearances, child employment took place among only a small percentage of the metropolitan population by the late 1990s. This documented decline in child employment is convincing, insofar as using the measure of employment which is typically used for adults can accurately reflect children's experiences in employment.

Using longitudinal data, even over a short four-month period, convincingly demonstrates the inadequacy of traditional (adult) employment measures when applied to children. Traditional measures based on a single reference week substantially underreport child employment due to the propensity of young workers to move in and out of the labor force. Measures of employment over four consecutive months show that relatively small proportions of young workers in urban Brazil remain employed for four months. Very high proportions of 10-16 year olds make at least two transitions in and out of employment in a four-month period. This implies relatively short durations of employment spells. Although scholars of child labor are familiar with case study findings that many children work intermittently, this is the first large-scale study to confirm this "stylized fact."

While entry rates are higher for lower-SES children, exit rates do not differ by socioeconomic status, implying that once employed, higher-status children are as likely to continue working as are lower-status children. The pattern is comparable to that for sex: boys' and girls' exit rates are much more similar to each other than are their entry rates.

The confirmation that many children move rapidly in and out of employment does not negate the finding that child employment declined in urban Brazil in the 1980s and 1990s. What the traditional measure of employment tells us is this: on average, in the reference week of any given month or year, a substantially smaller percentage of children were employed in the late 1990s, compared to the early 1980s. (This trend appears to have continued through 2004, as evidenced by ILO (2006) findings for Latin America.) Our additional evidence shows that the percentage of children employed during the reference week of at least one month out of four observed months has also fallen substantially between 1982-84 and 1996-98. For example, about 30 percent of 13-14 year old boys in Salvador, São Paulo, and Porto Alegre were employed at least one month in four in 1982-84. By 1996-98, this number was more than halved to about 13 percent. Employment of 13-

14 year old girls fell even more, from 15-21 percent to about 6 percent employed at least one month in four.

Using employment measures designed for adults has, in this case, correctly indicated that child employment is declining in urban Brazil. Although the direction of the trend is correct, however, the levels indicated by the traditional measure are highly misleading. One-time measures generally fail to identify many children who are, in fact, often found working in the labor force. Moreover, such measures inappropriately emphasize distinctions between employed and non-employed children, who are taken to represent ever-employed and never-employed children. This, then, gets to the heart of the problem: intermittent employment is a crucial characteristic of child work that is generally ignored and, thus, not understood.

Our intermittency multipliers imply that for children age 10-12 in urban Brazil we often observe more than twice as many children working during a four-month period as work in any given reference week. If work intermittency were similar in magnitude for child workers around the world, these estimates imply that there could be 409 million child workers world-wide based on a four-month reference period. In order to estimate the number of children who are "often" or "frequently" workers, intermittency multipliers are needed for many countries and labor markets. There is no universal multiplier. While the patterns observed for the intermittency multipliers in metropolitan Brazil may well be characteristic of child employment, multipliers' levels should vary depending on labor market characteristics and reference periods. There may also be substantial differences by urban or rural residence. This can be predicted by the generally higher employment levels for children in rural areas.[16]

[16] For example, in Brazil in 1999, Kassouf (2001) reports that about three times as many 5-9 year olds worked in rural areas as in urban. For 10-14 year old boys and girls, 1.5 times as many worked in rural areas as in urban areas.

To some extent, we suspect that high then decreasing intermittency should be considered part of the "normal" age pattern whereby youth transition from school, play, and unpaid work into paid, adult-status employment. Some basic skills are acquired after initial labor force entry. For example, young people must learn to show up for work on time, day after day. Some learn this the hard way – by being fired for transgressions. For each new job, there must be a search process, and a learning process about how to identify good jobs, or jobs that are a reasonable fit. Some job acceptances will prove to have been a bad idea. Jobs that are intolerable, for one reason or another, *should* lead to higher quit rates, as youth learn to leave abusive or exploitative situations. While higher intermittency rates may have positive dimensions for young adults, the intermittency rates also imply that more children than generally recognized are supplying work hours – sometimes many hours per week – to the labor market. The priority, especially for younger children, should be consistent school attendance and effort on schooling, not finding a good job match.

The evidence presented here suggests that intermittent work is a fundamental feature of children's work activity, with levels of short-term movement that are much higher than those observed for adults. This level of intermittency means that standard employment measures based on a single reference week miss important dimensions of children's work experience and potentially give a misleading picture about the prevalence of child labor. On the hand, our results suggest that most children who work, especially at younger ages, do not work all of the time, with many who are working in one month having stopped working the next. On the other hand, these same results imply that the total number of children engaged in work is much larger than the amount seen working in any one month. A richer view of this intermittent nature of children's work will lead to better policies and better programs targeted at child labor.

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Table 1: Top ten industries for employed children in 3 metropolitan areas, 1982-84, by age and sex, Brazil, PME

	Salvador		São Paulo		Porto Alegre	
Rank	Industry	Percent	Industry	Percent	Industry	Percent
	Boys, ages 10-14					
1	Street vending	29.5	Undefined	9.5	Shoemaking	22.5
2	Auto repair	11.2	Street vending	6.3	Undefined	13.3
3	Undefined	10.8	Supermarkets	6.0	Food sales	6.0
4	Food sales	8.9	Fairs/Markets	5.4	Street vending	5.6
5	Food service	8.4	Food service	5.0	Supermarkets	5.5
6	Construction	4.1	Construction	4.6	Construction	3.7
7	Non-motorized transportation	4.1	Food sales	4.5	Cattle, livestock	2.8
8	Domestic servant	3.5	Auto repair	4.2	Clothing & shoe repair	2.5
9	Miscellaneous sales	1.3	Clothing & shoe repair	3.1	Editorial and graphics industries	2.3
10	Food production industry	1.3	Miscellaneous sales	2.8	Auto repair	2.2
	(N=3,646)		(N=4,098)		(N=3,398)	
	Boys, ages 15-16					
1	Construction	12.9	Undefined	8.2	Shoemaking	15.0
2	Street vending	11.8	Construction	6.4	Undefined	11.8
3	Auto repair	10.9	Supermarkets	4.8	Supermarkets	9.2
4	Undefined	10.8	Banking and finance	4.3	Construction	8.0
5	Food sales	8.3	Food service	4.0	Food sales	4.1
6	Food service	7.0	Metallurgical industries	3.9	Metallurgical industries	2.6
7	Domestic servant	3.6	Auto repair	3.5	Auto repair	2.5
8	Food production industry	2.2	Food production industry	3.2	Food production industry	2.0
9	Non-motorized transportation	2.0	Transportation manufacturing	2.9	Banking and finance	2.0
10	Fishing	1.6	Food sales	2.9	Miscellaneous sales	1.8
	(N=4,210)		(N=8,763)		(N=6,145)	
	Girls, ages 10-14					
1	Domestic servant	67.6	Domestic servant	45.1	Domestic servant	37.6
2	Undefined	8.3	Undefined	8.1	Shoemaking	32.4
3	Food service	4.9	Clothing industry	7.2	Undefined	7.1
4	Street vending	4.8	Food service	3.9	Food sales	3.5
5	Food sales	3.4	Selling textiles	3.8	Social Assistance	2.3
6	Security guard	1.7	Food sales	2.5	Food service	1.9
7	Tutoring and/or teaching	1.4	Fairs/Markets	2.3	Street vending	1.9
8	Fishing	1.0	Glassmaking	2.2	Cattle, livestock	1.4
9	Personal hygiene services	0.8	Street vending	2.2	Selling textiles	1.2
10	Selling textiles	0.7	Miscellaneous production	2.1	Supermarkets	0.9
	(N=1,816)		(N=2,283)		(N=2,141)	
	Girls, ages 15-16					
1	Domestic servant	64.8	Domestic servant	29.7	Domestic servant	34.1
2	Undefined	8.9	Clothing industry	12.4	Shoemaking	23.9
3	Tutoring and/or teaching	4.6	Undefined	8.2	Undefined	8.5
4	Food service	3.7	Selling textiles	5.8	Supermarkets	3.7
5	Street vending	3.5	Clothing and textile production	2.8	Selling textiles	2.4
6	Security guard	1.8	Miscellaneous production	2.7	Food sales	1.7
7	Food sales	1.5	Food service	2.5	Clothing industry	1.4
8	Personal hygiene services	1.4	Supermarkets	2.3	Food production industry	1.2
9	Selling textiles	1.3	Miscellaneous sales	2.2	Social Assistance	1.2
10	Banking and finance	1.3	Plastics	1.6	Paper	1.0
	(N=2,820)		(N=5,435)		(N=3,685)	

