

# Labor Demand Study: Final Report

## Research on Children Working in the Carpet Industry in India, Nepal and Pakistan

May 2012 | Final Report

### Submitted to:

United States Department of Labor  
Office of Child Labor, Forced Labor,  
and Human Trafficking  
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Subject: IL-16565-07-75-K

Dear Angie:

Enclosed please find the final report for the Labor Demand (LD) Study. The Labor Demand Study was one component of ICF Macro's "Research on Children Working in the Carpet Industry of India, Nepal and Pakistan" project.

Attached to this report is a copy of the comments ICF received from USDOL that were based on the draft final report (dated December 30, 2011) plus ICF's responses.

Should you have any questions regarding the document, please contact the undersigned at (301) 572-0827.

Sincerely,

Art Hansen  
Project Director

Enclosures

## TABLE OF CONTENTS

<b>TABLE OF CONTENTS.....</b>	<b>3</b>
<b>LIST OF TABLES .....</b>	<b>4</b>
<b>PREFACE .....</b>	<b>5</b>
<b>ABBREVIATIONS .....</b>	<b>6</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>7</b>
<b>INTRODUCTION .....</b>	<b>10</b>
<b>TEMPORAL VARIATION IN CARPET ESTABLISHMENTS.....</b>	<b>13</b>
2.1. <b>SAMPLING .....</b>	<b>13</b>
2.1.1.    India Specific Sampling Issues .....	14
2.1.2.    Nepal Specific Sampling Issues.....	14
2.1.3.    Pakistan Specific Sampling Issues.....	16
2.2. <b>MEASUREMENT .....</b>	<b>18</b>
2.2.1.    Content of Survey.....	18
2.2.2.    Key Concepts Related to Employment.....	19
2.2.3.    Key Concepts Related to Production.....	20
2.2.4.    Survey Timing.....	22
2.3. <b>WEIGHTING .....</b>	<b>23</b>
2.4. <b>FINDINGS – VARIATION IN EMPLOYMENT AND PRODUCTION IN INDIA .....</b>	<b>24</b>
2.4.1.    Labor.....	24
2.4.2.    Production.....	26
2.5. <b>FINDINGS – VARIATION IN EMPLOYMENT AND PRODUCTION IN NEPAL.....</b>	<b>28</b>
2.5.1.    Labor.....	28
2.5.2.    Production.....	30
2.6. <b>FINDINGS – VARIATION IN EMPLOYMENT AND PRODUCTION IN PAKISTAN .....</b>	<b>32</b>
2.6.1.    Labor.....	32
2.6.2.    Production.....	34
2.7. <b>SUMMARY OF VARIATION IN EMPLOYMENT AND PRODUCTION IN REGION.....</b>	<b>36</b>
<b>DETERMINANTS OF CHILD EMPLOYMENT.....</b>	<b>38</b>
3.1. <b>BACKGROUND – THEORIES ON WHY EMPLOYERS USED CHILD LABOR .....</b>	<b>38</b>
3.2. <b>EMPIRICAL METHODS .....</b>	<b>41</b>
3.3. <b>REGION RESULTS ON DETERMINANTS OF CHILD EMPLOYMENT .....</b>	<b>44</b>
3.4. <b>FINDINGS FROM INDIA ON DETERMINANTS OF CHILD EMPLOYMENT .....</b>	<b>50</b>
3.5. <b>FINDINGS FROM NEPAL ON DETERMINANTS OF CHILD EMPLOYMENT.....</b>	<b>51</b>
3.6. <b>FINDINGS FROM PAKISTAN ON DETERMINANTS OF CHILD EMPLOYMENT .....</b>	<b>53</b>
3.7. <b>SUMMARY .....</b>	<b>54</b>
<b>POLICY IMPLICATIONS .....</b>	<b>56</b>

## LIST OF TABLES

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Table 1: Changes in Carpet-Weaving Establishments in Nepal: June 2009 – July 2011 .....	16
Table 2: U.S. Dollar – Local Currency Exchange Rates Used for Profit and Revenue Conversions .....	21
Table 3: Time Period for Establishment Interviews by Round and Country .....	22
Table 4: Number of Workers in Hand-made Carpet Production in India by Survey Round .....	24
Table 5: Employment Patterns in India across Survey Rounds .....	25
Table 6: Production Patterns in India across Survey Rounds .....	27
Table 7: Number of Workers in Hand-Made Carpet Production in Nepal by Survey Round .....	28
Table 8: Employment Patterns in Nepal across Survey Rounds .....	28
Table 9: Production Patterns in Nepal across Survey Rounds .....	31
Table 10: Number of Workers in Hand-Made Carpet Production in Pakistan by Survey Round .....	32
Table 11: Employment Patterns in Pakistan across Survey Rounds .....	33
Table 12: Production Patterns in Pakistan across Survey Rounds .....	34
Table 13: Summary of Number of Workers in Hand-Made Carpet Production by Country and Survey Round .....	36
Table 14: Summary of Empirical Implications of Theories .....	40
Table 15: Determinants of the Employment of Children Below 18 .....	44
Table 16: Determinants of the Employment of Children Below 15 .....	46
Table 17: Determinants of the Employment of Children that Appear Below-18 .....	47
Table 18: Determinants of Child Employment in India .....	50
Table 19: Determinants of Child Employment in Nepal .....	51
Table 20: Determinants of Child Employment in Pakistan .....	53
Table 21: Implied Conditional Wage Elasticities of Child Employment at Sample Means .....	54

## PREFACE

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In 2007, the Bureau of International Labor Affairs, United States Department of Labor (ILAB-USDOL) funded a cooperative agreement with Macro International (ICF) <sup>[1]</sup> entitled "Research on Children Working in the Carpet Industry of India, Nepal, and Pakistan" (Carpet Project). The Carpet Project's overall objective was to develop reliable and accurate data and information about the prevalence, working conditions, and demand for children's work and child labor in the production process of the handmade-carpet export industry in India, Nepal, and Pakistan. To accomplish its objectives, the Carpet Project designed and conducted six major quantitative research studies as well as semi-structured qualitative research activities. These included the following.

- Three Prevalence and Conditions (PC) Studies for India, Nepal and Pakistan. These were large-scale quantitative studies conducted to produce reliable, statistically sound, and nationally representative estimates of the prevalence of working children and child labor as well as detailed descriptions of children's working conditions in the production process of the national carpet industries.
- The Labor Demand (LD) Survey. This was a longitudinal panel study of establishments producing carpets in all three countries to understand the underlying causes of variation in management's decisions about employing children in the carpet industry.
- The Sending Areas (SA) Study in Nepal. This was a qualitative rapid assessment of child trafficking and bonded labor focused on rural children who migrated to work in the carpet factories in the Kathmandu valley.
- The Schooling Incentives Project Evaluation (SIPE) Study in Nepal. This was a randomized controlled trial to assess the impact of two educational interventions on children's attendance and success in school.
- The Best Practices (BP) Review. This was a qualitative meta-analysis of existing and documented good practices to identify the most effective programs and interventions that targeted child labor in the industry.

This Labor Demand Study report was written by Professor Eric V. Edmonds, the principal investigator for this study. The study and report have benefited from the constructive input of Jagat Basnet, Pablo Diego Rosell, Art Hansen, Ronaldo Iachan, and Maheshwor Shrestha.

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<sup>[1]</sup> The company was Macro International when the Cooperative Agreement was signed with USDOL. The company was ICF International, hereafter referred to as ICF, when this report was written.

## ABBREVIATIONS

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LD	Labor Demand Study
LDS#	Round of the Labor Demand Study
PC	Prevalence and Conditions Study
HH	Household

## EXECUTIVE SUMMARY

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This report contains the findings from the Labor Demand (LD) Study of the carpet industry in India, Nepal, and Pakistan. The Labor Demand Study focused on employment decisions in the production stage of the carpet sector, the stage where carpets were knotted, tufted, or hand-loomed. The decision to focus on the production stage was motivated by policy and public concern about this stage. The study focused on export-oriented hand-production and excluded machine-made carpets and floor coverings. Approximately 525 establishments that produced hand-made carpets were interviewed three times in India, Nepal, and Pakistan over a 15-month period (April 30, 2010 to July 19, 2011). Establishments included formal registered factories, informal factories, cottage sheds, and homes.

The purpose of collecting this panel survey was to document the volatility of carpet employment over time and to use the data to understand the underlying causes of child employment in the carpet sector. The total number of children under 18 employed in the hand-made carpet industry in India, Nepal, and Pakistan varied during the period of study from a low of 26,266 to a high of 34,216. Approximately three-fourths of those employed children were in Pakistan.

The Labor Demand Study provided information that addressed the question of why employers hired children in the carpet industry. Child labor<sup>1</sup> research typically focused on the supply: how and why a family decided to allow a child to work. However, much child labor related policy in low-income economies, including regulation of minimum age of employment, focused on the employer and affecting employment decisions. There were many theoretical studies considering why employers used child workers as well as several intriguing qualitative projects. This study was not aware of any other representative statistical surveys that were suitable to test among theories of why children were employed in a particular sector. This study provided novel evidence on why employers in the export-oriented hand-made carpet-manufacturing sector in the Indian sub-continent employed children.

This study was able to distinguish among theories of why employers used children by using econometric techniques to estimate the relationship among child employment and wages in the establishment's locality.

The competitive markets hypothesis posited that carpet establishments operated as perfectly competitive firms with the singular focus on maximizing profits. Under the competitive markets hypothesis, establishments took the prices of labor as given by the labor market and chose

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<sup>1</sup> In this report, the terms labor and work are used as equivalents, and the child labor supply means the supply of children as workers. This usage is unlike other reports from the carpet research project that distinguish between child work (economic activity) and child labor (situations or conditions where working children are exploited or abused).

cheaper labor to produce the profit-maximizing output as cheaply as possible, assuming that establishments had unrestricted ability to substitute one type of labor for another. Higher adult wages relative to children's wages led to more child employment in carpet establishments. Higher relative children's wages led to less child employment in the carpet sector.

The poverty hypothesis was that carpet establishments did not operate as perfectly competitive, price-taking firms. Instead, decisions about employment in the establishment were intertwined with other decisions made by the establishment (which might have been a household or family residence). Decisions about child employment in those establishments were made in the context of other family considerations. The establishment chose child labor because it needed its children to work. That was different than the competitive markets hypothesis where establishments chose the cheapest available source of labor and poverty considerations did not enter into the establishment's decisions about which type of labor. Although poverty may have led families to send their children to work, poverty did not motivate the establishment to choose child over other types of labor in competitive markets. Under the poverty hypothesis, higher adult wages led to less child employment as higher adult wages implied higher adult income and diminished motive for having children work. Higher child wages, everything else equal, led to more child employment to take advantage of greater child productivity.

Findings varied across countries. In Pakistan, the data were consistent with the competitive markets hypothesis. In Nepal, the findings were mixed; the poverty hypothesis seemed to best fit the patterns observed among children under-18, but the patterns for children under-15 did not conform to the predictions of the poverty hypothesis. The under-18 results included children under-15, so the difference between those two findings was from the employment of children aged 16-17. Separate from manager reports on employment, the study also had enumerator counts of the number of workers who looked under-18. Results using those enumerator estimates were also consistent with the competitive markets hypothesis. The findings from India were too imprecise to conclusively establish which model best fit the Indian data in isolation. The Indian data did not reject the competitive model in a statistical sense, and enumerator counts also led to findings consistent with competitive markets. When the data were combined for the region as a whole, the competitive markets hypothesis best described the employment of children in the carpet sector in the region.

The finding that the sector in the region may be characterized by a model of profit-maximizing establishments making hiring decisions in a competitive economic environment had substantive policy implications. It was possible to deter child labor in the carpet sector by making children relatively more costly to carpet employers.<sup>2</sup> Such efforts would not eliminate the child labor

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<sup>2</sup> This study collected and analysed its data using the market costs of factors. Thus, the cost of child labor for this study was the wage cost. In a broader context that took into consideration government regulations and possible fines for violating labor laws, the cost of child labor would be calculated differently.



supply as children would divert into other jobs where they were not so costly. Perfect competition made it easy to move workers to different jobs without changing the prevalence of child labor in the economy (although the location of work changed). In addition, efforts to combat child labor through raising adult wages may increase child labor in the carpet sector as they made children relatively less expensive. These findings, if applicable to other types of sectors where children were employed, highlighted the potential for unintended consequences of efforts to deter child labor through promoting adult income and employment.

