

# **Child Labour in Glass - Bangless Industry of Ferozabad - Uttar Pradesh**

**- An Economy Anlaysis**

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## CHILD LABOUR IN GLASS – BANGLES INDUSTRY OF FEROZABAD – UTTAR PRADESH – An Economic Analysis

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### Introduction

Before we began this study, over 50,000 children were generally believed to be languishing in the hazardous glass industry of Ferozabad in Uttar Pradesh. It was commonly believed that children were necessary to carry the rod with molten glass on the top, as the children run fast and are smaller and so can better navigate in the cramped work sites. The available research and popular literature also indicated that child labour was concentrated in the production of glass bangles. For these reasons, the glass bangles industry, rather than the glass industry as a whole, was taken up for study by Centre for Operations Research and Training (CORT) in collaboration with International Labour Organization, Geneva.

This study differs from other studies of child labour. The focus of the study is not the child and his/her family background, but the industry. The paper makes an attempt to understand whether adults can substitute for children or whether children bring a unique and irreplaceable skill, and in turn how the cost of production of the industry would be affected, by the elimination of child labour whether improved production process (where child labour is not needed) could be introduced, etc.

An enterprise survey was carried out in the glass bangle manufacturing industry at Ferozabad, Uttar Pradesh. The production process for glass bangles involves in number of different and distinct stages. Enterprises were selected from all the different stages. In all, 268 producing enterprises with 4100 workers and approximately 1000 child labours were covered in this survey.

At the outset, it is important to stress three aspects of the glass bangles industry which made the study difficult. First there is extreme nervousness and deferenceness in the industry about the use of child labour. Second the labour market in the industry is disintegrated. The production process is broken down to such an extent that each stage of production involves subcontracting to another set of enterprises. Finally there

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was little hard evidence previously available on the economic dimension of child labour problem on which we could draw.

### Background on Industry

The glass industry in Ferozabad produces bangles (thin glass bracelets), utensils, decorative pieces, bulbs etc. The government has designated the glass industry as a prohibited industry for child labour, because of the concentration of children and the health hazards believed to be involved.

Glass bangles have a symbolic significance within the social system of India. It would be considered as a bad omen if either a married or an unmarried female does not have bangles on her hand. On occasions like marriage there are special ceremonies when the bangles are worn not only by all the females in the family where the marriage is taking place, but also the relatives, close friends are invited for this occasion. Many a time, the colour of the bangles are specific to certain ceremonies. And, of course, it is also considered as well dressed if the colour of the dress and that of bangles match.

One problem for the industry is that fashion trends have changed and glass bangles are no longer a regular wearing accessory. Also many girls and women find it a hindrance due to its fragility. But probably the main competitive pressure for keeping costs down is the reasonably high price elasticity of demand for glass bangles. As they are worn by the masses, even small increases in price might have a significant effect on demand for the product.

The glass bangles industry is concentrated in and around the city of Ferozabad<sup>1</sup>. Virtually all the production of glass bangles in India takes place in Ferozabad. The development of glass industry started around 1910 and the "belan" (where the glass is rolled or "spun" prior to making bangles) developed around 1932–35. In the early 1950s there were said to be around 20–22 factories with Ustad Qadir Bux and Rustam Ustad acknowledged as among the developers of the modern system of glass bangles manufacturing.

At present, glass factories are very large establishments, with hundreds of workers, and these are registered under the Factories Act<sup>2</sup>. They are easy to spot while walking around Ferozabad as they require chimnies for the exhaust of heat, and smoke. Yet, in the production of glass bangles most of the employment, including the employment of children, occurs in small, informal sector enterprises that are unregistered and difficult to observe as they are frequently located inside households and in small alleys.

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<sup>1</sup> Glass bangles wearing is basically an Indian subcontinent phenomenon (and there is similar glass bangles production in Pakistan begun by immigrants from India who moved there at the time of partition). There is no direct competitor in India for bangles from Ferozabad, as production is concentrated in Ferozabad.

<sup>2</sup> There are no specific government concessions given to the glass industry except previously there was a coal quota at a subsidized rate. But now with the liberalization going on, this advantage has largely disappeared.