Table 2: Top ten industries for employed children in 3 metropolitan areas, 1996-98, by age and sex, Brazil, PME

	Salvador		São Paulo		Porto Alegre	
Rank	Industry	Percent	Industry	Percent	Industry	Percent
	Boys, ages 10-14					
1	Street vending	19.1	Food service	10.2	Shoemaking	11.5
2	Auto repair	11.0	Food sales	5.8	Food sales	8.8
3	Food service	10.2	Auto repair	5.7	Construction	6.9
4	Food sales	9.4	Construction	5.6	Auto repair	6.9
5	Non-motorized transportation	6.1	Supermarkets	5.3	Street vending	6.8
6	Undefined	5.4	Street vending	5.2	Undefined	5.7
7	Construction	3.6	Bus-/taxi-driving	3.8	Supermarkets	5.3
8	Bus-/taxi-driving	3.5	Production of metals, woods, ceramics	3.0	Food service	4.2
9	Fishing	2.8	Metallurgical industries	2.4	Food production industry	3.8
10	Editorial and graphics industries	2.4	Food production industry	2.3	Furniture production	2.0
	(N=1,238)		(N=1,445)		(N=957)	
	Boys, ages 15-16					
1	Undefined	10.4	Construction	6.7	Shoemaking	12.1
2	Street vending	10.2	Food service	5.9	Construction	8.6
3	Construction	9.9	Auto repair	5.9	Supermarkets	8.3
4	Food service	9.0	Supermarkets	5.2	Undefined	5.7
5	Auto repair	7.3	Food sales	3.7	Auto repair	5.1
6	Food sales	5.6	Metallurgical industries	3.4	Food sales	4.1
7	Food production industry	3.8	Transportation manufacturing	2.8	Food service	4.1
8	Non-motorized transportation	3.2	Food production industry	2.7	Food production industry	3.3
9	Domestic servant	2.3	Office of accounting/auditing/bookkeeping	2.6	Metallurgical industries	2.8
10	Bus-/taxi-driving	2.3	Editorial and graphics industries	2.4	Production of metals, woods, ceramics	2.3
	(N=2,221)		(N=4,737)		(N=3,279)	
	Girls, ages 10-14					
1	Domestic servant	54.5	Domestic servant	22.5	Domestic servant	31.3
2	Food service	14.2	Food service	10.3	Shoemaking	14.2
3	Street vending	8.2	Food sales	6.2	Social Assistance	7.7
4	Fishing	3.9	Clothing industry	4.3	Food service	7.2
5	Food sales	3.5	Supermarkets	3.9	Food sales	6.8
6	Selling textiles	3.3	Miscellaneous sales	3.6	Food production industry	3.4
7	Tutoring and/or teaching	2.5	Street vending	3.5	Supermarkets	2.6
8	Food production industry	1.0	Entertainment services	3.4	Street vending	2.5
9	Clothing industry	0.8	Office of lawyers, judges, or prosecutors	2.6	Selling textiles	2.3
10	Personal hygiene services	0.6	Food production industry	2.5	Miscellaneous sales	1.9
	(N=514)		(N=773)		(N=530)	
	Girls, ages 15-16					
1	Domestic servant	54.9	Domestic servant	19.7	Domestic servant	27.3
2	Food service	10.0	Food service	10.3	Shoemaking	13.5
3	Food sales	3.2	Selling textiles	7.2	Food service	6.1
4	Selling textiles	2.8	Miscellaneous sales	3.9	Selling textiles	3.8
5	Street vending	2.6	Tutoring and/or teaching	3.5	Food production industry	3.4
6	Supermarkets	2.5	Office of lawyers, judges, or prosecutors	2.7	Supermarkets	3.2
7	Tutoring and/or teaching	2.1	Clothing industry	2.6	Food sales	3.2
8	Social Assistance	2.1	Office of accounting/auditing/bookkeeping	2.3	Social Assistance	2.6
9	Fishing	1.9	Food production industry	2.3	Street vending	1.7
10	Personal hygiene services	1.6	Food sales	2.2	Personal hygiene services	1.7
	(N=1,216)		(N=2,594)		(N=1,727)	

Table 3. Employment rates and employment transition rates for 10-12, 13-14, and 15-16 year old boys and girls in metropolitan Salvador, São Paulo and Porto Alegre, 1982-84, Brazil PME

	Salvador			Sao Paulo			Porto Alegre		
Boys 1982-84	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**
Percent employed 0 months	85.6	68.0	51.6	92.0	69.9	36.8	91.6	71.1	38.5
Average Percent employed each month	7.1	18.4	32.5	4.2	18.4	49.7	4.7	20.8	48.1
Low SES[1]	9.2	22.1	38.4	4.9	21.2	52.9	6.4	23.7	52.4
High SES[1]	3.2	10.7	21.3	2.1	10.7	40.6	1.7	14.6	38.4
Percent employed at least 1 month	14.4	32.0	48.4	8.0	30.1	63.2	8.4	28.9	61.5
Low SES[1]	18.4	38.0	57.4	9.7	34.3	68.0	11.2	33.0	67.4
High SES[1]	7.0	20.1	31.8	3.6	18.3	49.9	3.6	19.8	48.8
Intermittency Multiplier[2]	2.02	1.74	1.49	1.93	1.63	1.27	1.78	1.39	1.28
Low SES[1]	2.01	1.71	1.50	1.97	1.62	1.28	1.74	1.40	1.29
High SES[1]	2.19	1.88	1.49	1.70	1.71	1.23	2.05	1.35	1.27
Sample size	2,763	1,740	1,794	4,311	2,801	2,796	2,935	2,029	1,951
Low SES[1]	1,763	1,125	1,135	3,117	2,062	2,032	1,870	1,384	1,307
High SES[1]	991	602	635	1,183	734	755	1,058	640	631
For those working at least 1 month:									
Sample size	397	557	869	347	842	1,767	248	587	1,200
Average hours worked per week[3]	29.3	32.1	36.4	30.4	37.8	42.7	31.5	37.4	41.1
Percent employed 1 month	48.4	36.3	23.5	43.5	32.3	13.6	37.1	20.3	14.1
Percent employed 2 months	20.9	21.0	18.5	22.2	19.8	13.9	24.6	17.4	15.5
Percent employed 3 months	15.4	19.6	23.9	17.3	18.5	16.8	15.3	16.2	14.3
Percent employed 4 months	15.4	23.2	34.1	17.0	29.3	55.7	23.0	46.2	56.2
Percent with 1 transition	40.6	38.2	33.5	41.8	36.5	22.8	39.5	27.3	24.3
Percent with 2 transitions	35.0	28.2	23.4	26.8	22.4	14.8	25.8	17.2	11.6
Percent with 3 transitions	4.0	5.4	4.5	5.5	4.5	1.9	4.0	2.9	2.4
Girls 1982-84									
Percent employed 0 months	94.6	84.6	71.7	96.0	83.0	58.7	95.0	79.2	63.4
Average Percent employed each month	2.4	9.1	19.0	1.9	10.0	29.9	2.6	14.2	26.7
Low SES[1]	2.2	7.5	16.0	2.2	11.5	33.9	3.3	16.9	30.6
High SES[1]	1.2	3.3	9.7	0.7	4.3	17.0	1.4	7.7	15.0
Percent employed at least 1 month	5.4	15.4	28.3	4.0	17.0	41.3	5.0	20.8	36.6
Low SES[1]	5.6	15.4	27.3	4.8	19.8	46.9	6.2	24.5	42.2
High SES[1]	3.3	6.6	17.4	1.5	7.6	24.9	2.9	12.6	21.2
Intermittency Multiplier[2]	2.23	1.70	1.49	2.11	1.70	1.38	1.92	1.47	1.37
Low SES[1]	2.54	2.04	1.70	2.15	1.73	1.38	1.89	1.45	1.38
High SES[1]	2.75	2.02	1.80	2.19	1.76	1.46	2.11	1.64	1.41
Sample size	2,724	1,836	1,828	4,207	2,796	2,741	2,815	1,818	1,867
Low SES[1]	1,607	1,113	1,010	3,046	2,049	1,939	1,796	1,186	1,206
High SES[1]	1,045	623	631	1,145	722	707	1,013	613	567
For those working at least 1 month:									
Sample size	147	282	518	167	474	1,132	142	378	683
Average hours worked per week[3]	33.0	42.4	41.5	32.7	40.9	43.2	33.0	41.7	42.9
Percent employed 1 month	59.2	34.8	28.8	50.3	37.1	21.3	42.3	25.9	22.1
Percent employed 2 months	16.3	22.7	15.8	24.0	18.1	15.9	24.6	17.5	12.9
Percent employed 3 months	10.2	14.5	13.5	12.0	17.1	15.1	15.5	15.1	16.3
Percent employed 4 months	14.3	28.0	41.9	13.8	27.6	47.7	17.6	41.5	48.8
Percent with 1 transition	42.9	31.2	26.6	43.1	34.6	29.1	39.4	31.5	30.5
Percent with 2 transitions	38.1	32.6	22.6	34.7	28.5	14.9	28.2	17.5	14.5
Percent with 3 transitions	0.7	2.5	3.7	2.4	3.4	2.9	5.6	2.9	1.9