The differences between the findings for Nepal and Pakistan for children under-18 highlighted the importance of taking a nuanced, country specific approach, although the study did not regard the Nepal findings as conclusive enough to guide policy. While the competitive hypothesis may imply that raising adult wages led to more children working in the carpet sector, the poverty hypothesis implied that raising adult wages reduced child engagement in the carpet sector. Under the competitive hypothesis, it was difficult to reduce the prevalence of child labor overall as children easily moved between jobs. Under the poverty hypothesis, it was possible to reduce child labor with anti-poverty efforts. Punitive, anti-child labor actions that reduced incomes increased child labor. Hence, the best policies to deter child employment in the carpet sector in Nepal may differ substantively from what would be best for Pakistan.

## INTRODUCTION

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As part of its research into the export-oriented handmade carpet industry in India, Nepal, and Pakistan, the carpet project conducted both a Prevalence and Conditions (PC) Study and a Labor Demand (LD) Study. The large-scale Prevalence and Conditions (PC) Study provided estimates of the number and prevalence of children working in the carpet industry.

Many qualitative reasons for the hiring of children had been reported in rapid assessments: child workers were inexpensive, easier to train, easier to manage, and easier to exploit than adults. The purpose of this Labor Demand (LD) Study was to document temporal variation in the carpet industry and to use econometric methods to understand why carpet establishments employed children. The LD Study visited a much smaller set of carpet establishments three times over 15 months to provide a sense of how employment in the industry varied over the period of study. By viewing the employment decisions of a panel of firms over 15 months, the LD Study may inform theory about why carpet establishments employ children.

Ultimately, the best way to understand why children were hired in the carpet sector was to study how child employment responded to changes in the economic environment. From a policy perspective, the role of economic determinants in child labor demand was more useful information than a qualitative description of how children interacted with the technology of carpet production. Moreover, formal estimates of how child employment responded to changes in the local economic environment, as embodied in labor prices, allowed forecasting how child involvement in the carpet sector responded to changes in the economic and policy environment. The next section documents the temporal variation in employment observed in the LD Study. The data are described in detail and sampling and measurement issues are explained. Estimates of employment and production differences over time are reported by country and for the region as a whole. That is followed by a section that uses the data to test among competing explanations of why establishments employ children. It begins with a review of the theoretical reasons for child employment that had been emphasized in qualitative research. The section then describes the econometric methods used to test between theories and presents results, first for all three countries combined, then each country separately. The final section concludes with a summary of the main findings and a discussion of their policy relevance.

There were some important limitations to this LD Study. The study was originally conceived as a multi-year data collection effort that would allow researchers to separate seasonal patterns from time trends. Budget issues and delays in other parts of the project reduced the period of study to 15 months, making it impossible to separate seasonal patterns from random events and business cycles. The data were still useful for measuring changes in the extent of child involvement over time, but it was impossible to separate seasonal patterns from those induced by business cycles.

The study tracked only carpet-producing (by weaving or tufting) establishments that were involved in export manufacture and missed the most common source of child engagement (pre-weaving activities such as carding, balling, and spinning yarn) in the sector in Nepal and India. The decision to focus on carpet manufacture was made to match policy interest.

An initial error in developing the sampling frame for the PC Study in India meant that the establishments operated by contractors (not exporters) were omitted from this study's frame in India unless they were household based. That omission may have important implications for estimating the number of children working in export-oriented handmade carpet-production in India (section 2).

Given differences in calendar time and in questionnaire design, the estimates of numbers of children working in the carpet sector from this study cannot be compared to estimates from the PC Study.

This study described the sampled firms at the time of interview for the population that existed at the time of frame development. There was considerable discussion in the field about how substantively the carpet industry was changing. There were no obvious signs that the industry dynamics that were underway differed from what would be expected in the lifecycle of any industry, but the reader should be cautious about extrapolating the characterization of the industry at that time period to the future or to other environments.



## TEMPORAL VARIATION IN CARPET ESTABLISHMENTS

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The Labor Demand (LD) Study panel was drawn from the samples developed for the Prevalence and Conditions (PC) Study. The PC Study surveyed establishments that performed any one of sixteen activities that the research team identified as carpet sector activities for the PC Study. Those activities spanned wool-processing, carpet production, and post-production tasks. The establishment was defined as a factory if it primarily hired labor in manufacture. Size was not a consideration in the definition of factory. An establishment was defined as a household if the labor used in production was primarily family based. This LD Study focused on only carpet establishments directly engaged in carpet production. The information collected in this study did not differ depending on whether the establishment was a factory or a household.

There were many parts to this study. The instruments are described in detail in section 2.2.1.

- The establishment survey collected accounting data and general information on the establishment's operation and environment.
- The most recently completed carpet survey collected detailed price and product quality data on the most recently completed carpet.
- The worker survey collected data on workers for the sampled establishment.
- The site survey that provided detail on the worksite environment was completed by the enumerator.
- The community survey was administered to a local community leader informed about recent community events.
- The school survey was given to local schools to find out about their quality and operation.

### 2.1. SAMPLING

The goal of sampling for this study was to produce a sample of carpet establishments that was representative of establishments in the handmade export-oriented carpet-manufacturing sector in each country. This goal differed from the PC Study, which focused on measuring the conditions of children engaged in the entire overall handmade carpet sector.

The Labor Demand Study focused on employment decisions in the production stage of the carpet sector, the stage where carpets were knotted, tufted, or hand-loomed. The decision to focus on the production stage and employment decisions was motivated by policy and public concern about this stage. The study focused on export-oriented hand-produced carpets and excluded machine-made carpets and floor coverings.

Whereas the PC Study surveyed nationally representative samples of all carpet establishments, this Labor Demand Study restricted its subsample of PC establishments to those engaged in

production. The establishments for this study were selected as a simple random sample of the establishments directly engaged in production within each stratum of the PC Study's sample. Because of stratification in the PC Study's sample, factories were selected from the PC factory stratum sample using simple random sampling, and household areas were selected from the PC sample of household areas using simple random sampling. For households, geographic areas were selected rather than specific households from the household frame in order to maximize geographic coverage within cost constraints.

The following sub-sections discuss issues associated with sampling in each country.

### **2.1.1. India Specific Sampling Issues**

In India, there were two strata for the PC Study. The exporter stratum consisted of factories involved in the exporting of carpets, and 25 factories that manufactured handmade carpets were randomly sampled for this study from the list of PC respondents. The 25 factories in this study represented an estimated 219 factories (in the PC Study's sample). The 25 factories came from 13 different communities. This study included 150 households, representing an estimated 109,215 households engaged in handmade carpet production. Those households came from 30 different communities covered by the PC Study. The prevalence of home based production in India dwarfed factory production, and any analysis using weights in effect eliminated factories from our India results.

#### **Jammu and Kashmir**

The Jammu and Kashmir state of India was important for carpet manufacture, but it had been the locus of political conflict since the partition of India. Armed insurgency, terrorism, kidnapping, and human rights abuses all made it a difficult place to conduct fieldwork. Data collection at the establishment level encountered no unique difficulties in Jammu and Kashmir, but school data in the state could not be collected in the first round because schools were closed due to strikes, curfews, and mobility restrictions. In the rest of India, school data were collected in the first and third rounds because those rounds spanned different school years. In Jammu and Kashmir, school data were collected in the second and third rounds. The second round was during the same school year as the first round, so the Jammu and Kashmir school data also spanned two school years.

### **2.1.2. Nepal Specific Sampling Issues**

The carpet industry in Nepal during the period of this study was reported to be undergoing major structural change. The study implemented a data collection procedure designed to measure those

changes and keep the data representative of sampled localities even in a dynamic industrial environment.

The past several years were filled with news accounts of difficulty in the carpet sector in Nepal. Shrinking global demand for carpets, an unstable political situation, and rising demand for Nepali workers in the Middle East and East Asia had the potential to radically change the industry. There were numerous stories of plant closings and of shifting carpet production out of factories and into households to lower costs, avoid regulation, and evade the attempts at extortion that reportedly were being directed at larger establishments with increasing frequency.

In order to keep track of changes within the industry, during each round of data collection, the study conducted a census of carpet-weaving establishments in the wards that were sampled by this study. Within each sampled ward, the study collected a complete list of carpet-weaving establishments and looms in each of the three rounds. That allowed the study to gauge how the carpet industry in Nepal changed during the period of study as long as the changes did not move production to fundamentally new geographic areas outside of the 2008 frame. The study expected a reallocation of production within carpet producing areas, but assumed that production would not shift to new geographic areas. Areas with proximate pre- and post-weaving infrastructure had a cost advantage to areas without any infrastructure. Movement to entirely new localities would be costly, especially given the low quality of Nepal's transportation infrastructure.

Table 1 contains estimates of the prevalence of establishments, looms, and the ratio of the two for the three rounds as well as the total count of the number of establishments engaged in weaving at the time of the PC Study's survey in June 2009.

There are two panels in Table 1. The top panel contains tabulations where the data are weighted by their inverse sampling probability. The bottom panel is not weighted. Hence, the top panel is designed to present a picture of changes over time in the areas covered by this study by comparing columns. The bottom panel presents a picture of the raw data that underlay those projected trends.

The data tabulated in Table 1 were collected in order to keep the sample in Nepal representative. Sampling was more complicated in Nepal than in the other two countries, because of ex-ante expectation that there would be substantive changes in the structure of the industry. An initial draw was made as a simple random sample of (1) wards from Sindhupalchok District and (2) establishments from the factory and household samples of the PC Study for the Kathmandu Valley. Five wards were drawn as a simple random sample from the PC wards in Sindhupalchok, and 25 household-based weaving establishments were selected from those five wards. In the Valley, 128 factories and 22 households were selected as simple random samples from the

factory and household PC surveys. The difference in the treatment of households in the Valley compared to Sindhupalchok owed to the difference of completeness of the sampling frame provided by the Nepali data collection partner in those two regions.

**Table 1: Changes in Carpet-Weaving Establishments in Nepal: June 2009 – July 2011**

	June 2009	May 2010	December 2010	July 2011
<b>Weighted</b>				
# Establishments	1,339	1,578	1,785	1,824
# Looms	n/a	14,059	16,040	16,207
Looms/Establishment	n/a	8.9	9.0	8.9
<b>Unweighted (EPS Wards Only)</b>				
# Establishments	-	445	521	538
# Looms	-	5,371	6,391	6,455
Looms/Establishment	-	12.1	12.3	12.0

The bottom panel marked "unweighted" contains counts of the number of establishments and looms in the Wards sampled for EPS only. June 2009 comes from the PC study.

This initial draw defined the set of 70 locations to be covered by this study. In other countries, closed establishments were replaced from randomly selected establishments drawn from the same community in the original PC survey. That was feasible because of relatively few closures. In Nepal, the study expected closure rates to make this impossible. Closed establishments were replaced with randomly selected establishments from the same community, drawn from the lists assembled and described in the context of Table 1. This approach kept the data representative of the ward for each round of this study.

### **2.1.3. Pakistan Specific Sampling Issues**

Between the first and second rounds of this study, Pakistan was hit with devastating floods. Approximately one-fifth of Pakistan was under water at one point. Roughly 20 million people were affected by flooding, and nearly 2,000 died. Flooding was prevalent in our study areas. By the time of the second round, flood waters had receded and communities were working on recovery.

The floods had a minimal impact on the study's ability to find the sample, and there was no more attrition between the first and second rounds than between the second and third rounds. The main impact of the flooding was that it distorted time allocation and the organization of economic production in affected communities. To control for this, the study adapted the community survey



to collect measures of community exposure to the floods directly and indirectly through surrounding areas.

Overall, the period of this study in Pakistan was ripe with political instability and tensions. To work within this environment, the data collection sub-contractor worked with local enumerator teams and secured support from important local leaders prior to data collection. There were a few delays in fieldwork because of events external to the project, but the integrity of the sample was not compromised.

For Pakistan, there were three strata for the PC study, and this study's subsamples were drawn as a simple random sample from each stratum. The household stratum listed areas where households produced handmade export-oriented carpets, and 30 areas were selected at random from the 45 areas sampled in the PC Study. With five sampled households per community, those 150 sampled household-based establishments represented an estimated 35,833 households engaged in manufacturing handmade carpets. There were two factory strata in the PC frame: five factories were selected at random from the rural stratum, and 20 factories were selected using simple random sampling from the urban stratum. This 20 to five split between urban and rural factories matched the ratio of urban to rural factories in the population at the time of frame development. Those 25 factories represented an estimated 371 factories in the population.