These small informal sector enterprises specialize in particular stages in the production of glass bangles. There are sets of enterprises specializing in for example: straightening, hardening, joining, cutting or colouring. This type of production structure represents an extreme form of subcontracting where the production process is broken down into separate steps, with each step performed by a specialized set of informal sector enterprise under subcontract (involving piece rate payment). It is very important to understand and recognize and study this type of industry structure, because working conditions, pay rates and use of child labour vary greatly between steps in the production process and therefore 8th type of enterprise where children work.

### Child Labour in the Industry

Before estimating the number of child labourers engaged in the production of glass bangles, it is useful to have a description of each of the different types of enterprises noted above.

### Glass Bangle Factories

These are usually big enterprises with varying numbers of furnaces. The activities carried out around the furnace are usually performed by a team with each member of the team having a defined job who works continuously in a chain. This team, which produces the spring bangles, usually involves around 25 people. The number of furnaces producing the spring bangles varies depending on the size of the enterprise.

The factory sheds are large and open on the sides. The process of production of glass in the factory begins when soda ash, sand and chemicals are measured and mixed in the required proportion. This mixture is then carried to a large round furnace where the raw materials are heated to 1700° – 1800°C. Coal is used for fuel, and the furnace is continuously kept running by a furnace tender "the fireman" and his helper. A long iron rod about one and a half meter long is put into the furnace and dipped in the mixture and carried by a carrier to the 'shaper' (or 'loom maker') who gives it a cylindrical shape. The rod is again carried back to the furnace to add on more molten glass. This is done by the carrier, who moves to and for from the Gundiwala and the loom maker until the glass bulb or the labia at the end of the rod is about 8 to 10 inches long with a diameter of about one and a half inch or so at the bottom and slowly tapering towards the tip. Once this required size of glass bulb is achieved, the 'Gulliwala' adds on a different colour of glass on it if a second colour needs to added.

The 'sekai' makes it soft at the small furnace and then it is carried by the carrier to yet another small furnace where the rollers (or "belans") are. Here a small team of basically three people works as a team. The 'Tarkash' takes the rod with the molten glass on its tip from the carrier and puts it inside a metal box which acts as a sort of furnace. The glass comes out of this furnace in the form of thin wire (or 'tar') which gets rolled in the form of spring on a rod which is being rotated by the 'belan'. Each rod has about

216 bangles coming out in the form of spring. A third person takes out the rod once its length is covered by the spiral rings of glass. The 'Muthaiya' takes off the extra glass remaining on the rod which the 'tarkash' has finished with.

Basically each team consist of the following workers:

<u>Number</u>	<u>Local name by which they</u>	<u>Activities carried out are addressed</u>
2	Gundiwala	takes smallest block from furnace
2	Bubblewala	adds from the furnace
2	Battiwala	adds design, different colour from furnace
1	Gulliwala	adds glass over design from furnace
5	Thandi battiwala	carriers
2	Loom maker	patting glass on floor
2	Pailwala	cleans sticking glass
1	Sekai	makes it soft at a small furnace
1	Garam loomwala	takes it to the belan
1	Belania	rotates the rod there are two in an 8 hour shift
1	Tarkash	controls the glass on the rotating belan
2	Muthaiya	takes off extra glass from the rod
1	Mutha dikhanewala	shows to the manager
1	Gundhewala	cleans the labiya on the iron rod
1	Bhangin	female who cleans

Once the spring of bangles have been assessed by the manager as of acceptable quality, there are 3 to 4 other workers who are further involved before the bangle is ready to be sent to the next enterprise. One person cuts the spring of bangles by moving a diamond tip instrument across the spring. One or two person then count (giniya) these now split spiral rings which are then tied together in a bundle with a string by yet another person (puriya).

The number of workers in a team at a spinning unit in the factory in this case is 24–25. This is for good quality multicoloured bangles with design. For the relatively few refractory units where glass would generally be of one colour, the workers in a team goes down to 17–19.

All workers are employed on a daily basis except for the manager, clerk, etc. who are hired on a monthly basis. The daily wages of each of these workers depends on their expertise. It ranges from Rs 300–275–225 per shift for a Tarkash, to Rs 200–175–150 for a Belani (for 4 hours), to Rs 35–30 for Thandi battiwala, to Rs 100–90–70 for others.

Usually these units work for 9 to 10 hours, but the working time is considered to begin when the first mutha (spring from belan) comes out<sup>3</sup>.

For each spinning unit there is supposed to be a paniwala (one who goes around serving glass of water) usually done by a male child. He serves water to several spinning units. We did not enumerate paniwalas in our survey.