[1] Low SES refers to children who live in households with below-median adult household income; high SES refers to children living households with above-median adult household income.

[2] Intermittency Multiplier = Percent employed at least 1 month / Average percent employed each month

[3] Average hours worked excludes weeks for which the child did not work. A few cases reported being employed in a month while working zero hours. These were excluded from average hours worked, but not from the percent employed.

Table 4. Employment rates and employment transition rates for 10-12, 13-14, and 15-16 year old boys and girls in metropolitan Salvador, São Paulo and Porto Alegre, 1996-98, Brazil PME

	Salvador			Sao Paulo			Porto Alegre		
Boys 1996-98	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**
Percent employed 0 months	94.8	86.7	69.9	97.1	86.8	59.1	98.6	87.6	63.8
Average Percent employed each month	2.1	5.5	15.2	1.3	7.3	29.1	0.6	7.5	25.0
Low SES[1]	2.3	6.5	17.0	1.6	8.2	29.9	0.6	9.1	28.6
High SES[1]	1.5	3.3	11.2	1.1	6.1	28.0	0.7	5.5	19.7
Percent employed at least 1 month	5.2	13.3	30.1	2.9	13.2	40.9	1.4	12.4	36.2
Low SES[1]	6.1	15.4	33.6	3.6	14.8	43.5	1.3	15.3	41.3
High SES[1]	3.6	8.8	22.5	2.0	11.1	37.6	1.6	8.7	28.7
Intermittency Multiplier[2]	2.53	2.44	1.98	2.14	1.81	1.41	2.16	1.65	1.45
Low SES[1]	2.59	2.38	1.97	2.30	1.80	1.46	2.06	1.68	1.44
High SES[1]	2.35	2.70	2.02	1.87	1.82	1.34	2.29	1.60	1.46
Sample size	2,376	1,756	1,817	3,143	2,241	2,337	2,351	1,668	1,735
Low SES[1]	1,551	1,186	1,225	1,683	1,241	1,302	1,334	922	1,011
High SES[1]	825	566	587	1,454	998	1,027	1,013	745	715
For those working at least 1 month:									
Sample size	124	234	547	90	295	956	33	206	628
Average hours worked per week[3]	29.9	32.1	34.9	30.4	35.5	39.0	35.3	34.5	37.7
Percent employed 1 month	60.5	58.1	41.5	52.2	37.3	23.4	57.6	31.6	24.4
Percent employed 2 months	25.8	24.4	26.9	22.2	25.4	14.0	12.1	23.8	17.4
Percent employed 3 months	8.9	12.8	19.6	12.2	15.9	17.3	18.2	15.5	15.6
Percent employed 4 months	4.8	4.7	12.1	13.3	21.4	45.3	12.1	29.1	42.7
Percent with 1 transition	37.1	45.7	41.7	50.0	40.7	29.7	36.4	35.9	30.6
Percent with 2 transitions	42.7	37.2	32.5	25.6	26.1	18.9	48.5	24.3	18.2
Percent with 3 transitions	9.7	7.7	6.9	5.6	4.1	1.9	0.0	4.9	2.7
Girls 1996-98									
Percent employed 0 months	97.9	94.3	84.8	98.5	93.1	75.9	98.9	94.3	76.9
Average Percent employed each month	0.7	2.4	7.2	0.6	3.7	15.8	0.5	3.2	15.6
Low SES[1]	0.8	2.5	6.8	0.7	4.7	16.3	0.7	4.2	16.1
High SES[1]	0.4	1.2	4.1	0.5	2.4	14.1	0.3	1.9	13.5
Percent employed at least 1 month	2.1	5.7	15.2	1.5	6.9	24.1	1.1	5.7	23.1
Low SES[1]	2.4	6.4	15.4	1.6	8.6	25.1	1.4	7.2	24.0
High SES[1]	1.5	3.3	10.4	1.3	4.9	21.4	0.7	3.6	20.1
Intermittency Multiplier[2]	3.00	2.43	2.10	2.45	1.87	1.52	2.17	1.75	1.48
Low SES[1]	2.86	2.58	2.26	2.40	1.82	1.54	2.17	1.71	1.49
High SES[1]	3.69	2.67	2.57	2.48	2.02	1.51	2.15	1.93	1.50
Sample size	2,288	1,712	1,942	3,046	2,277	2,270	2,283	1,640	1,626
Low SES[1]	1,478	1,135	1,299	1,699	1,236	1,209	1,318	920	926
High SES[1]	793	553	585	1,343	1,034	1,021	961	716	656
For those working at least 1 month:									
Sample size	48	98	295	46	158	546	26	93	375
Average hours worked per week[3]	28.9	35.0	36.0	27.1	34.5	36.4	29.3	33.7	35.9
Percent employed 1 month	75.0	61.2	52.2	60.9	45.6	27.7	50.0	48.4	25.1
Percent employed 2 months	16.7	22.4	18.6	19.6	17.7	17.9	23.1	7.5	18.9
Percent employed 3 months	8.3	7.1	15.3	15.2	13.9	18.3	19.2	11.8	16.0
Percent employed 4 months	0.0	9.2	13.9	4.3	22.8	36.1	7.7	32.3	40.0
Percent with 1 transition	60.4	39.8	39.3	54.3	49.4	35.5	42.3	33.3	35.2
Percent with 2 transitions	37.5	41.8	36.6	32.6	18.4	22.0	34.6	28.0	17.9
Percent with 3 transitions	0.0	8.2	5.4	4.3	2.5	1.8	11.5	1.1	0.8

[1,2,3] See notes to Table 3.