## 2.2. MEASUREMENT

### 2.2.1. Content of Survey

There were four data collection components of EPS. The establishment survey was directed at the establishment manager and collected information on the establishment's history, its revenues, and its costs. The establishment survey was administered in all three rounds. There were some slight differences in instruments among rounds as the study tried to limit the number of times that time invariant questions were repeated. Overall, there were few substantive differences in instruments over time. There were two important subcomponents of the establishment survey.

- First, there was a worker survey. All workers were listed; basic demographic information was collected for each worker; and data on how they worked at the establishment was provided. The worker survey was considered to be manager provided information, although in practice it appeared that frequently workers were directly contacted by the manager to provide some information.
- Second, there was a “most recently completed carpet” survey that gathered specific quality data on the most recently completed carpet from the sampled establishment.

The site survey was an observational sheet completed by enumerators immediately after the site visit. It contained information on the worksite environment that may extend beyond the sampled establishment when multiple establishments share worksites. Site and establishment surveys were collected each round of the survey. The site surveys did not change among rounds. India packaged the site survey as a part of the establishment survey, although it was still completed by the enumerators, not the managers.

The community, or location, survey was asked in each round and directed at a respondent with knowledge of the primary sampling unit area. Most often, it was the local Ward (Nepal), Tehsil (Pakistan), or Panchayat (India) political leader. The location survey collected information on the population and industrial composition of the ward, local infrastructure, and important socio-political changes.

The school surveys were collected in the first and third rounds (thereby spanning two school years).<sup>3</sup> The school surveys were administered to headmasters for all primary schools with 20 or more students from the sampled location (ward, village, etc.). Students at the school did not need to have any relationship to the carpet sector and did not need to be located in the sampled location. The instrument collected information about students, school operation, and school infrastructure. The school data were collected out of concern that local schools influenced

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<sup>3</sup> The exception of collecting the school survey in the second and third rounds in Jammu and Kashmir was noted earlier.

whether children engaged in work. In the end, the school data were not used in this report as the resulting attributes appeared uncorrelated with wages and were not predictors of the use of child employment in carpet establishments conditional on wages.

Compared to other countries, Nepal had several large factories that required a modification of the survey instrument. We defined a large factory in Nepal as one having more than 25 workers. This cut-off was arbitrary, but seemed appropriate to enumerators given their field experience. The establishment survey instrument was shortened in large establishments. Our assumption was that large establishments were formal enterprises with accounting systems in place. Hence, fewer questions were required to compute revenue and profit.

### **2.2.2. Key Concepts Related to Employment**

This study contains information on employment at the establishment level in the establishment survey, the worker survey, and the site survey. All tabulations documenting variation over time in employment related outcomes below were weighted to be nationally representative.

A challenge in asking about employment was that the research team's concept of employment differed from that of establishment managers. The instrument contained specific instructions to include a broad range of workers. The study focused on "workers" rather than just employees to mitigate confusion. The instrument stated: "These individuals may include employees, casual workers, unpaid helpers, or family members including supervisors, security, cooks, or people who simply help with cleaning, meals, bringing tea, etc."

The establishment survey reported total workers in the establishment. The instrument asked about total in-kind expenditures on workers as well as actual cash payments. The two were combined and divided by the number of total workers to create a "unit wage" over the previous 30 days. That unit wage was the average labor attributed expenditure per worker. It was not the actual wage paid to any worker. In fact, the study collected separate data on the cost of hiring new labor. Unit wages appeared low by a third. Nevertheless, it was the best measure available of per worker costs for an establishment. Unit wages were lower in households than establishments. The study assumed that households had difficulty attributing in-kind expenditures to workers (many of whom would be family members) as those would be intertwined with the costs of operating a household.

The study collected information related to measuring child employment in the worker survey and site survey. The worker survey asked about the age of workers and hours worked. The study tabulated the average number of youths below-18 per establishment and the average share of workers below-18. The site survey asked the enumerator to report how many workers appeared below-18 and how many locations had missing workers. Missing workers were identified easily

on loom-based manufacturers because weavers worked in line, and it was important for a team to stay constant throughout a given carpet. Counts of workers on-site and missing from the site survey need not match the worker survey. There may be multiple establishments on a site, and the enumerators were not asked to distinguish within a site.

The study reported the average number of workers below-15 and below-18, the average number of workers who appeared below-18, and the number of absent workers. The study combined the number who appeared below-18 with the number of absent workers to get an upper bound on the potential number of children in the establishment. That combined variable was labelled the “maximum potential children per establishment.” The study did not think that those empty workspaces were generally missing children because the prevalence of empty spaces on a worksite did not appear to be correlated with other observed establishment characteristics.

For other worker characteristics, the study relied on the worker survey. The questionnaire collected gender and migrant status. Migrant status was measured by whether an individual was resident in the current locality before starting to work at the sampled establishment. It measured whether the worker migrated in association with the sampled establishment rather than whether the worker ever migrated. The questionnaire collected the worker’s relationship to the manager, and the study reported whether the manager was a relation. The study also reported average hours worked in the last week as a measure of the intensity of labor.

Debt-bondage was an enormous concern in the Indian sub-continent, but it was difficult to codify. The study’s instruments had three markers that were not themselves direct measures of debt-bondage, but they were apt to be present among bonded laborers. The worker survey asked whether the worker owed a debt to the employer, slept inside the establishment, and received pay. The study tabulated the prevalence of workers owing a debt, sleeping inside an establishment, both owing a debt and sleeping inside an establishment, and combined owing a debt, sleeping inside, and not receiving pay. Some bonded laborers received pay (and, hence, did not fall in the last combined category), and some family members might have owed the manager a debt (and, hence, would fall in the last combined category). Nonetheless, those worker characteristics were tabulated for each country.

### **2.2.3. Key Concepts Related to Production**

The establishment survey included basic information about output, revenue, and costs as well as detail about the most recently completed carpet. Both sources of information were used in the discussion of patterns in carpet production over time. All data on variation in patterns over time were weighted by inverse sampling probabilities to be nationally representative.

The establishment survey measured the volume of output and carpet production. The study measured volume from questions about the number of handmade carpets manufactured at the establishment in the last 30 days. Capacity was the ratio of the number manufactured in the last 30 days to the number the respondent reported being able to manufacture on-site. The study reported the averages of those two variables in each round. The study also created an indicator for whether the establishment subcontracted out any manufacture. The mean of that indicator was the prevalence of sub-contracting in a given round. Revenue and profits were both asked directly for the establishment as a whole, (which may have included non-carpet activities) with a reference period of the last 30 days.

The study converted revenue and profits to dollars using the average of daily average exchange rates over the period of the establishment survey for each round in each country. The exchange rates are reported in Table 2.

**Table 2: U.S. Dollar – Local Currency Exchange Rates Used for Profit and Revenue Conversions**

	Round 1	Round 2	Round3
Indian Rupee	.0216	.0217	.0221
Nepali Rupee	.0132	.0137	.0138
Pakistan Rupee	0.016	.0116	.0118

Source: Bid price daily average over sample period of establishment surveys as reported on: <http://www.oanda.com/currency/historical-rates/>.

Carpet attributes came from the most recently completed carpet survey. The decision to focus on the most recently completed carpet was made because of its specificity. The study computed the prevalence of hand-knotted, hand-loomed, and tufted production by taking the mean of indicators for whether the most recently completed carpet could be so characterized. For carpet attributes, its size was summarized in square feet (computed by multiplying the dimensions of the carpet) and its weight.

The study collected data on prices using the most recently completed carpet survey. The price data were extremely unusual. Most price data from establishment surveys were unit prices (revenue divided by output). However, by asking about the most recently completed carpet, the study had actual price data since it was the price of a single unit. The study reported both prices and profit from the most recently completed carpet survey in U.S. dollars. Prices and profits on the most recently completed carpet did not need to be related to revenue or profits for the last 30 days for the establishment. Profits and revenue for the establishment were affected by a wider array of activities, and the most recently completed carpet did not need to be completed within the last 30 days.

## 2.2.4. Survey Timing

The study used its data to document temporal variation in the handmade carpet-weaving sector and to estimate how child employment responded to changes in the economic environment. It was important to keep in mind the time structure of the data. Table 3 provides the start and end dates for each round of data collection for each country.

**Table 3: Time Period for Establishment Interviews by Round and Country**

	Round 1 - 2010		Round 2 - 2010		Round 3 - 2011	
	Start	End	Start	End	Start	End
India	June 14	July 3	Nov 28	Dec 31	April 24	May 10
Nepal	May 13	June 25	Nov 11	Dec 7	June 6	July 19
Pakistan	Apr 30	July 14	Oct 23	Dec 2	April 9	May 29

The study design was to have all three rounds conducted concurrently. The first two rounds were successful at accomplishing this, although India was late in starting both rounds, and Pakistan took longer than elsewhere. The third round (LDS#3) was implemented at approximately the same time in India and Pakistan. In those two countries, LDS#3 was on average 11 months after the first round (LDS#1). Nepal started LDS#3 after data collection was completed in India and Pakistan, so LDS#3 was on average 13 months after LDS#1 in Nepal.

The result of the delay in LDS#3 for Nepal was that the study could not separate differences across countries in time trends between the second round (LDS#2) and LDS#3 from variation associated with differences in the timing of the surveys. For example, with these data the study could not say that the industry was growing in India relative to Nepal. The study was able to make only within-country comparisons. For example, the study could say, for Nepal, that total output in July 2011 appeared less than it was in June 2010 and, for India, that total output in May 2011 was greater than it was in June 2010. However, a comparison between rounds LDS#2 and LDS#3 of changes in India versus in Nepal was not feasible with these data.

### 2.3. WEIGHTING

In India and Pakistan, factories were a small share of total employment in handmade export-oriented manufacture of carpets. However, the study decided that it was important to include factories in the study. In what follows, the sampling weights are used to document changes in the sector across the period of study. Using the study for this purpose was somewhat problematic: the sample sizes were small, and weighting gave some establishments a large influence on tabulations. The study made those calculations, anyway, as those were the only data the study had that permitted such a discussion.

The study did not use weights in the econometric work in the next section. The conceptual reason for not weighting the econometric work was that the econometric exercise treated each observed establishment as an observation and asked how its child employment decisions were influenced by adult and child wages. The subject of interest was the observed establishment, not the universe of establishments it represented. The practical reason for not weighting the econometric work was that, if weighted, a small number of establishments wound up with a lot of influence on the econometric findings. This was especially a problem in India.

## 2.4. FINDINGS – VARIATION IN EMPLOYMENT AND PRODUCTION IN INDIA

### 2.4.1. Labor

India had more than half of the carpet workers documented in the study. Across the three countries, an estimated 401,935 people worked in hand-made, export-oriented carpet establishments at the time of the first round, and 259,550 of those workers (or 65 percent) were living in India.

Table 4 contains tabulations of total employment and child employment for each round in India. Total employment was computed by the weighted sum of the number of workers reported by the manager. “Under-15” and “Under-18” were the weighted sum of all the workers identified in the worker survey as under-15 and under-18, respectively. The study divided counts for each age class by total workers to compute the share of workers who were under-15 and under-18. The under-18 category includes those under-15.

The bottom row contains the weighted sum of the enumerator’s counts of the number of workers who appeared under-18 and the empty work-spots. That was only available for under-18. Especially in hand-knotting, workers worked in a line, and there should not have been any empty work-spots while production was proceeding. The study was skeptical about attributing all empty work-spots to hidden children, as the number of empty slots did not appear correlated with observed establishment characteristics. Nevertheless, the study reported the sum of the number who appeared under-18 and empty slots as a type of upper bound on the number of children who might have been in the sector assuming the validity of the sampling frame used to draw this sample and compute the weights used in those calculations.

**Table 4: Number of Workers in Hand-made Carpet Production in India by Survey Round**

	Round 1	Round 2	Round 3
<b>Total</b>	<b>259,550</b>	<b>290,582</b>	<b>273,740</b>
<b>Under 15</b>			
Worker Survey	0	1,163	2,791
<i>As a share of workers</i>	0%	0%	1%
<b>Under 18</b>			
Worker Survey	5,581	4,269	8,212
<i>As a share of workers</i>	2%	1%	3%
<b>All Missing and Appeared</b>	<b>113,142</b>	<b>28,794</b>	<b>46,676</b>

Source: Author’s calculation from LD Study surveys. All counts were weighted to be nationally representative. “Workers” refers to the estimated number of workers of any age as reported by the establishment manager. “Worker Survey” refers to the number of workers below-18 (or below-15) as provided in the worker survey. “All Missing and Appeared” refers to the sum of all workers who appeared to be under-18 according to our enumerators and the number of workspaces missing workers at the time of enumerator visits.