Among the different activities, the child labourer are generally involved as carriers, muthaiya and gundhiwala (see below section on irreplaceability of child labour).

***Straightening (Sadai):*** These are small, usually household based enterprises. Here, workers essentially line up the edges of the bangles after the glass spiral has been cut. This activity is usually done within the household by females using a small, slightly raised stone platform of about one feet by two to two and a half feet long. Small kerosene burners are kept around three edges of the stone. Typically, 22 to 24 small burners are arranged. The height of the stone is adjusted in such a way that the flame from the burner comes just over the edge of the stone. The female who sits on the longer side of the stone goes on arranging the bangles on these flames by putting the opposite side of the cut bangle on the tip of the flame and pressing on the cut edge, which then lines up with the other side of the bangle.

***Joining (Judai):*** The size of these enterprise generally varies from 2–3 to 10–15 burners. The owner might rent out on daily basis to different individuals or hire workers; or might pay piece rate daily for those working on these burners; or the owner herself/himself might sit and do the joining. If there are ten burners, the workers will sit in a row with five on each side facing the opposite person with one burner for each person. A pipe goes through the centre aisle, through which air is forced by a small motor on to the flames emerging from the kerosene pot. These motors may be operated by electricity or by generator. Sometimes the air is blown manually into these pipes by use of a 'turtle'. In this way, the flames are directed horizontally towards the worker who is sitting near a burner.

The worker – usually males (both adult and children) – takes a bunch of bangles, generally 6–7 at a time in his hand, and applies the cut edge of the bangle one at a time to the flame. This melts the glass slightly, thus joining it.

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<sup>3</sup> Production in the glass factory takes place generally in one shift only. There are a few cases of glass factories with and without bangles production working for 2–3 shifts; locals put the number of such enterprises around 8–10. On Sunday, factories and bigger units close down and there is no production. The rainy season is said to be bad for the industry. Furnace heating at the factory becomes a problem as the coal gets wet; the pakai bhatti don't work properly; in many cases the roofs are temporary or made of thatch and most likely to leak. There is no sewerage system and the roads and houses get flooded.

**Hardening (Pakai):** The glass bangle is considered to be very fragile after the joining stage. It is therefore sent for hardening to a different enterprise which basically consists of a small furnace constructed inside a thatched structure which is open on one or two side. The furnace is a mud structure with three levels of heat in it. Each furnace requires a team of three–four persons working together. One person, often a child, arranges the bangles in single rows on a metal tray, about 11 rows of 12–13 bangles at a time. Smaller bangles often are laid within the larger ones. The second person, an adult, places these metal trays with the help of a long wooden handle inside the furnace at the topmost level and approximately every minute moves down the tray at the top to the middle level and then to the lowest level. The temperature of the furnace is highest at the top and lowest at the bottom. The position of the trays are changed at an interval of about one minute. In the lowest level, the tray is rotated by 180 degrees, kept for about one minute and then dumped on the floor. In all, this baking/hardening takes about 5 minutes for one tray of bangles. The third person counts and puts the bangles into a string ready to be moved from there. Each string has one tora (312 or 13 double dozens) of bangles on it. Hardening (Pakai) is done at two different stages (but not for all types of bangles) – first after joining, and secondly after colouring.

**Cutting (Katai):** In this type of enterprise, designs are made on the bangle by holding them against a spinning wheel that has abrasive ridges. By varying the pressure and the angle, cuts and design are made on the bangle. There are two ways of applying pressure – with the hands or for more pressure with the feet. The spinning wheels on which designs had been cut, by diamond for example, are rotated either by a motor. For the smaller units, a generator is not available and it depends on electricity. Working hours would then depend on the availability of electricity which is irregularly available. The worker sits with a set of bangles in their hands and they rotate the bangles making the design on it. Each unit, or adda, usually consists of two spinning wheels. On each wheel two person sit on the opposite sides of the wheel to cut the bangle. A steady, slow flow of water is maintained over the rotating wheel so that it does not get hot. These spinning wheels last for 6 to 9 months. This activity is usually carried out by (mostly adult) males<sup>4</sup>.