Table 5. Intermittency multipliers for 10-12, 13-14, and 15-16 year old boys and girls in 6 metropolitan areas, 1982-84 and 1996-98, Brazil PME

	10-12		13-14		15-16	
	Girls	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**
Using all four-month periods:						
1982-84	**2.05**	**1.97**	**1.65**	**1.63**	**1.43**	**1.35**
Low SES[1]	2.09	1.97	1.69	1.62	1.45	1.36
High SES[1]	2.21	1.95	1.77	1.68	1.52	1.31
1996-98	**2.37**	**2.20**	**1.96**	**1.85**	**1.58**	**1.49**
Low SES[1]	2.39	2.31	1.94	1.83	1.59	1.51
High SES[1]	2.37	2.04	2.08	1.87	1.60	1.45
Using only four-month periods between March and November:						
1982-84	**2.04**	**1.95**	**1.61**	**1.62**	**1.43**	**1.35**
Low SES[1]	2.11	1.96	1.65	1.61	1.46	1.36
High SES[1]	2.05	1.93	1.72	1.72	1.48	1.29
1996-98	**2.21**	**2.12**	**1.88**	**1.78**	**1.57**	**1.47**
Low SES[1]	2.23	2.22	1.90	1.77	1.57	1.49
High SES[1]	2.19	1.93	1.89	1.79	1.61	1.43

[1] Low SES refers to children who live in households with below-median adult household income; high SES refers to children living households with above-median adult household income.

Table A. Evidence on attrition in Brazil PME - Sample means for 10-16 year-old boys and girls present in month 1 and present in months 1-4 of PME, 1982-1999

Variable	*Children observed in month 1 (1)*	*Children observed in months 1-4 (2)*
Boys:		
Age of child in month 1	12.97	12.98
Child enrolled in school in month 1	88.3%	89.2%
Child working in month 1	14.7%	14.4%
Years of schooling for child	3.97	4.01
Fraction whose mothers have 4+ years of education in month 1	63.5%	63.5%
Sample size	239,586	199,033
Percent of all those seen in month 1	100%	83.1%
Girls:		
Age of child in month 1	13.01	13.00
Child enrolled in school in month 1	88.0%	89.4%
Child working in month 1	8.2%	7.6%
Years of schooling for child	4.37	4.42
Fraction whose mothers have 4+ years of education in month 1	64.3%	63.9%
Sample size	239,340	196,683
Percent of all those seen in month 1	100%	82.2%

Appendix Table B. Standard Errors Corresponding to Percentages in Table 3[1]

	Salvador			Sao Paulo			Porto Alegre		
Boys 1982-84	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**
Percent employed 0 months	0.67%	1.12%	1.18%	0.41%	0.87%	0.91%	0.51%	1.01%	1.10%
Average Percent employed each month[2]	0.55%	1.15%	1.52%	0.35%	0.93%	1.40%	0.46%	1.17%	1.64%
Low SES[2]	0.69%	1.45%	1.90%	0.40%	1.09%	1.64%	0.58%	1.41%	2.00%
High SES[2]	0.82%	1.83%	2.55%	0.74%	1.75%	2.70%	0.67%	2.13%	2.89%
Percent employed at least 1 month	0.67%	1.12%	1.18%	0.41%	0.87%	0.91%	0.51%	1.01%	1.10%
Low SES[2]	0.74%	1.16%	1.17%	0.45%	0.90%	0.88%	0.58%	1.04%	1.06%
High SES[2]	0.48%	0.96%	1.10%	0.29%	0.73%	0.95%	0.34%	0.89%	1.13%
Percent employed 1 month	2.51%	2.04%	1.44%	2.66%	1.61%	0.82%	3.07%	1.66%	1.00%
Percent employed 2 months	2.04%	1.73%	1.32%	2.23%	1.37%	0.82%	2.73%	1.56%	1.04%
Percent employed 3 months	1.81%	1.68%	1.45%	2.03%	1.34%	0.89%	2.29%	1.52%	1.01%
Percent employed 4 months	1.81%	1.79%	1.61%	2.02%	1.57%	1.18%	2.67%	2.06%	1.43%
Percent with 1 transition	2.46%	2.06%	1.60%	2.65%	1.66%	1.00%	3.10%	1.84%	1.24%
Percent with 2 transitions	2.39%	1.91%	1.44%	2.38%	1.44%	0.85%	2.78%	1.56%	0.92%
Percent with 3 transitions	0.99%	0.96%	0.70%	1.22%	0.72%	0.33%	1.25%	0.69%	0.44%
Girls 1982-84									
Percent employed 0 months	0.43%	0.84%	1.05%	0.30%	0.71%	0.94%	0.41%	0.95%	1.11%
Average Percent employed each month2	0.31%	0.81%	1.17%	0.22%	0.69%	1.17%	0.34%	1.03%	1.36%
Low SES[2]	0.25%	0.67%	1.08%	0.22%	0.68%	1.17%	0.34%	1.04%	1.35%
High SES[2]	0.22%	0.65%	1.04%	0.20%	0.67%	1.14%	0.31%	0.95%	1.35%
Percent employed at least 1 month	0.43%	0.84%	1.05%	0.30%	0.71%	0.94%	0.41%	0.95%	1.11%
Low SES[2]	0.57%	1.08%	1.40%	0.39%	0.88%	1.13%	0.57%	1.25%	1.42%
High SES[2]	0.56%	0.99%	1.51%	0.36%	0.99%	1.63%	0.52%	1.34%	1.72%
Percent employed 1 month	4.05%	2.84%	1.99%	3.87%	2.22%	1.22%	4.15%	2.25%	1.59%
Percent employed 2 months	3.05%	2.49%	1.60%	3.30%	1.77%	1.09%	3.62%	1.95%	1.28%
Percent employed 3 months	2.50%	2.10%	1.50%	2.51%	1.73%	1.06%	3.04%	1.84%	1.41%
Percent employed 4 months	2.89%	2.67%	2.17%	2.67%	2.05%	1.48%	3.20%	2.53%	1.91%
Percent with 1 transition	4.08%	2.76%	1.94%	3.83%	2.18%	1.35%	4.10%	2.39%	1.76%
Percent with 2 transitions	4.01%	2.79%	1.84%	3.68%	2.07%	1.06%	3.77%	1.95%	1.35%
Percent with 3 transitions	0.68%	0.93%	0.83%	1.18%	0.83%	0.50%	1.93%	0.86%	0.52%

[1] This table presents standard errrors corresponding to the percentages in Table 3. The standard error for a given percentage $100p$ is calculated as sqrt{$p*(1-p)/N$}, where N is the sample size. The "Average Percent Employed Each Month" in Table 3 is calculated as .25*(Percent Employed 1 month) +.5*(Percent Employed 2 months) + .75*(Percent Employed 3 months) + Percent Employed 4 months. Accordingly, the standard errors for this average are calculated as sqrt{$.25^2$*Var(Percent Employed 1 month) + $.5^2$*Var(Percent Employed 2 months) + $.75^2$*Var(Percent Employed 3 months) + Var(Percent Employed 4 months).

[2] Low SES refers to children who live in households with below-median adult household income; high SES refers to children living households with above-median adult household income.