The number of workers was greatest in LDS#2 in India, and the number of child workers was greatest in LDS#3. Between one and three percent of workers were under-18. It was tempting to look at rounds LDS#1 – LDS#3 for children under-15 and conclude that child employment was growing in India, but the data were not conclusive. There was wild variation in the number missing and appearing young across rounds. The study found it extremely surprising that there were no reported workers under-15 during the first round of data when schools were closed. The large number of missing workers and workers who appeared young were driven by both sources of variation.

More detail on employment variation in India is in Table 5, which contains average establishment, site, and worker characteristics of the Indian hand-made export-oriented carpet-manufacturing sector in each of the three rounds of the LD Study. The number of workers, unit wages, and prevalence of workers below-18 were similar across all three rounds. The lowest prevalence of workers reported as under-18 occurred in the first round when schools were closed. The reported prevalence of establishments having any workers under-18 in this table differed from the prevalence of workers under-18: the latter was counting individual workers whereas the former tabulated whether an establishment had any workers below-18.

**Table 5: Employment Patterns in India across Survey Rounds**

	Round		
	1	2	3
<b>Establishment Characteristics (Last 30 Days)</b>			
# workers per establishment	2.80	3.25	3.16
Unit Wage in USD	43.23	35.65	36.87
Any Workers<15	0.0%	1.1%	1.7%
Any Workers <18	3.0%	3.7%	5.4%
Days School Open in Last 7	0.77	5.90	5.82
Schools Closed in Last Week	84.6%	0.0%	0.0%
<b>Site Observations (at Time of Survey)</b>			
Prevalence of Establishments with Empty Work Spots	31.5%	16.4%	21.8%
# Empty Work Spots per establishment	0.51	0.26	0.30
Maximum # Workers per establishment	3.71	2.72	2.84
# Appear <18 per establishment	0.52	0.01	0.13
Maximum Potential Children per establishment	1.03	0.26	0.43
Maximum Prevalence of Child Labor	27.9%	9.7%	15.0%
<b>Worker Characteristics (from Worker Survey)</b>			
Under 15	0.0%	0.3%	0.9%
Under 18	1.9%	1.2%	2.6%
Female	24.1%	33.5%	34.4%

	Round		
	1	2	3
No Relation to Manager	17.1%	15.2%	20.9%
Migrant	26.2%	16.6%	12.6%
Owe Debt to Establishment	14.9%	13.6%	13.2%
Sleep inside Establishment	75.7%	62.5%	61.3%
Owe Debt & Sleep Inside	12.9%	8.3%	7.7%
Owe Debt, Sleep Inside, & Not Receive Pay	12.9%	1.9%	1.0%
Average Hours worked in last 7 Days	33.89	33.51	29.64
Average Hours worked by children in last 7 days	13.31	32.47	31.82

The workforce in India was largely male and related to the manager. Most were not migrants although the prevalence of migrants was slightly larger than observed in Pakistan. More than one in 10 owed a debt to an employer. Interestingly, with regards to the combined variables that were interpreted as markers of being at risk of debt-bondage, the second and third rounds looked similar and differed substantively from the first round. Average hours worked were roughly constant across rounds, although children under-18 worked substantively fewer hours in the first round than in the other two rounds.

#### 2.4.2. Production

Table 6 tabulates production patterns in India across the three survey rounds. The three rounds had the potential to capture seasonal production patterns. The first and third rounds in India were during planting season. The second round was at the end of harvest and start of the dry season in most areas. Nonetheless, compared to other countries, production in India appeared relatively similar across rounds.

Revenue, profits, and the price of the most recently completed carpet were increasing across all three rounds in India. Subcontracting, number of carpets produced, and capacity utilization did not appear to change substantively across rounds. We encountered reports of a shift from hand-knotting to hand-loomed. Round 1 seems different from rounds 2 and 3 in this regard. Between rounds 1 and 2, hand-knotting declined. Hand-loomed increased. Round 2 looks like round 3 in terms of carpet type.

**Table 6: Production Patterns in India across Survey Rounds**

	Round		
	1	2	3
<b>Establishment Characteristics (Last 30 Days)</b>			
# Carpets Manufacturing	2.28	4.06	3.47
Capacity Utilization	36%	36%	28%
Prevalence of Subcontracting	2%	0%	4%
Revenue (in USD)	103.98	107.04	124.42
Profit (in USD)	59.15	74.43	110.39
<b>Most Recently Completed Carpet Characteristics</b>			
Hand-knotted	71%	64%	64%
Hand-Loomed	8%	19%	17%
Tufted	20%	18%	19%
Area (in square feet)	78.06	52.80	42.93
Weight (in pounds)	18.82	36.31	33.63
Price (in USD)	124.19	163.86	198.49
Profit (in USD)	82.31	94.34	108.91

All establishment characteristics referred to the 30 days prior to interview as the recall period. Source: Author's calculations from the India LD surveys. Data were weighted to be nationally representative.

## 2.5. FINDINGS – VARIATION IN EMPLOYMENT AND PRODUCTION IN NEPAL

### 2.5.1. Labor

Nepal was a small country that had approximately six percent of the carpet workers documented in this study. Table 7 contains estimates of workers and child employment for each round of the study in Nepal.

**Table 7: Number of Workers in Hand-Made Carpet Production in Nepal by Survey Round**

	Round 1	Round 2	Round 3
<b>Workers</b>	<b>23,488</b>	<b>25,817</b>	<b>29,197</b>
<b>Under 15</b>			
Workers Survey	197	295	247
<i>As a share of workers</i>	1%	1%	1%
<b>Under 18</b>			
Workers Survey	1,736	2,220	2,098
<i>As a share of workers</i>	8%	8%	7%
<b>All Missing and Appeared</b>	<b>9,084</b>	<b>10,125</b>	<b>11,398</b>

Source: Author's calculation from LD Study surveys. All counts were weighted to be nationally representative. See Table 4 notes for description of table contents.

The observation that the number of workers was increasing in each subsequent round is surprising given reports about the decline in the industry that we encountered in field. Employment was 24 percent greater in the third round compared to the first round. That rise in employment was larger than the 16 percent rise in establishments that was shown in Table 1.

**Table 8: Employment Patterns in Nepal across Survey Rounds**

	Round		
	1	2	3
<b>Establishment Characteristics (Last 30 Days)</b>			
# workers	14.83	14.35	16.05
Unit Wage in USD	8.07	10.87	12.89
Any Workers < 15	10.2%	12.4%	11.4%
Any Workers <18	35.4%	42.1%	41.1%
Days School Open in Last 7	5.28	3.79	3.05
Schools Closed in Last Week	0.0%	0.0%	45.9%
<b>Site Observations (at time of survey)</b>			
Prevalence of Establishments with Empty Work Spots	74.2%	48.6%	71.1%
# Empty Work Spots	4.29	4.10	4.75

	Round		
	1	2	3
Maximum # Workers	14.73	14.73	16.38
# Appear <18	1.45	1.53	1.51
Maximum Potential Children	5.73	5.54	6.27
Maximum Prevalence of Child Labor	38.9%	37.6%	38.3%
<b>Worker Characteristics (from Worker Survey)</b>			
Under 15	0.8%	1.1%	0.8%
Under 18	7.5%	8.4%	7.1%
Female	66.2%	65.0%	63.4%
No Relation to Manager	87.7%	87.3%	89.4%
Migrant	66.6%	72.0%	74.7%
Owe Debt to Establishment	9.1%	6.4%	4.4%
Sleep inside Establishment	76.3%	78.4%	78.8%
Owe Debt & Sleep Inside	6.3%	5.7%	3.3%
Owe Debt, Sleep Inside, & Not Receive Pay	0.0%	0.0%	0.0%
Average Hours worked in last 7 Days	52.82	52.05	55.29
Average Hours worked by children in last 7 days	50.53	48.00	54.11

Despite the growth in employment in each round, the study did not observe a perfectly corresponding growth in under-15 and under-18 employment. For both categories, the second round was greater than the first or third. Comparing rounds LDS#3 and LDS#1, under-15 employment was up 25 percent and under-18 employment was up 20 percent. However, both youth employment categories were down when comparing rounds LDS#2 and LDS#3.

Table 8 contains average establishment, site, and worker characteristics of the Nepali hand-made export-oriented carpet-weaving sector in each of the three rounds. All averages were weighted using inverse sampling probabilities so that the means were estimates of the sector in the country at the time of each round. The study did not observe any manufacturing process other than hand-knotting in Nepal.

Compared to India, there were more differences between rounds in Nepal, with the second round standing out as distinct from the first and third rounds, which were similar in most attributes.

The number of workers and unit wages were increasing across all three rounds. Factories were more prevalent than household employment in Nepal compared to India, but unit wages were substantively lower in Nepal (nearly a third of India's wages in the summer of 2011). The prevalence of establishments with workers under-18 was similar across the three rounds, although the second and third rounds had a slightly higher proportion of establishments (four out

of 10 compared to 3.5 out of 10). Schools were open during all three rounds of the Nepal surveys.

The distinction between the prevalence of workers under-18 in the industry (seven to nine percent across rounds) and the prevalence of establishments with at least one child under-18 (35 to 40 percent) was striking. This difference was unique to Nepal. The study documented a similar pattern for workers under-15. The large gap between the number of young workers and the prevalence of establishments with a young worker implied that most of the establishments with children working have only a few present. There was nothing close to a “child only” factory in the Nepali data.

The site observations appeared similar across rounds. The only exception was that the prevalence of establishments with empty work spots was substantively lower in the second round. The average number of empty work spots was similar across rounds, which implied that, compared to other rounds, factories with empty work spots in the second round must have had more empty work spots than in other rounds.

The workforce in Nepal was largely female and not related to the manager. Most were migrants who slept inside the worksite, and the prevalence of migrant labor was increasing across rounds. Those findings were consistent with narrative reports from Nepal where employers complained about having more difficulty in finding workers than in the past. Average hours were greater in Nepal than in India and did not appear to vary much across rounds, although both adults and children appeared to be working more in the third round compared to the second round.

Fewer workers owed managers a debt in Nepal than in India, and the prevalence of owing debts declined over the period. That was also consistent with narrative reports from the field of more competition for workers. Employers may have been less comfortable offering credit to new migrants and more transient workers. Interestingly, in the second and third rounds, more than three-fourths of the workers who owed debts lived inside establishment premises. The study did not observe workers who owed a debt, slept inside the establishment, and worked without pay.

### **2.5.2. Production**

The three rounds had the potential to capture seasonal production patterns. The first round in Nepal was during a planting season; the second round was at the end of harvest and start of the dry season in most areas; and the third round was pre-monsoon when weeding and fertilization would be important in agricultural communities. In fact, compared to India, the study observed more substantive differences in production across rounds. Table 9 tabulates production patterns in Nepal across the three survey rounds.

**Table 9: Production Patterns in Nepal across Survey Rounds**

	Round		
	1	2	3
<b>Establishment Characteristics (Last 30 Days)</b>			
# Carpets Manufacturing	7.98	5.44	9.38
Capacity Utilization	94%	76%	97%
Prevalence of Subcontracting	97%	95%	98%
Revenue (in USD)	1219.77	699.05	1498.71
Profit (in USD)	19.07	-187.27	58.29
<b>Most Recently Completed Carpet Characteristics</b>			
Hand-knotted	100%	100%	100%
Hand-Loomed	0%	0%	0%
Tufted	0%	0%	0%
Area (in square feet)	44.76	49.70	47.88
Weight (in pounds)	53.84	54.13	52.95
Price (in USD)	193.63	259.79	251.44
Profit (in USD)	41.80	52.95	58.76

All establishment characteristics refer to the 30 days prior to interview as the recall period. Source: Author's calculations from the Nepal LD Study surveys. Data were weighted to be nationally representative.

Compared to India, Nepali establishments manufactured more carpets, used more of their capacity, and sub-contracted out work much more. Prices and revenue were higher in Nepal, although profits were substantively lower. The diminished profits were somewhat surprising given that per unit labor costs were much lower in Nepal.