**Colouring (Rangai):** Colouring of the bangles is again carried out in a separate type of household enterprise. Depending on the type of colour to be applied, the bangles might be sent to that respective enterprise. Basically there are four different ways in which colour is applied on the bangles (golden colour, multi-colour, metalized colour and mudai/twisted multi colour). The one processes described below (golden colouring) is by far the most common type of colouring. In addition, these are the types of enterprises which we included in our study.

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<sup>4</sup> It is also said that there are a few smaller units of katai at the household level which use one or two grinding wheels and female labour, but we did not observe these in our survey.

Small brushes made out of squirrel's tail are used for applying the golden colour which is a combination of golden colour and chemicals. This work is done both by men and women working within the enterprise. The workers paint on the cut marks made by the cutter. They work very fast with several (4–6 or so) bangles in their hand, using a brush to colour gold over the cut mark. They then rotate the set of bangles to the next cut mark and so forth until they finish the bangles in their hand.

From this colouring enterprise, the bangle is sent to the hardening unit once again. Only after they are baked does the golden colour appears fully on the bangle, till then it looks like a transparent solution. Compared to other bangles, these bangles are much stronger as they have undergone hardening twice.

### Estimates of Workers and Child Labour

There have been various estimates of employment and child labour in the glass industry (Table 1). Neera Burra (1986) estimated 200,000 total workers with 150,000 adults and 50,000 children. Debarish (1986) talked of 150,000 total workers and 40,000 child labour, whereas Prasant (1986) put the figure at 75,000 total workers. The wide variation in these estimates of child labour provide a flavour of how inexact is our knowledge on this.

Table 1: Previous estimates of adult and child labour in glass industry in Ferozabad				
Area	Total Workers	Employment –		Source
		Adults	Children	
Glass factories & potteries (including bangle making /joining)	20,000 to 23,000	12,000 to 15,000	8,000	Report on child labour in Indian industries. Labour bureau, Ministry of Labour, govt. of India Shimla 1981
Bangle cutting	26,000 to 31,000	20,000 to 25,000	6,000	
Glass Ferozabad	2,00,000	150,000	50,000	Neera Burra 1986–Glass factories of Ferozabad II: Plight of child workers in Eco. & Pol. Weekly vol.XXI. No.47, 22 Nov. 2033
Glass	150,000		40,000	1986 Debarish Chatterji "Child labour in Glass industry; Surya India" in Children of Darkness – A manual on child labour in India
Glass	75,000			1986 Prasant Kumar, squeezing blood from glass, in children of darkness

The CORT/ILO study also collected data which enables us to estimate employment by sex for adults and child labourers. How these data, were collected and how they are used to estimate employment by age and sex are described below.

As indicated above, the production process for glass bangles involves a number of different and distinct stages. The production process is broken down into six separate stages and includes six sets of enterprises that do only one particular type of work.



Indeed, people in Ferozabad talk about a glass bangle passing through 100 hands from the start to the finish of the production process.

Hardening (Pakai) is done at two different stages (but not for all types of bangles) the first after joining, secondly after colouring. Before the bangle actually reaches the distributors in the market the bangles are sorted out according to their size and quality. Following this the puriya (the person who counts) counts and puts 7½ dozen bangles in one string and packs it up for sending it to the distributor.

For each production stage after the glass factory, there are separate sets of small, informal sector enterprises that specialize in only one production stage; and in this stage, basically only one work activity is performed. The large glass factories are different in several respects from the enterprises for the other stages of glass bangles production: (i) they are large in size with hundreds of workers; (ii) they are registered and so in the formal sector; (iii) they have many different types of work activities performed by teams of workers. The last observation has very important implications for the present paper and estimates of child labour, because children are concentrated in certain work activities in the glass factory while being absent from other work activities in the factory.

The CORT/ILO study collected data for 268 enterprises engaged in the production of glass bangles. These enterprises included approximately 4100 workers. It was conducted in the summer of 1993. These data were collected using structured survey questionnaires and face to face interviews. This included 15 glass factories (of the 60 such factories estimated to be working at the time). It also included approximately 50 enterprises engaged in each of the other stages of production: hardening, straightening, joining, cutting and colouring. These informal sector enterprises were identified through the help of key informants as lists of enterprises were not available, and the sample of 50 enterprises for each stage of production was meant to provide a realistic picture without being truly representative in nature in a statistical sense.