Appendix Table C. Standard Errors Corresponding to Percentages in Table 4[1]

	Salvador			Sao Paulo			Porto Alegre		
Boys 1982-84	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**	**10-12**	**13-14**	**15-16**
Percent employed 0 months	0.46%	0.81%	1.08%	0.30%	0.71%	1.02%	0.24%	0.81%	1.15%
Average Percent employed each month	0.26%	0.51%	0.96%	0.22%	0.64%	1.26%	0.18%	0.78%	1.37%
Low SES[2]	0.29%	0.64%	1.16%	0.27%	0.87%	1.66%	0.25%	1.04%	1.80%
High SES[2]	0.53%	0.76%	1.68%	0.37%	0.95%	1.93%	0.24%	1.18%	2.11%
Percent employed at least 1 month	0.46%	0.81%	1.08%	0.30%	0.71%	1.02%	0.24%	0.81%	1.15%
Low SES[2]	0.49%	0.86%	1.11%	0.33%	0.75%	1.03%	0.23%	0.88%	1.18%
High SES[2]	0.38%	0.68%	0.98%	0.25%	0.66%	1.00%	0.26%	0.69%	1.09%
Percent employed 1 month	4.39%	3.23%	2.11%	5.27%	2.82%	1.37%	8.60%	3.24%	1.71%
Percent employed 2 months	3.93%	2.81%	1.90%	4.38%	2.54%	1.12%	5.68%	2.97%	1.51%
Percent employed 3 months	2.55%	2.19%	1.70%	3.45%	2.13%	1.22%	6.71%	2.52%	1.45%
Percent employed 4 months	1.93%	1.38%	1.39%	3.58%	2.39%	1.61%	5.68%	3.17%	1.97%
Percent with 1 transition	4.34%	3.26%	2.11%	5.27%	2.86%	1.48%	8.37%	3.34%	1.84%
Percent with 2 transitions	4.44%	3.16%	2.00%	4.60%	2.56%	1.27%	8.70%	2.99%	1.54%
Percent with 3 transitions	2.66%	1.74%	1.09%	2.41%	1.15%	0.44%	0.00%	1.50%	0.65%
Girls 1982-84									
Percent employed 0 months	0.30%	0.56%	0.81%	0.22%	0.53%	0.90%	0.22%	0.57%	1.04%
Average Percent employed each month	0.10%	0.36%	0.65%	0.13%	0.46%	0.97%	0.15%	0.51%	1.14%
Low SES[2]	0.10%	0.32%	0.58%	0.13%	0.47%	0.96%	0.15%	0.52%	1.14%
High SES[2]	0.04%	0.22%	0.52%	0.13%	0.43%	0.98%	0.13%	0.47%	1.14%
Percent employed at least 1 month	0.30%	0.56%	0.81%	0.22%	0.53%	0.90%	0.22%	0.57%	1.04%
Low SES[2]	0.40%	0.73%	1.00%	0.30%	0.80%	1.25%	0.33%	0.85%	1.40%
High SES[2]	0.43%	0.75%	1.26%	0.31%	0.67%	1.28%	0.27%	0.70%	1.57%
Percent employed 1 month	6.25%	4.92%	2.91%	7.20%	3.96%	1.91%	9.81%	5.18%	2.24%
Percent employed 2 months	5.38%	4.21%	2.27%	5.85%	3.04%	1.64%	8.26%	2.74%	2.02%
Percent employed 3 months	3.99%	2.60%	2.09%	5.30%	2.75%	1.66%	7.73%	3.35%	1.89%
Percent employed 4 months	0.00%	2.92%	2.01%	3.01%	3.34%	2.06%	5.23%	4.85%	2.53%
Percent with 1 transition	7.06%	4.94%	2.84%	7.34%	3.98%	2.05%	9.69%	4.89%	2.47%
Percent with 2 transitions	6.99%	4.98%	2.80%	6.91%	3.08%	1.77%	9.33%	4.65%	1.98%
Percent with 3 transitions	0.00%	2.77%	1.32%	3.01%	1.25%	0.57%	6.27%	1.07%	0.46%

[1] This table presents standard errrors corresponding to the percentages in Table 3. The standard error for a given percentage $100p$ is calculated as sqrt{$p*(1-p)/N$}, where N is the sample size. The "Average Percent Employed Each Month" in Table 3 is calculated as .25*(Percent Employed 1 month) +.5*(Percent Employed 2 months) + .75*(Percent Employed 3 months) + Percent Employed 4 months. Accordingly, the standard errors for this average are calculated as sqrt{$.25^2$*Var(Percent Employed 1 month) + $.5^2$*Var(Percent Employed 2 months) + $.75^2$*Var(Percent Employed 3 months) + Var(Percent Employed 4 months).

[2] Low SES refers to children who live in households with below-median adult household income; high SES refers to children living households with above-median adult household income.

Appendix Table D. Adjusted child workers world-wide, boys and girls ages 5-14

Age/Sex Group	ILO estimate of children at work[1] (thousands)	Intermittency multipliers from metropolitan Brazil[2] 1982-84	1996-98	Intermittency-adjusted estimates of children at work (thousands)	
Boys 5-9	38,100	1.71	1.90	65,269	72,432
Boys 10-14	70,900	1.71	1.90	121,459	134,787
Girls 5-9	35,000	1.74	1.98	60,877	69,441
Girls 10-14	66,800	1.74	1.98	116,187	132,534
Total 5-9	73,100			126,146	141,873
Total 10-14	137,700			237,646	267,321
Total 5-14	210,800			363,792	409,194

[1] ILO (2002), Table 1, page 17.

[2] The 10-14 multiplier was applied to the 5-9 age group, since we do not observe 5-9 year olds in the PME. This is a conservative estimate of the multiplier since intermittency decreases with age.

Figure 1. Percent of 14 year old boys and girls who are only in school, only employed, doing both, or doing neither, 6 metropolitan areas, 1982-99, Brazil PME