The second round stood out as distinct from the first and third rounds in Nepal. The number of carpets manufactured was down; capacity utilization was down; revenue was down; and average profits were negative. The fact that those declines in the sector in the second round were not apparent in price or profit on the most recently completed carpet likely reflected the decline in manufacturing volume. Establishments made a similar amount on the carpets they produced in the second round, and they were producing similar carpets in all three rounds. However, establishments were producing fewer carpets to cover their operating costs.

In the narrative work, researchers heard discussion of the decline in the industry in Nepal. The third round looked a lot like the first round. It was impossible to identify whether the decline in the second round reflected normal seasonal patterns in Nepal, or whether the third round reflected a recovery in the sector or was itself an aberration. The census of establishments conducted concurrent with each of the sample surveys and described in Table 1 did not suggest a general decline in the number of looms or establishments over the time period of this study.

## 2.6. FINDINGS – VARIATION IN EMPLOYMENT AND PRODUCTION IN PAKISTAN

### 2.6.1. Labor

Pakistan had approximately one-third of the carpet workers documented in this study; three-quarters of those were below-18, and 78-99 percent of those were under-15. Table 10 contains tabulations of total employment and child employment across the three rounds.

Children under-18 and under-15 were a larger share of the carpet labor force in Pakistan than in either India and Nepal. In fact, in the first round, Pakistani children constituted all but 197 of the under-15 labor force in the study.

There were fewer children under-15 and under-8 in the labor force in the second and third rounds compared to the first round. That could not be explained by declining total employment, as total employment was flat between the first and second rounds and increased by the third round.

**Table 10: Number of Workers in Hand-Made Carpet Production in Pakistan by Survey Round**

	Round 1	Round 2	Round 3
<b>Workers</b>	<b>118,897</b>	<b>118,850</b>	<b>131,319</b>
<b>Under 15</b>			
Worker Survey	17,029	11,026	10,917
<i>As a share of workers</i>	14%	9%	8%
<b>Under 18</b>			
Worker Survey	26,899	19,777	21,395
<i>As a share of workers</i>	23%	16%	16%
<b>All Missing and Appeared</b>	<b>94,563</b>	<b>94,483</b>	<b>94,927</b>

Source: Author's calculation from LD Study surveys. All counts were weighted to be nationally representative. See notes to Table 4 for additional details.

Table 11 contains average establishment, site, and worker characteristics of the Pakistani hand-made export-oriented carpet-manufacturing sector in each of the three rounds. All averages were weighted using inverse sampling probabilities so that the means were estimates of sector in the country at the time of each round. The study did not observe tufting in Pakistan.

Compared to Nepal, there were few substantive differences between rounds in Pakistan. The numbers of workers and unit wages were similar across all three rounds. Unit wages in Pakistan were similar to India and substantively greater than in Nepal. The prevalence of factories with any workers under-18 was similar in Pakistan to Nepal and substantively greater than in India. Given the larger share of the workforce that is under-18 in Pakistan, children must be less diffuse across establishments in Pakistan compared to Nepal. By and large, schools were open during all three rounds of the Pakistan surveys.



The site observations appeared extremely similar across rounds. The only exception was that the prevalence of establishments with empty work spots was substantively lower in the third round, although the average number of empty work spots was roughly constant.

The workforce in Pakistan was almost evenly split by gender. A majority of the workforce was related to the manager, although there appeared to be a shift in the third round away from unrelated labor. In the first and second rounds, one-third of the work force was unrelated to the manager, but fewer than 10 percent were unrelated in the third round. Average hours were similar to India and less than Nepal and did not seem to vary substantively across rounds.

**Table 11: Employment Patterns in Pakistan across Survey Rounds**

	Round		
	1	2	3
<b>Establishment Characteristics (Last 30 Days)</b>			
# Workers	3.39	3.28	3.63
Unit Wage in USD	24.00	25.81	25.02
Any Workers <15	30.0%	20.6%	22.6%
Any Workers <18	42.7%	33.5%	35.1%
Days School Open in Last 7	5.20	5.36	5.90
Schools Closed in Last Week	0.1%	0.0%	0.0%
<b>Site Observations (at time of survey)</b>			
Prevalence of Establishments with Empty Work Spots	100.0%	100.0%	41.7%
# Empty Work Spots	1.99	1.95	1.90
Maximum # Workers	5.17	5.30	5.56
# Appear <18	0.71	0.66	0.72
Maximum Potential Children	2.61	2.61	2.62
Maximum Prevalence of Child Labor	50.5%	49.2%	47.2%
<b>Worker Characteristics (Worker Survey)</b>			
Under 15	14.3%	9.1%	8.3%
Under 18	22.6%	16.4%	16.2%
Female	49.5%	52.1%	51.8%
No Relation to Manager	35.9%	34.2%	9.5%
Migrant	13.2%	12.4%	15.9%
Owe Debt to Establishment	11.0%	15.7%	3.6%
Sleep inside Establishment	68.6%	83.7%	84.4%
Owe Debt & Sleep Inside	3.8%	12.3%	1.7%
Owe Debt, Sleep Inside, & Not Receive Pay	0.0%	8.1%	0.0%
Average Hours worked in last 7 Days	38.06	37.63	43.90
Average Hours worked by children in last 7 days	33.45	34.01	39.38

The second round followed three months after a devastating series of floods, and the patterns observed in debt and related indicators may have reflected that. Compared to the first round, in the second round the study observed more workers owing debt, more workers sleeping inside establishments, and more workers without pay. Nearly one in 10 workers fell in this combination category in the second round.

## 2.6.2. Production

The three rounds had the potential to capture seasonal production patterns. The first and third rounds in Pakistan were during planting season in agricultural areas. The second round was at the end of harvest and start of the dry season in most areas. Despite the similarity in timing in Pakistan and India, production in Pakistan appeared substantively different across rounds. Table 12 tabulates production patterns in Pakistan across the three survey rounds.

**Table 12: Production Patterns in Pakistan across Survey Rounds**

	Round		
	1	2	3
<b>Establishment Characteristics (Last 30 Days)</b>			
# Carpets Manufacturing	0.30	0.76	0.39
Capacity Utilization	76%	88%	78%
Prevalence of Subcontracting	1%	2%	1%
Revenue (in USD)	220.29	147.36	174.00
Profit (in USD)	102.22	96.96	64.68
<b>Most Recently Completed Carpet Characteristics</b>			
Hand-knotted	93%	90%	100%
Hand-Loomed	7%	10%	0%
Tufted	0%	0%	0%
Area (in square feet)	80.58	62.36	77.23
Weight (in pounds)	57.79	57.21	61.95
Price (in USD)	187.49	216.86	246.38
Profit (in USD)	137.22	132.23	138.35

All establishment characteristics refer to the 30 days prior to interview as the recall period. Source: Author's calculations from the Pakistan LD Study surveys. Data were weighted to be nationally representative.

The nature of carpet production in Pakistan was closer to India than Nepal, but even smaller in scale. In the first and second rounds, a majority of the establishments had not completed a carpet in the last 30 days. Sub-contracting was rare. Unlike India, profits were declining across the three rounds, although profits on the most recently completed carpet appeared stable.

The second round occurred in almost the exact same time period in all three countries. Whereas that time period was difficult in Nepal, it appeared to be the peak production period for Pakistan. Nearly twice as many carpets were manufactured in the second round compared to the first and third rounds. Capacity utilization was up as was sub-contracting (although still rare). Revenue was down slightly in the second round in Pakistan, although the ratio of profits to revenue was up. The fall of 2010 was not as difficult for the carpet sector in Pakistan compared to Nepal.

## 2.7. SUMMARY OF VARIATION IN EMPLOYMENT AND PRODUCTION IN REGION

The measurement of the conditions and prevalence of child labor in all three countries was the objective of the large-scale PC Study. The Labor Demand Study samples were small. Estimates of the prevalence of child workers from this study were imprecise, but there needed to be some discussion of what the data suggested for the prevalence of and changes in child engagement in carpet production. Table 13 contains tabulations of the number of workers, number of workers under-15, and number of workers under-18 in all three countries for each round. It compiles the information from earlier sub-sections in this report and does not contain new information.

**Table 13: Summary of Number of Workers in Hand-Made Carpet Production by Country and Survey Round**

	Round		
	1	2	3
<b>Total</b>			
Workers	401,935	435,249	434,256
Under 15	17,226	12,484	13,955
Under 18	34,216	26,266	31,705
<b>India</b>			
Workers	259,550	290,582	273,740
Under 15	0	1,163	2,791
Under 18	5,581	4,269	8,212
<b>Nepal</b>			
Workers	23,488	25,817	29,197
Under 15	197	295	247
Under 18	1,736	2,220	2,098
<b>Pakistan</b>			
Workers	118,897	118,850	131,319
Under 15	17,029	11,026	10,917
Under 18	26,899	19,777	21,395

Source: Author's calculation from LD Study surveys. All counts were weighted to be nationally representative.

A majority of the carpet workers were in India. Of the children under-15 working in the hand-made carpet industry, between 78 and 99 percent were in Pakistan. Three-fourths of children under-18 working in carpet establishments were in Pakistan. In the first round, there were more children under-18 working in Pakistan than there were total workers in Nepal.

Children under-15 were between three and four percent of the total hand-made carpet workforce in the region. Children under-18 represented between six and nine percent. The study observed the largest number of workers in the second round, and the largest number of children were reported working in the first round. Taken together, there was some variation from round to

round, but the measured movements in total and child employment across the three rounds of the survey were less than were expected.

In sum, the LD Study encompassed at least two different seasons in each country and did not observe the large differences in output and labor use that were expected. It was possible that the seasonal variation existed but was offset by business cycle variation and economic shocks. The study also did not observe a transparent decline in the industry in any of the countries. Nepal's industry seemed to have done badly during the second round in December 2010; average profits were negative; and capacity utilization was only 76 percent. Despite that bad period, the industry in the summer of 2011 appeared similar to the late spring of 2010. The LD Study data did not provide convincing support for any claims of substantive, on-going trends in the region over the period of study.

## DETERMINANTS OF CHILD EMPLOYMENT

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### 3.1. BACKGROUND – THEORIES ON WHY EMPLOYERS USED CHILD LABOR

A core goal in the study was to understand the decision to employ children. This LD Study was unique in the child labor literature in collecting data on child employment with detailed establishment level data. The study used the data to distinguish among several popular theories of why children were employed. Child labor research has focused almost exclusively on labor supply. The key insights about how firms choose workers are typically not discussed.

To fix ideas, it is worthwhile to review the Theory of the Firm. Consider an establishment maximizing profits by producing hand-made carpets in a competitive marketplace. The establishment takes input prices as given, and an infinite supply of all inputs is available to the establishment at established market prices. Output prices are also fixed from the establishment's perspective. It has a given production technology through which it converts purchased input into output.

The production technology for hand-made carpets requires raw materials such as wool, capital such as looms, and labor. Child and adult labor are substitutes in production meaning that the establishment can substitute child for adult labor. They might not be perfect substitutes. However, it seems reasonable to assume they are substitutes given that either can sit on a line and weave (in the case of hand-knotting).

A profit-maximizing establishment minimizes its costs. When choosing two types of labor, it chooses the cheaper. If child and adult labor were perfect substitutes, firms would specialize depending on whether the relative cost of child labor was greater or less than its relative productivity. If child and adult labor were not perfect substitutes, then the mix of child and adult labor within an establishment would depend on their relative costs and relative productivity. With diminishing marginal products in each type of labor, establishments choose relatively more children when they are relatively cheap. This implies that given child wages and the amount of output from the establishment, higher adult wages imply more child labor. Given adult wages and output, higher child wages imply less child labor. When the study does not condition on output, the relationship between relative wages and labor use is less clear, because relative wages also influence the optimal level of output (where the marginal cost of production equals the product price).

The study refers to this prediction that firms hire child labor when it is relatively inexpensive as the **competitive markets hypothesis**. The competitive markets hypothesis does not say anything about what types of families choose to let their children work or why. Adult and child wages are

determined in local labor markets based on the types of jobs available. Given prevailing wages, establishments choose what type of labor to use and families determine whether their children work. However, each establishment perceives an infinite cache of child and adult labor to draw on. Seasonality can lead to relative wage movements and, therefore, influence the mix of child and adult labor within the same establishment over time.