One particular aspect of the data collection methodology needs to be explained the collection of information on the existence of child labour. Since there was extreme nervousness and defensiveness about the existence of child labour, we did not feel that we could ask employers questions about the number of child labourers in the enterprise. Also, we felt that employers would greatly understate the number of children who were working. For this reason, we collected our data on child labour by observation. To increase the validity of observations by the interviewer discussions were carried out with the child development department in MS University, Baroda. Details on facial hair and muscular growth were pointed out. A team of two investigators were used in the field work, one to break the ice and initial hesitation and reluctance of the respondents and the other having more responsibility for the observation part. The observations were noted on the inside of the cover or margin of

the questionnaire through an agreed sequence corresponding to the sequence of the observation sheet which was filled in later. Local schools were visited of the seventh/eight class to get a visual feel and possible regional difference in children growth. The observation was filled in after consensus of the two team members and any major differences was resolved with the view of the interviewer responsible for observation at the particular unit prevailing. A category of 'probably child' was added where the differences whether it be a child or not could not be reconciled. In this case the overall perception of the interviewers was that the probably child though not 'definitely child', the possibility ranged over 50 percent to 80 percent i.e., more chances of being a child but could not be almost sure (80–95 percent) of being a child. A possible range of 'probably child' would be to assume 50 percent and 75 percent of them being child.

The difficulty in identifying which workers are children should not be underestimated. There are no birth certificates to use. Asking workers for their age is fraught with major problems as they often do not know and in any case they have vested interest in overestimating their age. For example, what should an investigator conclude if he/she gets a response "I am 16" from a worker who appears to be a child (by observation)? Should this worker be considered a child or an adult worker? On the other hand, observing is also difficult, especially for 12–15 year old as observable physical difference may be small at these ages.

Table 2: Percentage distribution of work force by age (adult and child) and sex							
Age/Sex of workers	Bangles factory	Sadai	Joining	Hardening	Cutting	Colouring	Total
<b>Definitely adult</b>							
Male	81.9	10.0	48.7	67.1	71.9	56.5	71.5
Female	4.2	60.0	21.8	1.4	4.8	19.9	9.5
Total	86.1	70.0	70.5	68.5	76.7	76.4	81.0
<b>Definitely child</b>							
Male	4.8		7.0	16.3	8.1	5.5	6.3
Female	0.1		3.1	0.3	1.2	5.5	1.2
Total	4.9		10.1	16.6	9.3	11.0	7.6
<b>Child<sup>1a</sup></b>							
Male	13.6		20.5	31.2	21.2	12.9	16.3
Female	0.3		9.0	0.3	2.1	10.7	2.7
Total	13.9	30.0	29.5	31.5	23.3	23.6	19.0
<b>Child<sup>1b</sup></b>							
Male	11.4		17.2	27.5	18.0	11.5	13.8
Female	0.2		7.5	0.3	1.9	9.4	2.3
Total	11.6	23.0	24.7	27.8	19.8	20.9	27.1
<b>N</b>	<b>16</b>	<b>51</b>	<b>65</b>	<b>56</b>	<b>64</b>	<b>67</b>	<b>268</b>
1 <sup>a</sup> Child = Definitely child + 100 percent Probably child							
1 <sup>b</sup> Child = Definitely child + 75 percent Probably child							

Sadai is done within the home mostly by women and girls. When interviewers visited these household enterprises, the female child labourers frequently left the room where the work was being done. For the calculations here, we assumed that the level of their participation was similar to that in joining. This figure is consistent with information we obtained from in-depth discussions with knowledgeable key informants. We also assumed that the composition of adults by sex was as observed in the survey.

The survey data on the percentage distribution of workers by age and sex for the different stages of production gives us an excellent overview of where child labour is concentrated in the glass bangles industry. As seen from table 2, adults comprise approximately 73 percent of workers in our sample of enterprises. Of the definitely adults, males constitute approximately 80 percent and females 20 percent in our sample. However, the definitely adult participation varies a great deal across the type of enterprise, from 68.5 percent in hardening to 86.2 percent in glass factory. Overall, the proportion of workers who are 'definitely child' in our sample is about 10 percent. It is as high as 16.6 percent in hardening, followed by colouring (10.9 percent), joining (10.2 percent), cutting (9.3 percent) and glass factory (4.9 percent). Also taking into account the 'probably child' category and assuming it is comprised of 75 percent(1b) or 100 percent(1a) children, our estimate of the proportion of workers who are children in our sample of enterprises goes up to around 21 and 26 percent respectively for our sample of enterprises.