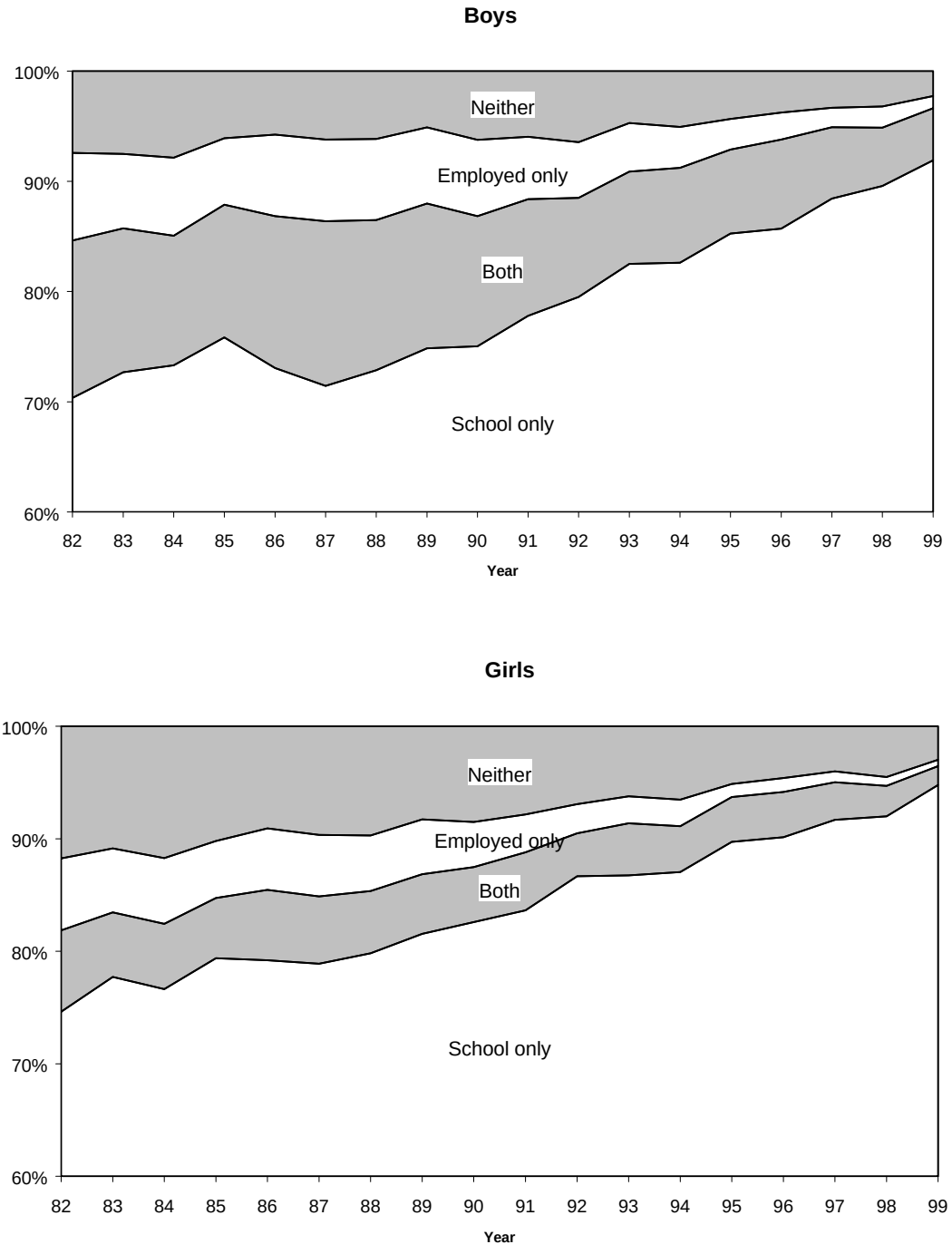

Figure 2. Proportion of 14 year old boys and girls employed in metropolitan Salvador, São Paulo, and Porto Alegre, and 6 metropolitan areas combined, 3-month moving averages, 1982-99, Brazil PME

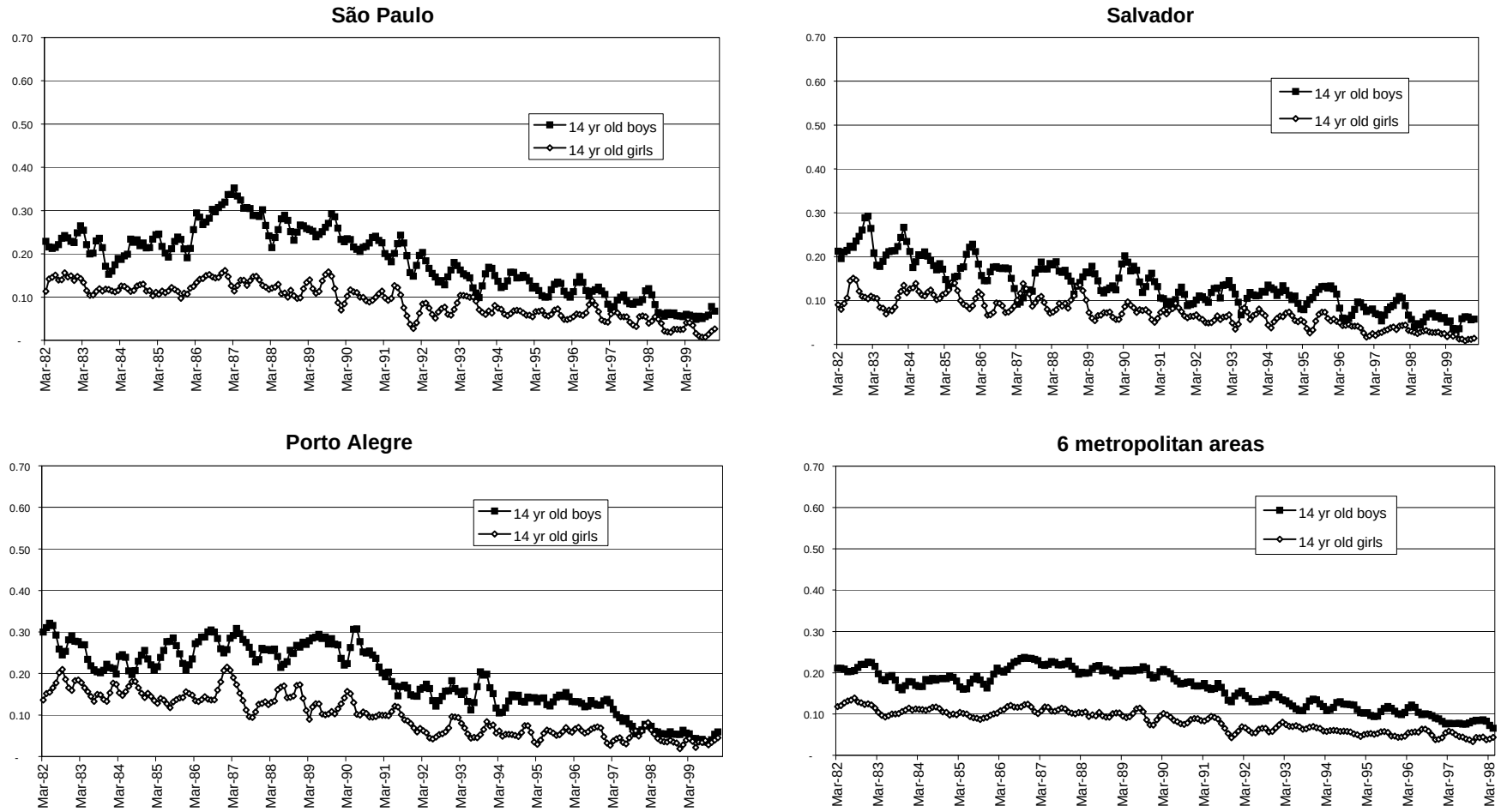

Figure 3. Proportion of 16 year old boys and girls employed in metropolitan Salvador, São Paulo, and Porto Alegre, and 6 metropolitan areas combined, 3-month moving averages, 1982-99, Brazil, PME