This discussion about employment decisions presumes that children are productive workers. This seems reasonable given field experience, but it is plausible that the presence of children on site might reflect adult employment rather than the use of child labor in production. Consider two examples. Suppose children are unproductive, but it is possible to attract adult labor at a reduced market wage by allowing their children to accompany them (carpet establishments might have comparative advantage by having extended family present in the work place). Alternatively, suppose children can be productive, but regulation constrains them to perform only relatively unproductive tasks when in carpet establishments (for example, they are prohibited from weaving). In these cases, the cost-minimizing establishment uses less adult labor as wages rise. Child labor should be unrelated to child wages either conditionally or unconditionally. Whether adult labor declines with adult wages or is inelastic conditional on output depends on whether it is possible to substitute adult labor and other inputs to production.

The study refers to this hypothesis that child labor is just in the establishment as a companion to adult labor as the **surplus child labor hypothesis**. The observable implications of the surplus labor hypothesis are similar to what could be observed if adult labor markets were competitive and child labor was forced labor. While there is likely substantive forced labor in the carpet sector in the region, the researchers did not think it was widespread enough to characterize the average employment relationship whereas the surplus labor hypothesis could.

When does the competitive markets hypothesis break down? It fails when establishments face constraints on their ability to hire in labor or when families face constraints on their ability to sell labor. When competitive markets fail, wages impact the availability of labor to the establishment. The availability of labor determines labor productivity and hence wages. An extreme example of this is a household based establishment without an external labor market. Labor supply and wages are jointly determined. When poverty is a key determinant of child labor supply, higher adult wages lead to less child labor, because families are less motivated to have their children work. Higher child wages lead to more child labor to take advantage of its productivity.

The study refers to this as the **poverty hypothesis**. Note that under the competitive markets hypothesis, child labor supply may be motivated by poverty related concerns, but poverty does not affect the solution to an individual establishment's solution to its cost minimization problem.

Another version of the hypothesis that participation in carpet establishments reflects market failures is the **absorptive labor hypothesis**. This hypothesis posits that children and adults both work in carpet establishments when few other employment options are available. This hypothesis is commonly asserted with regards to cottage industries and is consistent with accounts we heard in the field that claimed that carpet manufacture was unprofitable. The implication of the absorptive labor hypothesis is that carpet employment increases for both adults and children when wages are lower.

These different theories have implications for the conditional correlations that should exist in the data for the relationship among child employment, adult employment, and wages. By conditional correlation, the study means the correlation among these variables controlling for other input prices and output. Table 14 summarizes the empirical implications of these four hypotheses:

**Table 14: Summary of Empirical Implications of Theories**

Hypothesis:	Sign of Conditional Correlation between Child Employment &:	
	Adult Wages	Child Wages
Competitive Markets	+	-
Surplus Child Labor	-	0
Poverty	-	+
Absorptive Labor	-	-

These four hypotheses have different implications for the sign of the correlation among adult wages, child wages, and child employment. The focus of the empirical work was to estimate the relationship between variation in adult and child wages and the employment of children.



### 3.2. EMPIRICAL METHODS

The basic approach is to use linear regression techniques to distinguish among these theories. This study regresses child employment on adult wages and child wages in the community controlling for output. Wages affect both output and the mix of inputs. By conditioning on output, the study controls for the effect of prices on the establishment's cost minimization problem. This captures only the relative price effects that are the focus of the previous section's discussion. Nonetheless, this study also reports the results that do not condition on output. In some cases (as in surplus child labor), the theory has implications for the unconditional relationship between wages and child employment although in general the unconditional results are harder to interpret. Estimating total employment responses to wages embody the effect of prices on the solution to the establishment's cost minimization problem in addition to the relative wage effects.

This analysis focuses on three measures of child employment. From the worker survey, this observes the number of workers present who are under-18 and the number of workers present who are under-15. The choice of ages is discussed in the PC Study report. There is sensitivity to issues associated with child labor in the carpet sector in all three countries, at least at the political level. Hence, the study was concerned about misleading manager reports or worker responses. In the site surveys, the researchers asked enumerators to record the number of workers present who appeared to be under-18. In the labor section, this study discussed a fourth measure of potential child employment that coupled enumerator reports of children with enumerator reports of missing work-spots. This proxy for the maximum prevalence of child labor in an establishment was uncorrelated with any of the control variables discussed below in any of the regressions reported below. This seems consistent with the prior assertion that these "empty" work-spots were random rather than systematic concealment of child laborers.

Those manager and enumerator responses about the prevalence of child employees on site are apt to be mismeasured. Measurement error in outcomes adds variance to the empirical work and leads to false failures to reject null hypotheses. It need not create bias in the estimates. Measurement error in outcome can lead to bias if the error is correlated with variables of interest. The study did not have a priori reason to expect mismeasurement of child employment to be correlated with wages, but the likelihood of false failures to reject implies that the study should pay attention to the size and magnitudes of regression coefficients in addition to the t-statistics associated with nulls the regression coefficients are zero.

This study measures adult and child wages at the community level. There are reports on typical daily earnings for adults and youths under-18 in the community survey and in the establishment survey in each round of data collection. All of the records are incomplete to some degree, because the questionnaire asked daily earnings in specific activities. Few respondents had

information across the full range of activities. Hence, the study pooled all the responses on daily earnings for children in a community and took the maximum as the measure of the cost of hiring child labor. This procedure was repeated for adults.

One concern with estimating the response of child employment to community wages is that there may be reasons why the wages carpet establishments pay differ from community wages because of some negative or positive amenity. Carpet wages need to be related to community wages, but it is plausible that the scaling of the regression coefficients is wrong when the study uses community wages. The study cannot regress child employment on establishment wages as establishment wages would be determined by child employment under some of the hypothesis described above.

To appropriately scale the coefficients while addressing the endogenous nature of establishment wages, the study implemented an instrumental variables procedure. This uses community wages as instruments for establishment wages. The idea behind this approach is that community wages do not separately impact child employment in carpets except through how they affect the wages establishments pay. These results are reported in tables under the heading “IV.”

This study prefers the community wage specifications to the IV specifications because they are simpler to interpret. Although the study reports IV results, the data never reject a Hausman test of the null that the IV and OLS results are the same. IV results are usually much larger in magnitude than the OLS results.

There are several other regression controls that are important to the analysis. It is possible that other local factor prices influence employment decision and the choice of child and adult labor. Hence, the study controlled for local prices of high quality wool and looms. Infrastructure may impact wages and child employment, so the study controlled for the availability of electricity, water, and transport disruptions in addition to survey rounds and country. Output is controlled for using the volume of carpets produced in the last 30 days. Employment is measured at the time of interview, but the last 30 days window is the narrowest to match to the employment period.

When the study omits output as a control to capture the total employment effect of wages, it is important to control for factors associated with product demand because those factors potentially lead to a spurious correlation between prices and labor as they affect the optimal solution to the firm's cost minimization problem in the competitive model. We do not observe product demand, but conditional on the cost of inputs and the production technology (where there is not much variance within carpet type), product attributes should be demand driven. Hence, we include the product attributes provided for the most recently completed carpet as controls for product

demand in the regressions that omit output as a control. This includes, carpet type, knots per square foot if hand-knotted, carpet size, and carpet weight.

The LD Study collected detailed information on many other attributes of the establishments and surrounding communities that we suspected to be important in child employment decisions. Controls that did not address an obvious source of bias in estimating child employment – wage relationships and that did not appear to substantively reduce variance have been omitted. These include the manager’s education, age of establishment, engagement with unions, tax collections, social labeling programs, access to school, status of schools, and incidence of natural disasters.

The choice of linear regression for this analysis is motivated by a desire for simplicity and ease of interpretation. Our analysis herein is not causal in nature, and linear regression is ideal for computing conditional expectations when the sample size precludes non-parametric methods. However, a linear model does not generate a distribution of predicted child employment that matches the empirical distribution of the outcome variables. That is not our goal, but it is useful to make sure that the sign of our conditional expectations are not changed when we attempt to address the empirical distribution of our outcomes. With the small sample, we stay parametric. We fit a Type II Tobit model with the controls above to test the robustness of the sign of our linear findings. The magnitude of the Tobit coefficients have the interpretation of marginal effects on an unobserved latent variable and are thus incomparable to the linear regressions, but the signs are consistent throughout.

### 3.3. REGION RESULTS ON DETERMINANTS OF CHILD EMPLOYMENT

While the number of children employed did not vary substantively in aggregate across rounds of the LD Study, there was considerable churning of labor within establishments over time. The purpose of this section is to report findings of the relationship between child and adult wages and child employment when data are pooled from all the countries. Results are presented separately by country below.

Table 15 contains our findings that will be used to interpret the association between wages and child employment. The table contains the results of six different regressions. The dependent variable in the table is the count of the number of children under-18 as provided in the worker survey. Columns (1) – (3) contain results controlling for total output in the last 30 days. Columns (4)-(6) do not condition on total output but control for demand conditions. The interpretation of results in columns (4) – (6) differ from the first 3, because the effects of wages on production decisions are also embodied in all the regression coefficients. Columns (1) and (4) contain OLS results, columns (2) and (5) contain IV results that instrument for establishment level wages with community wages. Columns (3) and (6) contain findings from the Tobit specification. The magnitude of the coefficients in the Tobit models cannot be compared to the OLS or IV coefficients.

**Table 15: Determinants of the Employment of Children Below 18**

	Conditional on Volume			Not Conditional on Volume		
	OLS (1)	IV (2)	Tobit (3)	OLS (4)	IV (5)	Tobit (6)
Child Wage (local)	-0.027	-	-0.091	-0.023	-	-0.088
	(0.038)	-	(0.117)	(0.035)	-	(0.115)
Adult Wage (local)	0.041	-	0.144	0.034	-	0.132
	(0.054)	-	(0.136)	(0.050)	-	(0.134)
Child Wage (estab.)	-	-0.147	-	-	-0.140	-
	-	(0.335)	-	-	(0.306)	-
Adult Wage (estab.)	-	0.513	-	-	0.408	-
	-	(0.751)	-	-	(0.724)	-
Price 10g Wool	0.003	0.002	0.008**	0.002	0.001	0.004
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.004)
Price 8x10 Loom	0.000	-0.000	0.002	-0.000	-0.001	0.001
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Factory	1.038**	0.780	1.655**	0.777**	0.600	1.061*
	(0.338)	(0.490)	(0.610)	(0.312)	(0.442)	(0.597)
Volume	-0.001*	-0.001	-0.004	-	-	-
	(0.000)	(0.001)	(0.006)	-	-	-

	Conditional on Volume			Not Conditional on Volume		
	OLS (1)	IV (2)	Tobit (3)	OLS (4)	IV (5)	Tobit (6)
Electricity Available	-0.108 (0.148)	-0.223 (0.207)	0.895 (0.960)	-0.113 (0.152)	-0.199 (0.194)	0.501 (0.927)
Substantive Electricity Disruptions	-0.244 (0.292)	0.000 (0.000)	-1.178** (0.520)	-0.238 (0.272)	-0.237 (0.280)	-1.093** (0.513)
Water Available	-0.772 (0.539)	0.000 (0.000)	-1.892** (0.749)	-0.767 (0.528)	-0.766 (0.534)	-1.837** (0.726)
Regular Transport Available	-0.206 (0.299)	0.000 (0.000)	-0.916 (0.561)	-0.311 (0.280)	-0.415 (0.320)	-1.048* (0.553)
Round 2	0.282 (0.241)	0.127 (0.342)	0.507 (0.569)	0.194 (0.216)	0.075 (0.324)	0.361 (0.557)
Round 3	-0.170 (0.192)	-0.463 (0.597)	-0.979 (0.669)	-0.130 (0.207)	-0.374 (0.648)	-0.779 (0.672)
Pakistan	1.029** (0.296)	1.250** (0.452)	7.467** (0.799)	0.758** (0.303)	0.906** (0.428)	6.724** (0.963)
Nepal	1.225** (0.274)	1.146** (0.279)	7.736** (0.872)	1.096** (0.250)	1.031** (0.302)	7.393** (1.053)
<b>Most Recently Completed Carpet:</b>						
Hand-knotted	- -	- -	- -	-0.451** (0.194)	-0.401 (0.266)	-1.517 (0.944)
Knots per sq. foot of Hand-knotted	- -	- -	- -	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Carpet area (sq. feet)	- -	- -	- -	0.000 (0.001)	0.000 (0.001)	0.001 (0.002)
Carpet Weight (pounds)	- -	- -	- -	0.013** (0.004)	0.013** (0.006)	0.024** (0.005)
Constant	0.673 (0.490)	0.286 (0.762)	-9.128** (1.211)	0.776 (0.528)	0.505 (0.829)	-7.567** (1.324)
Observations	1564	1564	1572	1554	1554	1556

Notes: All counties pooled. Robust standard errors were clustered by locality\*survey round. All wages and prices were in USD. Columns 1-3 condition on output volume in the last 30 days. Columns 4-6 do not. Columns marked OLS contain OLS regressions of the outcome variable (see table heading) on the listed variables. Columns marked IV instrument for the establishment reported wages with community wages using two-stage least squares. Columns marked Tobit contain results from estimating a type II Tobit model. Coefficients are not comparable to other columns. \* significant at 10 percent. \*\* significant at 5 percent. Source: Author's calculations from LD Study.