Within the bangles factory, information was collected on four main activities. The proportion of children in these activities shows great variation. We see that two activities basically exclude children – there is 100 percent (definitely) male adults working at the furnace and 98.9 percent in spinning. For the activities of carrier and sorting, there is a sizable, yet still minority, presence of child labour – with approximately 32 and 25 percent child labour respectively. These data again show quite clearly that it is necessary to look at specific work activities in order to be in a position to identify and understand the presence of child labour in the glass bangles industry. Children are doing the least skilled work activities within the glass factory just as they are concentrated in the least skilled stages of production within the glass bangle industry.

It is possible to estimate the number of child labourers in the glass bangles industry using the above information on the concentration of child labour in specific work activities and types of enterprises together with information on the number of workers in each work activity and type of enterprise.

First of course it is necessary to estimate total employment in the different stages of production and activities. This can be done based on various assumptions mainly taken from our survey data regarding: (i) the daily production of glass bangles by each team of workers in the glass factory (about 1750 tora per day), (ii) the number of factories

operating on average during the non-monsoon season (60), (iii) the number of spinning units per factory (an average of 5), (iv) the number of work days per year factories are open (about 285) and the number of days per week labourers can find work (4). These data help provide estimates of the number of workers in the glass factory (if we assume there are 25 workers per team on average) as well as the total number of glass bangles leaving the factory floor.

Then using this number together with the following assumption it is possible to estimate the number of workers at each production stage: (i) breakage rate at each subsequent stage of production (between 1 and 5 percent), (ii) daily productivity per worker (between 12 and 32 tora per day for different production stages), (iii) proportion of the bangles which are passed on to the next production stage (between 70 and 100 percent), and (iv) number of work days per week labourers are able to find work (4). These various assumptions are obviously inexact. On the other hand, we feel that they are reasonable, so-called ballpark estimates, as they are based on own survey data and in-depth discussions with knowledgeable persons. Interested readers are referred to the more complete paper on glass bangles by the authors where all of this is explained in detail.

The final estimates of total employment and number of children working is given in table 3. They are based on the above assumptions which yield total workers together with the percent child from table 2.

<i>Table 3: Estimate of Number of Workers and Child Labour in Glass Bangles Production</i>					
Activity	Total workers	% Ch1 <sup>a</sup>	No. of child	% Ch1 <sup>b</sup>	No. of child
Factory	7740	14.2	1099	11.6	898
Straighten	9344	30.0	2803	25.0	2336
Joining	10885	29.0	3222	27.8	3026
Cutting	11550	23.4	2703	24.7	2853
Colour	6060	23.6	1430	19.9	1206
Harden	12979	31.5	4088	25.9	3362
<b>Total</b>	<b>58558</b>	<b>19.0</b>	<b>11126</b>	<b>16.1</b>	<b>9428</b>

It is estimated that total employment in glass bangles production is approximately 60,000 with an estimated range of about 9,400 – 11,100 child labourers -- who comprise about 16 to 19 percent of the work force in this industry. These percentages are less than those from the survey mainly because formal sector factory workers comprise only about 6 percent of the sample of enterprises in our survey but about 13 percent of the workers in the industry and it is here that we found the lowest percentage of child labour among the production stages. Our estimates of total employment and child labour are considerably lower than those of Burra and Kumar (Table 1). We feel that our estimates are better. For several reasons. First, ours refer only to the glass bangles production; perhaps another 6000 to 8000 workers are engaged in other glass production in the large glass factories with refractory furnaces.

Second, we have not counted several peripheral glass bangles activities such as sorters, counters and traders, transporters and businessmen. Third, in any – the population of Ferozabad is only about 4,00,000. So, given its age distribution (older persons and persons below age 10 who are not in the labour force), the fact that many adult women are not in the labour force (probably somewhere around 80 percent) and the existence of important service industries such as laundry, maids/sweepers, restaurants, transport, repair, etc., it is clear that there could not be anywhere near the 1,50,000 to 2,00,000 glass industry workers reported by Burra and Kumar. Fourth, in any case, our estimates are based on what we feel are reasonable assumptions about output and productivity.