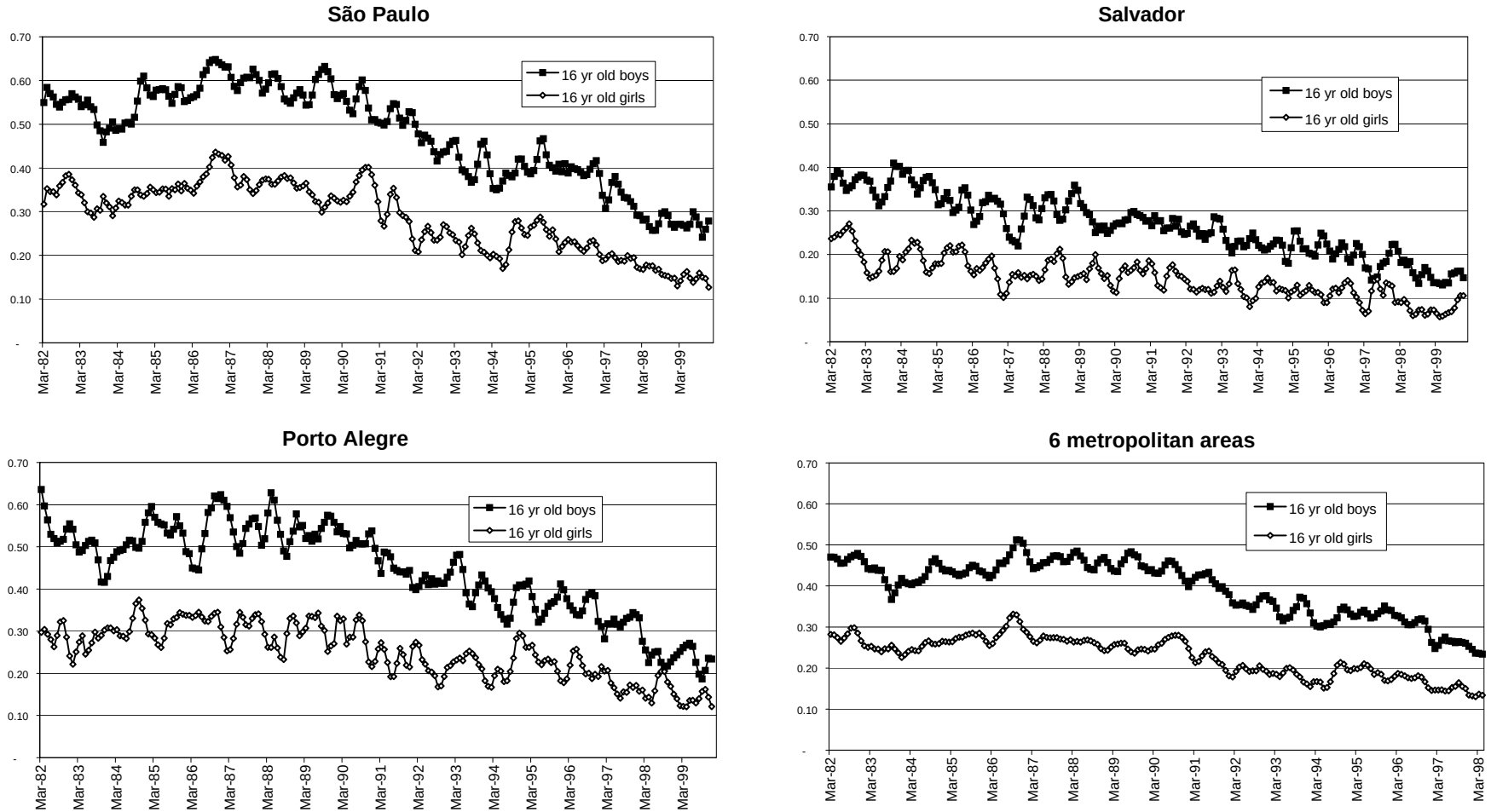

Figure 4. Proportion of 14 year olds employed, by household income, 6 metropolitan areas, 1982-99, 3-month moving averages, Brazil PME

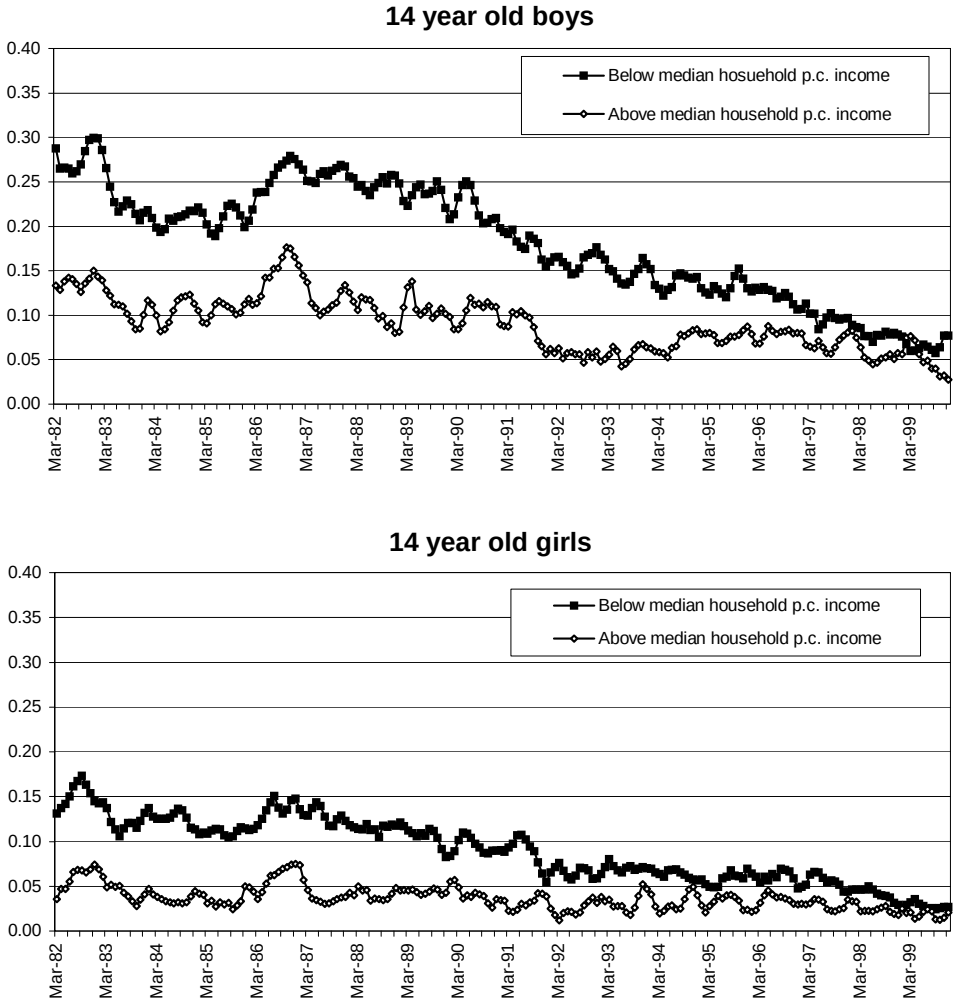

Figure 5. Rates of entry into and exit from employment, 14 year old boys and girls, 6 metropolitan areas, 1982-99, 3-month moving averages, Brazil PME

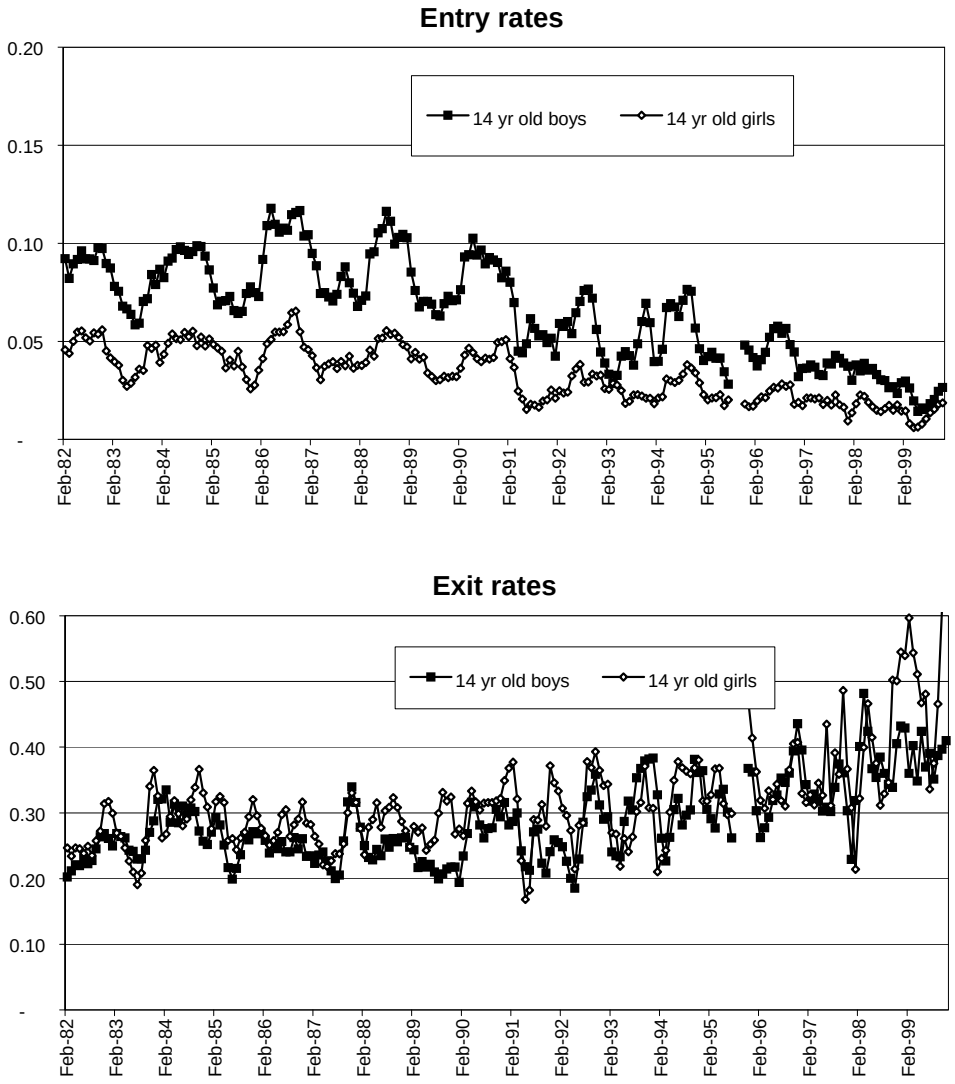

Figure 6. Rates of entry into and exit from employment, 16 year old boys and girls, 6 metropolitan areas, 1982-99, 3-month moving averages, Brazil PME