The competitive markets hypothesis is that establishments produce a given level of output by using more of the cheaper factor. Hence, higher child wages reduce child employment. Higher adult wages raise child employment. That is exactly what we observe in Table 15. In column (1), an additional dollar of child wages leads to 0.03 fewer children employed when we control for adult wages, output, and the other controls listed in the column. An additional dollar of adult

wages leads to 0.04 more of the relatively cheaper child employment. Our findings are consistent with the competitive markets hypothesis in every column.

The other controls listed in the table are provided for completeness, but our focus is on the wage – child employment relationship. Hence, we mention the other controls only briefly. Factories employ more child workers than non-factories. Electricity disruptions reduce the use of children. The availability of water and the absence of transport disruptions also reduce the use of children. None of these relationships are causal, though.

Our findings for children under-15 are similar in spirit to what we observed for children under-18. The magnitudes of how the employment of children responds to changes in child and adult wages are within a few thousandths of what we estimated in the previous tables. Results for children under-15 are in Table 16.

**Table 16: Determinants of the Employment of Children Below 15**

	Conditional on Volume			Not Conditional on Volume		
	OLS (1)	IV (2)	Tobit (3)	OLS (4)	IV (5)	Tobit (6)
Child Wage (local)	-0.033** (0.015)	- -	-0.190 (0.135)	-0.032** (0.015)	- -	-0.179 (0.132)
Adult Wage (local)	0.041 (0.025)	- -	0.250 (0.156)	0.039 (0.025)	- -	0.233 (0.153)
Child Wage (estab.)	- -	-0.246 (0.197)	- -	- -	-0.245 (0.193)	- -
Adult Wage (estab.)	- -	0.408 (0.421)	- -	- -	0.374 (0.421)	- -
Price 10g Wool	0.001 (0.001)	0.000 (0.001)	0.011** (0.003)	0.000 (0.001)	-0.000 (0.001)	0.006 (0.004)
Price 8x10 Loom	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.002)	-0.000 (0.000)	-0.001 (0.000)	-0.002 (0.002)
Factory	0.462** (0.225)	0.340 (0.323)	1.308* (0.683)	0.387* (0.203)	0.283 (0.292)	1.017 (0.682)
Volume	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.008)	- -	- -	- -
Electricity Available	0.060 (0.081)	-0.021 (0.125)	0.827 (1.120)	0.031 (0.079)	-0.032 (0.119)	0.433 (1.097)
Substantive Electricity Disruptions	-0.234 (0.178)	0.000 (0.000)	-1.529** (0.563)	-0.220 (0.174)	-0.240 (0.184)	-1.385** (0.564)
Water Available	-0.740* (0.397)	0.000 (0.000)	-2.702** (0.850)	-0.742* (0.396)	-0.727* (0.396)	-2.667** (0.833)

	Conditional on Volume			Not Conditional on Volume		
	OLS (1)	IV (2)	Tobit (3)	OLS (4)	IV (5)	Tobit (6)
Regular Transport Available	-0.205 (0.183)	0.000 (0.000)	-1.734** (0.647)	-0.234 (0.183)	-0.329* (0.190)	-1.661** (0.646)
Round 2	0.177 (0.163)	0.081 (0.217)	0.291 (0.608)	0.148 (0.148)	0.054 (0.205)	0.157 (0.605)
Round 3	-0.047 (0.084)	-0.229 (0.322)	-0.861 (0.811)	-0.023 (0.094)	-0.199 (0.363)	-0.664 (0.812)
Pakistan	0.726** (0.211)	0.796** (0.267)	8.901** (1.117)	0.730** (0.209)	0.726** (0.256)	8.653** (1.325)
Nepal	0.057 (0.153)	0.073 (0.153)	5.124** (1.189)	0.092 (0.145)	0.066 (0.161)	5.255** (1.432)
<b>Most Recently Completed Carpet:</b>						
Hand-knotted	- -	- -	- -	-0.305** (0.148)	-0.278 (0.194)	-1.624 (1.046)
Knots per sq. foot of Hand-knotted	- -	- -	- -	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Carpet area (sq. feet)	- -	- -	- -	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.003)
Carpet Weight (lbs.)	- -	- -	- -	0.003** (0.002)	0.004 (0.003)	0.012** (0.006)
Constant	0.722** (0.358)	0.598 (0.545)	-9.183** (1.563)	0.891** (0.397)	0.794 (0.610)	-7.492** (1.674)
Observations	1564	1564	1572	1554	1554	1556

Notes: All counties pooled. Robust standard errors are clustered by locality\*survey round. All wages and prices are in USD. Columns 1-3 condition on output volume in the last 30 days. Columns 4-6 do not. Columns marked OLS contain OLS regressions of the outcome variable (see table heading) on the listed variables. Columns marked IV instrument for the establishment reported wages with community wages using two-stage least squares. Columns marked Tobit contain results from estimating a type II Tobit model. Coefficients are not comparable to other columns. \* significant at 10 percent. \*\* significant at 5 percent. Source: Author's calculations from LD Study.

The enumerator site surveys lead to larger coefficients than we observe using the worker survey data in the two previous tables. Our findings when the dependent variable is the enumerator's report of the number of children below-18 are in Table 17.

**Table 17: Determinants of the Employment of Children that Appear Below-18**

	Conditional on Volume			Not Conditional on Volume		
	OLS (1)	IV (2)	Tobit (3)	OLS (4)	IV (5)	Tobit (6)
Child Wage (local)	-0.113** (0.038)	- -	-0.455** (0.145)	-0.107** (0.038)	- -	-0.461** (0.148)
Adult Wage (local)	0.152**	-	0.595**	0.143**	-	0.593**

	Conditional on Volume			Not Conditional on Volume		
	OLS (1)	IV (2)	Tobit (3)	OLS (4)	IV (5)	Tobit (6)
	(0.062)	-	(0.165)	(0.061)	-	(0.167)
Child Wage (estab.)	-	-0.789	-	-	-0.742	-
	-	(0.489)	-	-	(0.458)	-
Adult Wage (estab.)	-	1.675	-	-	1.578	-
	-	(1.062)	-	-	(1.041)	-
Price 10g Wool	0.003	-0.001	0.006	0.001	-0.002	0.003
	(0.002)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Price 8x10 Loom	0.001**	0.000	0.005**	0.001*	-0.000	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Factory	1.364**	0.756	2.445**	1.113**	0.563	1.843**
	(0.397)	(0.558)	(0.514)	(0.364)	(0.507)	(0.508)
Volume	-0.001**	-0.002*	-0.005	-	-	-
	(0.001)	(0.001)	(0.005)	-	-	-
Electricity Available	-0.265	0.000	-1.013	-0.307	-0.647**	-1.412**
	(0.181)	(0.000)	(0.717)	(0.187)	(0.273)	(0.709)
Substantive Electricity Disruptions	-0.268	0.000	-1.133**	-0.251	-0.256	-1.022**
	(0.345)	(0.000)	(0.448)	(0.331)	(0.366)	(0.444)
Water Available	-0.904	0.000	-1.497**	-0.902	-0.874	-1.530**
	(0.703)	(0.000)	(0.619)	(0.694)	(0.723)	(0.608)
Regular Transport Available	0.397	0.000	0.916*	0.302	-0.103	0.788*
	(0.291)	(0.000)	(0.481)	(0.277)	(0.363)	(0.478)
Round 2	0.073	-0.354	-0.686	-0.030	-0.444	-0.921*
	(0.256)	(0.409)	(0.485)	(0.231)	(0.399)	(0.479)
Round 3	-0.571**	-1.421*	-2.728**	-0.561**	-1.432	-2.472**
	(0.212)	(0.807)	(0.559)	(0.235)	(0.888)	(0.565)
Pakistan	0.899**	1.391**	4.919**	0.713**	1.079*	5.148**
	(0.324)	(0.634)	(0.639)	(0.312)	(0.628)	(0.760)
Nepal	1.963**	1.884**	7.849**	1.897**	1.713**	8.417**
	(0.270)	(0.348)	(0.713)	(0.257)	(0.384)	(0.858)
<b>Most Recently Completed Carpet:</b>						
Hand-knotted	-	-	-	-0.626**	-0.485	-2.484**
	-	-	-	(0.214)	(0.348)	(0.737)
Knots per sq. foot of Hand-knotted	-	-	-	-0.000	-0.000	0.000
	-	-	-	(0.000)	(0.000)	(0.000)
Carpet area (sq. feet)	-	-	-	-0.000	-0.000	0.000
	-	-	-	(0.001)	(0.001)	(0.002)
Carpet Weight (lbs.)	-	-	-	0.012**	0.012*	0.018**
	-	-	-	(0.004)	(0.007)	(0.004)



	Conditional on Volume			Not Conditional on Volume		
	OLS (1)	IV (2)	Tobit (3)	OLS (4)	IV (5)	Tobit (6)
Constant	0.334 (0.596)	-0.501 (0.902)	-6.713** (0.905)	0.653 (0.610)	-0.136 (0.985)	-4.913** (1.007)
Observations	1566	1566	1568	1562	1562	1564

Notes: All counties pooled. Robust standard errors are clustered by locality\*survey round. All wages and prices in USD. Columns 1-3 condition on output volume in the last 30 days. Columns 4-6 do not. Columns marked OLS contain OLS regressions of the outcome variable (see table heading) on the listed variables. Columns marked IV instrument for the establishment reported wages with community wages using two-stage least squares. Columns marked Tobit contain results from estimating a type II Tobit model. Coefficients are not comparable to other columns. \* significant at 10 percent. \*\* significant at 5 percent. Source: Author's calculations from LD Study.

Fixing output and controlling for adult wages, an additional dollar in child wages leads to a tenth fewer children. An additional dollar in adult wages leads to 0.15 more children. The enumerator survey data is also consistent with the competitive market hypothesis.

### 3.4. FINDINGS FROM INDIA ON DETERMINANTS OF CHILD EMPLOYMENT

While there appear to be more children working in the carpet sector in India compared to Nepal, it difficult to measure a relationship between the employment of children and local wages. The expected reported prevalence of children in a randomly selected establishment in India is very low. Our findings for India are reported in Table 18.

**Table 18: Determinants of Child Employment in India**

	# Below 18		# Below 15		# Appear Below 18	
	(1)	(2)	(3)	(4)	(5)	(6)
Child Wage (local)	0.029 (0.046)	0.021 (0.049)	-0.002 (0.010)	-0.004 (0.012)	-0.095 (0.111)	-0.077 (0.104)
Adult Wage (local)	0.028 (0.039)	0.037 (0.039)	0.006 (0.007)	0.009 (0.007)	0.326* (0.174)	0.278* (0.149)
Factory	-0.167 (0.105)	-0.171 (0.105)	-0.032* (0.017)	-0.032* (0.018)	-0.102 (0.155)	-0.107 (0.128)
Volume	-0.000 (0.000)	- -	-0.000 (0.000)	- -	-0.001 (0.000)	- -
Observations	521	521	521	521	523	523

Notes: Dependent variable indicated by super-header (row 1). All results are based on OLS regressions with robust standard errors in parenthesis clustered by locality\*survey round. All wages and prices in USD. Included, but not shown, are all the other regression coefficients listed in Table 15. Columns 1, 3, and 5 condition on output volume. Columns 2, 4, and 6 condition on most recently completed carpet characteristics. Source: Author's calculation from the India LD Study.