**Table 4: Personal Characteristics of owner/employers: Age, Sex and Education**

	Glass factory only bangles	Sadai	Joining	Hardening	Cutting	Colouring	Total
<b>Age of owner</b>							
< 19	-	-	3.1	-	6.3	-	2.2
20-29	-	13.7	12.3	19.7	22.9	16.7	16.5
30-39	25.0	33.3	33.8	26.8	35.9	27.3	30.7
40-49	43.7	33.4	16.9	17.9	28.1	43.4	27.7
50 +	28.3	19.7	33.9	35.7	7.8	13.1	21.8
Mean	44.7	38.7	41.2	41.9	35.0	38.8	39.4
SD	8.2	8.2	12.6	13.3	10.3	8.6	11.4
<b>Sex</b>							
Male	100.0	35.3	100.0	100.0	100.0	100.0	100.0
Female	-	64.7	-	-	-	-	-
<b>Education</b>							
Illiterate	-	82.3	62.5	25.0	37.1	30.3	36.7
1-5	-	11.8	10.9	10.7	35.5	3.0	14.0
6-10	12.5	5.9	21.9	34.0	24.2	45.5	30.3
11-14	-	-	4.7	10.7	3.2	10.6	6.8
15	68.7	-	-	10.7	-	6.1	8.0
16 +	18.8	-	-	8.9	-	4.5	4.2
<b>Total no. of owners/employers</b>	<b>15</b>	<b>51</b>	<b>63</b>	<b>56</b>	<b>64</b>	<b>66</b>	<b>264</b>

From table 4, it can be seen that averages age of the owners in our survey was 39.4 years. They were youngest in the cutting enterprise at 35 years and oldest at 45 years in the bangles factory. The ownership was 100 percent male, except in sadai where 64.7 percent were female (although the work is performed 100 percent by females). Regarding the educational level, 36.7 percent of the owners were illiterate, the percentage was as high as 62.5 percent in joining and 82.3 percent in sadai. There was no illiterate owner in the bangles factory; in fact 87.5 percent were graduates or more.

**Table 5: Personal characteristics of owners/employers: Age when started working**

	Glass factory only bangles	Sadai	Joining	Hardening	Cutting	Colouring	Total
Age when started working in Glass industry							
< 19	-	17.6	14.3	10.7	23.4	6.1	12.9
20-24	20.3	33.3	19.0	17.9	18.8	15.2	17.8
25-29	13.3	27.5	9.5	25.0	20.3	15.2	17.0
30-34	26.7	17.6	20.6	10.7	20.3	24.2	19.7
35-39	-	2.0	6.3	8.9	10.9	22.7	11.7
40-44	33.3	-	15.9	8.9	3.1	10.6	11.0
45-49	6.7	2.0	9.5	8.9	1.6	3.0	5.7
50 +	-	-	4.8	9.00	1.6	3.0	4.2
<b>N</b>	<b>16</b>	<b>51</b>	<b>65</b>	<b>56</b>	<b>64</b>	<b>67</b>	<b>268</b>

Taking the age when owners started work in the industry (Table 5), only 12.9 percent on average began working below age 20, with none from the bangles factory. These data indicate that few owners began as children and then worked their way up. This is even the case in the informal sector enterprises. Thus, the idea that child labourers could live an Horacio Alger life seem quite unlikely.

Very few owners had another job or source of income from child they earned more income from their glass bangles business.

### Profile of Child Labourers and Their Families

The workers in the glass industry are generally locals from Ferozabad city and adjoining villages. Some of the workers and owners, though, had migrated 20–30 years back from the adjoining districts of Etah, Manipuri and Agra. The child worker is usually a local residing with his family or relatives.

Ferozabad district has an average family size of 6.44 in rural areas and 6.75 in urban areas according to the 1991 census. This implies an average of about 4.5–4.75 children on an average for each family.

The monthly income of an average worker is around Rs 800–1,500 for work over 20 days in the glass industry. Skilled/unskilled work in construction and agriculture is similar at around Rs. 1000–2000. This is low for an average family size of 6–7 members. So, if a child worked and his/her average earning per day were in the expected range of Rs. 10–30, this would make a big contribution to family income. Working for around 20 days, the child would add an average monthly income to the family of about Rs. 200–600. This could mean an addition of around 20–40 percent of the earning of the head of the family.