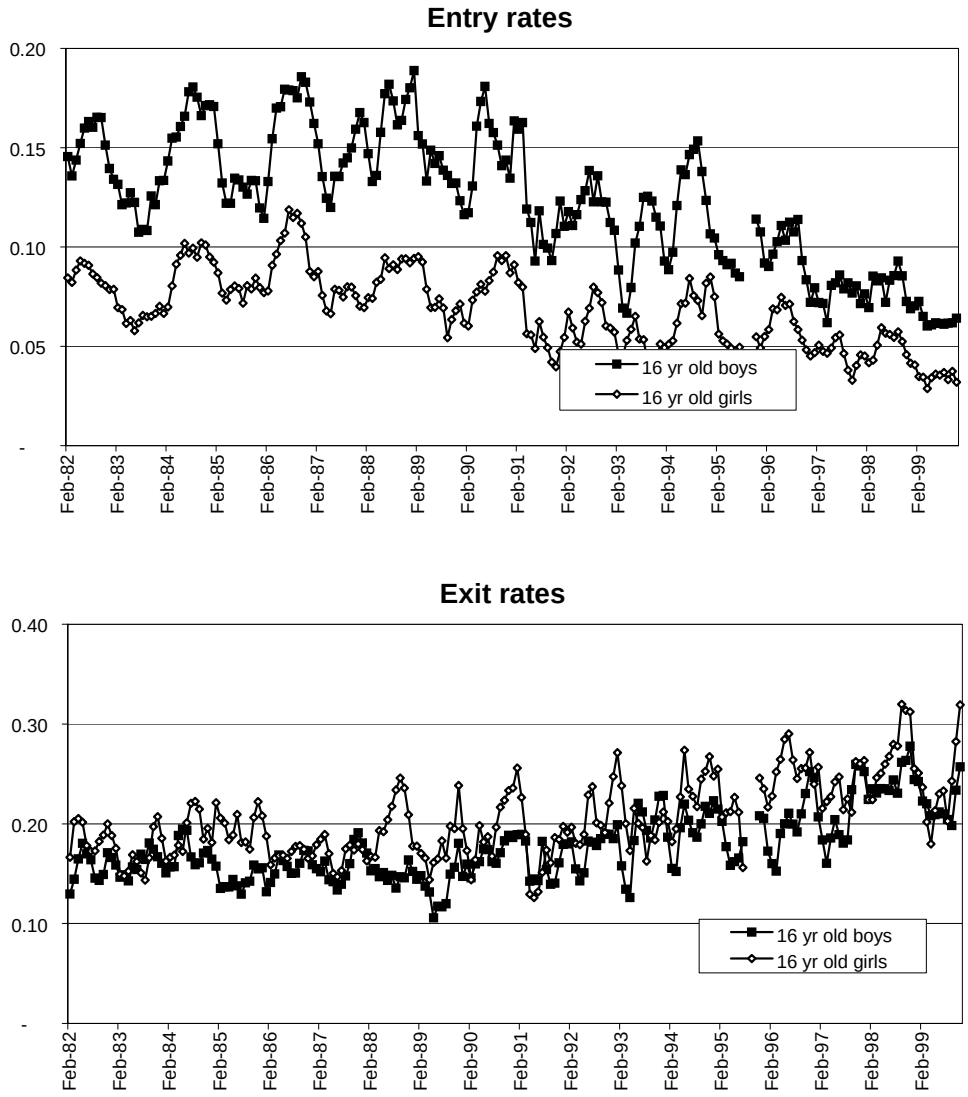

Figure 7. Rates of entry into and exit from employment, 14 year old boys, by household income, 6 metropolitan areas, 1982-99, 3-month moving averages, Brazil PME

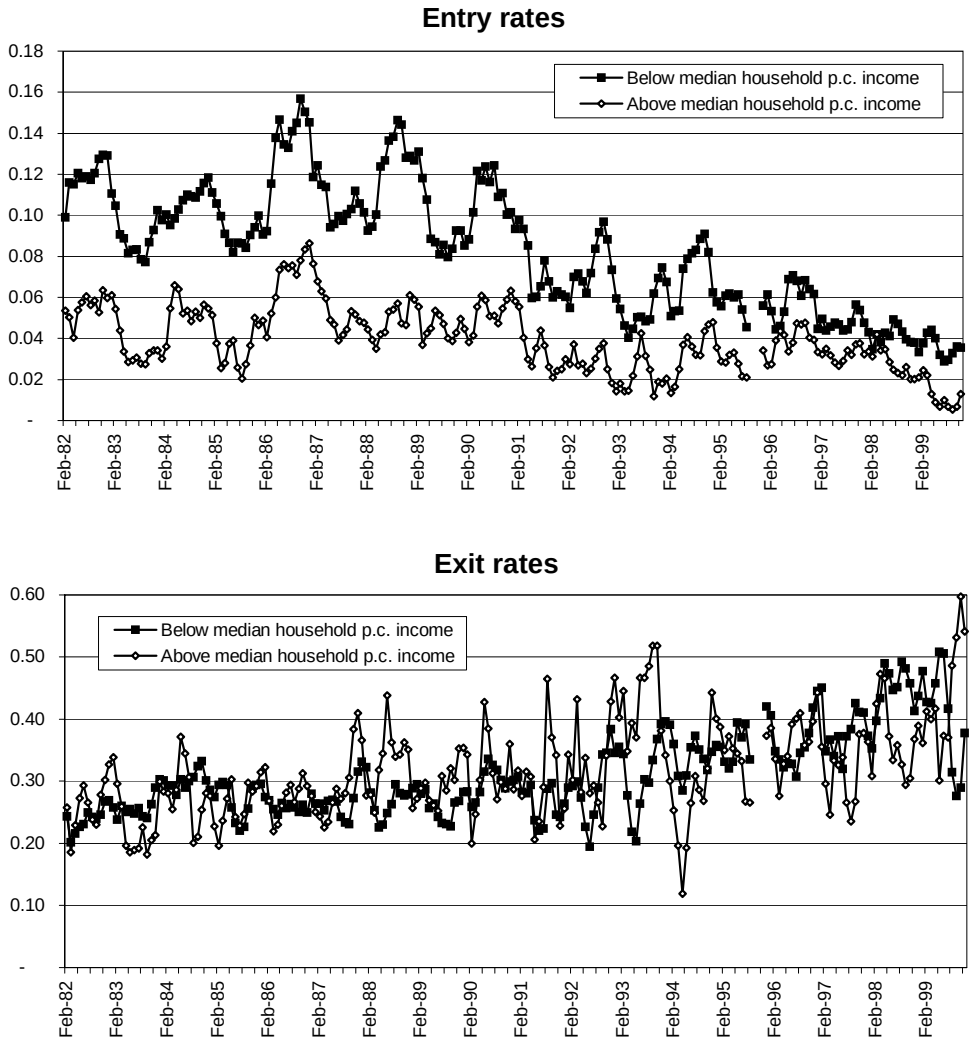

Figure 8. Simulated intermittency multipliers when employment is random, and observed multipliers for 10-12, 13-14, and 15-16 year old boys and girls, plotted against average percent employed, 1982-99, Brazil, PME