There is essentially no measurable relationship between worker survey reports of the number of children below-18 or below-15 present and wages. Unlike other countries where the patterns observed in the site survey reports are consistent with the worker survey, we observe a more substantive relationship between wages and the number of workers who appear below-18 in India. Conditional on output on child wages, an additional dollar in adult wages increases the number of workers who appear to be below-18 by 0.3. Conditional on output and child wages, an additional dollar in child wages decreases the number of workers who appear to be below-18 by 0.1. Thus, columns 5 and 6 are consistent with the competitive markets hypothesis.

### 3.5. FINDINGS FROM NEPAL ON DETERMINANTS OF CHILD EMPLOYMENT

Fewer children work in the carpet sector in Nepal compared to India, but their prevalence is higher. Children are also more widely spread across establishments than we observe in Pakistan. We examine the competing hypotheses about why children work in the carpet sector in Nepal in Table 19.

**Table 19: Determinants of Child Employment in Nepal**

	# Below 18		# Below 15		# Appear Below 18	
	(1)	(2)	(3)	(4)	(5)	(6)
Child Wage (local)	0.288** (0.092)	0.270** (0.085)	0.003 (0.013)	0.002 (0.014)	-0.039 (0.105)	-0.056 (0.103)
Adult Wage (local)	-0.166 (0.240)	-0.108 (0.219)	0.044* (0.024)	0.049** (0.025)	0.084 (0.196)	0.111 (0.200)
Factory	1.951** (0.635)	1.460** (0.627)	-0.065 (0.064)	-0.032 (0.058)	2.015** (0.393)	1.590** (0.400)
Volume	0.011 (0.008)		0.003 (0.002)		0.023** (0.009)	
Observations	531	521	531	521	525	521

Notes: Dependent variable indicated by super-header (row 1). All results are based on OLS regressions with robust standard errors in parenthesis clustered by locality\*survey round. All wages and prices in USD. Included, but not shown, are all the other regression coefficients listed in Table 15. Columns 1, 3, and 5 condition on output volume. Columns 2, 4, and 6 condition on most recently completed carpet characteristics. Source: Author's calculation from the Nepal LD Study.

Each of the three different measures of child employment in the table produces different findings. We focus our discussion on the findings that condition on output (columns 1, 3, and 5). In column (1), an additional dollar in adult wages when child wages are fixed leads to 0.2 fewer children below-18, 0.04 more children below-15, and the appearance of an additional 0.08 children under-18. Fixing adult wages, a dollar rise in child wages leads to 0.3 more children under 10, no effective change in children under-15, and the appearance of 0.04 children under-18. This pattern of response in under-18 does not match the prediction of the competitive markets hypothesis. Instead, the increase in child employment with higher child wages and the decline with higher adult wages is consistent with poverty motives for child employment, a classic model of labor supply rather than the hiring decisions of perfectly competitive enterprise.

While the under-18 results match the predictions of the poverty hypothesis, the results using enumerator reports of the number of workers who appear under-18 are consistent with the competitive markets hypothesis. The results in column (5) are not statistically significant, but higher adult wages are associated with more children who appear under-18 and higher child

wages are associated with less. We do not have an explanation for why we observe inconsistent findings across the three measures of child labor in the carpet sector in Nepal.

### 3.6. FINDINGS FROM PAKISTAN ON DETERMINANTS OF CHILD EMPLOYMENT

The measurement of the relationship between economic variables and child employment is simplest in Pakistan where prevalence rates are the highest and where there is variation in wages observed in the data compared to India and Nepal. Table 20 contains our findings.

**Table 20: Determinants of Child Employment in Pakistan**

	# Below 18		# Below 15		# Appear Below 18	
	(1)	(2)	(3)	(4)	(5)	(6)
Child Wage (local)	-0.083** (0.040)	-0.087** (0.040)	-0.056** (0.024)	-0.059** (0.025)	-0.105** (0.053)	-0.110** (0.052)
Adult Wage (local)	0.113* (0.061)	0.111* (0.058)	0.074** (0.034)	0.074** (0.035)	0.145* (0.082)	0.142* (0.078)
Factory	0.457 (0.583)	1.421** (0.679)	0.408 (0.442)	1.112** (0.506)	0.501 (0.650)	1.701** (0.804)
Volume	0.262** (0.060)		0.198** (0.048)		0.309** (0.068)	
Observations	512	512	512	512	518	518

Notes: Dependent variable indicated by super-header (row 1). All results are based on OLS regressions with robust standard errors in parenthesis clustered by locality\*survey round. All wages and prices are in USD. Included, but not shown, are all the other regression coefficients listed in Table 15. Columns 1, 3, and 5 condition on output volume. Columns 2, 4, and 6 condition on most recently completed carpet characteristics. Source: Author's calculation from the Pakistan LD Study.

All three measures of child involvement follow a similar pattern. We focus on column (1) as our default specification. Fixing output and adult wages, an additional dollar in child wages leads to approximately 0.1 fewer child workers. An additional dollar in adult wages leads to 0.1 more child workers. These results conform to the competitive markets hypothesis exactly. The similarity in magnitudes of responses of child employment to variation in wages is also strictly. A wide class of models can generate this type of relationship, but one where adults and children are perfect substitutes in production would imply identical and opposite signed responses of employment to wage movements under perfect competition.

### 3.7. SUMMARY

The coefficients in the tables above in this section are convenient to interpret, because all of the wage data have been translated to the same currency unit (dollars). However, the substance of a \$1 change in wages is very different in Nepal compared to Pakistan. We transform the coefficients on child and adult wages into unitless elasticities in Table 21.

**Table 21: Implied Conditional Wage Elasticities of Child Employment at Sample Means**

	Below 18		Below 15	
	Child Wage	Adult Wage	Child Wage	Adult Wage
Full Sample	-0.20	0.29	-0.84**	0.97
India	0.42	1.00	-1.15	1.30
Nepal	0.63**	-0.32	0.08	1.01**
Pakistan	-1.16**	1.47*	-1.24**	1.52**

Elasticities are computed using the OLS specification that conditions on volume for the outcome variable indicated by the column super-header (row 1) and the independent variable indicated by the header (row 2). The Full sample elasticities use results from Table 15 and Table 16. The country results in the remaining rows use results from Table 18, Table 19, and Table 20 for India, Nepal, and Pakistan respectively. \* is significant at 10 percent. \*\* is significant at 5 percent. Source: Author's calculations from LD Study data.

An elasticity is the percentage change in the dependent variable for a percentage change in the independent variable. In Table 21, the dependent variable is given by the first row of the table (the super-heading). For columns 1 and 2, the dependent variable is the number of children reported as below 18 from the worker survey. For columns 3 and 4, the dependent variable is the number of children reported as below 15. The independent variables in Table 21 are listed as the column headings in row 2. For columns 1 and 3, the independent variable is the child's daily wage. For columns 2 and 4, the independent variable is the adults' daily wage.

Coefficients are converted to elasticities in Table 21 by dividing the appropriate regression coefficients by the ratio of mean employment to mean wages. The appropriate regression coefficient depends on the sample (indicated by the row variable) in addition to the dependent variable and independent variable. For example, the first row of elasticities for the full sample is based on regression results in Table 15 and Table 16 in this section. The country specific elasticities are computed from the country level regression results below.

The elasticities for the full sample and Pakistan are consistent with the competitive markets hypothesis. The full sample elasticity of the employment of children under 15 to child wages of -0.84 implies that a doubling of child wages (holding output, adult wages, and all the controls in Table 16 constant) leads to an 84 percent reduction in child employment. A doubling is a 100 percent change. A doubling of adult wages doubles the employment of children under 15.

While the Pakistani results are consistent with competitive markets, the results estimated separately for India and Nepal are more ambiguous. For India, the elasticities are large, but they are extremely imprecisely measured. In Nepal, we observe different results across outcomes. The under 18 counts are consistent with the poverty hypothesis. The enumerator site observations are consistent with competitive markets. Our expectation in advance was that the competitive market hypothesis would clearly fit the Nepali data and that other countries would be more ambiguous. We are surprised to see the ambiguity in Nepal and clearly competitive markets in Pakistan.

## POLICY IMPLICATIONS

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This study has two goals. First, by following a panel of establishments, it documents how employment in the carpet sector varied across 15 months. Second, by collecting comprehensive data on establishments and their communities, this study considers why carpet establishments employ children.

There was variation in total employment during the period under study. Our results imply an increase in workers in the carpet sector in each success round of the survey in aggregate from 401,935 workers in spring 2010 to 434,256 workers in summer 2011. This phenomenon of increasing workers in successive rounds was not in the Indian or Pakistani data. Employment increased between round 1 and 2 in India, but it fell between rounds 2 and 3. Pakistan total employment fell between rounds 1 and 2 and increased between rounds 2 and 3. In every round, a majority of workers were in India.

Child employment appeared more variable than total employment. Children moved from 34,216 or 9 percent of the total carpet labor force in round 1 to 26,266 or 6 percent in round 2 and 31,705 or 7 percent in round 3. The greater variation in estimates of child employment than total employment is consistent with our main finding from the analytical portion of our discussion that there seems to be substitutability between children and adults in employment. While India had more than half of the total hand-made carpet workforce, three-fourths of employed children were in Pakistan.

The production data document variation as well. In Pakistan, establishments varied between using 76% and 88% of capacity. In Nepal, they moved between 76% and 97%. Profitability also varied. November and December 2010 were difficult for Nepali establishments with low capacity utilization and negative profits. In contrast, this was the busiest period for Pakistan. While Nepali profits were higher in the last round of data collected in the summer of 2011, profits were lower in Pakistani establishments in each successive round. They were higher in each successive round in India. Whether these patterns were seasonal, idiosyncratic, or reflecting long-term trends cannot be identified with the data.

This volatility in child employment and production is consistent with a dynamic economic environment that provides ample variation to consider the question of why carpet establishments employ children. We pose several different theories for why children might work in carpet establishments. When considering all three countries together, we observe employment behavior that is consistent with competitive markets. Carpet establishments appear to behave like profit-maximizing firms in a competitive economic environment. This finding is especially strong in Pakistan where most children in the carpet sector are employed. We observe this competitive behavior for children below 18 and below 15 in Pakistan and below 15 in India.



Child employment in carpet establishments may be different in Nepal than in Pakistan and India. For the young age group, children under 15, there does not appear to be a relationship between child wages and child employment although employment of those under 15 increases with parental wages, consistent with the competitive model. However, for the under 18 population, the model is consistent with the poverty hypothesis. Market imperfections intertwine labor supply and demand decisions, so higher child wages increase child employment to capture the additional income. Higher adult wages lead to less child employment. We were surprised to see the data in Pakistan suggest perfectly competitive markets whereas Nepal presented some hint of market imperfections. Our priors were the opposite. However, the different Nepali results are consistent with our observation that child workers are much more diffuse across establishments in Nepal compared to the India and Pakistan. Children in Nepal might be there to help their parents whereas workers in India and Pakistan seem more like employees. That said, our enumerator provided counts of workers who appear under 18 suggest that the competitive model fits in Nepal as well as India and Pakistan. In the end, we are uncomfortable making any strong statements about the nature of child employment in carpet establishments in Nepal given the ambiguity of our findings in that country.

What are the implications of this finding that, as a general characterization of the carpet sector across all the countries and especially valid for Pakistan, carpet establishments behave like perfectly-competitive profit-maximizing businesses? First, the potential for unintended consequences of anti-child labor policies are ripe. Anything that lowers child wages induces establishments to switch towards more child employment. This might arise from policies aimed to reduce the availability of child employment in sectors other than carpets. Similarly, anything that raises adult wages could also induce more child employment. New employment opportunities in communities, especially those targeted at adults because of design or difficulty could increase adult wages, making child labor more attractive to the carpet sector.

Second, raising the cost of child employment in the carpet sector is an effective way to deter child involvement in the sector. An increase in the cost of employing a child in carpets induces a substitution towards adults and away from children. Diverting children out of the carpet sector appears to be a goal of policy. This goal can be achieved with measures that raise the costs of employing children. However, the impact of this policy will be diversion because of the existence of competitive markets. There are alternative employment opportunities available and adult employment substitutes for child employment. Children shift to other types of employment. Hence, in considering the welfare consequences of efforts to raise the cost of child employment, it is critical to understand the nature of other employment opportunities in the local economy. Because markets appear perfectly competitive, the shifting of carpet work to adults is unlikely to affect the family's motives for having the child work. These possible diversions and unintended consequences have been often discussed in the theoretical literature, but the appropriateness of

the theoretical assumptions about local labor markets at the core of these models have not been established empirically until this study.