In the bangles industry the children working in different stages of production are generally introduced to the enterprise by either their family members or relatives. Their age at work could start from as young as 8 to 10 years in sorting, counting. In the factories, the children are mainly involved as 'carriers' i.e., carrying the iron rod from point to point. In joining the children would be doing the same work as the adult while in cutting and colouring initially the simpler designs are given to the children. It's not necessary that the child follows the specific activity being done by his father or relatives.

The parents say that we want the best for our child, send them to school, give them more time to play but the personal circumstances and economic conditions are such that the family needs whatever small addition income it can manage. They wanted to know from us what possible viable alternatives are present taking their economic and social circumstances into consideration. The parent's expectations were that the children would be helping hands and they can save enough to become a small 'firm' by owning an informal sector enterprise at one of the stages of bangle production and later possibly become a factory owner. Certain examples are cited by the workers, where their co-workers and others have become big businessmen. But as we saw in the previous section, this does not occur very often.

It's very interesting that the factory owners are generally a graduate and some of them whom we talked to in detail had their children studying in schools and colleges and even boarding schools. For the poorer sections, however, who are generally daily wage workers see a day at school (with no work) as a day's wage lost; as one said to us,

*"Its difficult to make both end's meet".*

On asking why they don't have small families, most of them said they wanted at least one son.

### **The Irreplaceability of Children Argument**

One reason for this very fractured and decentralized production process is that it allows the employer to avoid labour laws. Virtually everybody works on a piece rate basis and no one has a labour contract. Indeed, security of employment seems an alien concept to this industry; it appears as if employers purposely engage in practices which avoid any commitment or obligation to workers.

In terms of the technical replaceability of children, this does not appear to be problem in the glass bangles industry (Table 6). First, in all stages of production, child labourers work alongside adult labourers. Second, the percentage of workers that are children is highest in the stages of production which require the least skill. Third, within stages of production where several different activities are performed, children do the least skilled

of these activities. In short, children are not necessary for the glass bangles industry in terms of their providing unique and irreplaceable skills.

*Table 6: Percentage of children at various stages of production and level of skill required in Glass Industry*

Stages of Production	% of children <sup>a</sup>	% children <sup>b</sup>	Level of skill required
<b>Glass Industry</b>			
Furnace	–	–	More
Carrier	32.4	27.5	Less
Spinning	1.1	1.1	More
Sorting	25.0	20.8	Less
Sadai	30.0	23.0	Less
Joining	29.5	24.7	Less
Hardening	31.5	27.8	Less
Cutting	23.3	19.8	Moderate
Colouring	23.6	20.9	Less

<sup>a</sup> definitely child + 100% probably child    <sup>b</sup> definitely + 75% probably child

### Working Conditions and Health Hazards

Overall the working conditions are similar for both the child and adult. In the bangles factory even though generally the children do not work directly around the furnace but as `carriers' the heat, sound and pollution does not seem very conducive. The factories are large structures of an average size of over 1000 sq. metre. There is smoke, heat, noise. Most of them are open on all sides.

In case of sadai the young girls and women are working in a closed room with smoke coming out from dozens of kerosene lamps, with the room closed and no fresh air, they are continuously exposed to smoke. This is similar for judai also though the rooms are not totally closed as there is regular breathing in of the smoke.

Both Judai and Cutting include long hours of sitting in one position possibly leading to cramps. Colouring specially done for the multicoloured bangles in homes by girls has a very toxic effect. As the colours are chemical based and there is regular touching by hands for mixing and getting the colour on the bangles. The colours generally stick to the fingers and palm and is difficult to remove.

Hardening involves work regularly around a small furnace and hot trays.

Ferozabad has one of the biggest T.B hospital in the state. T.B is very common and both afflicts young males and females. A visit to the female ward of the TB hospital during the fieldwork revealed that nine women were admitted at that time. They were all, except one who was a widow currently married and their age group varied between 22 to 27 years. In the initial discussion they all revealed that they are not working in any stage of the bangle production and were housewives. Subsequently they did come out with the fact that they worked at the `joining' stage and that two of them started



from the age of 7–8 years. Like a respondent later reported 'we will have to do that work or else how will we survive'. Burns are very common and so are respiratory and throat problems.

We observe several young males and adults without the thumb and fore finger.

The working places for the joining enterprise are very small and cramped. The overall average floor space per person in bangle production is 3.5 sq. meter and this decreases to 1.8 sq. meter in joining. The average number of rooms is 1.2 with an average floor space of around 10 sq. meter.

There is no sewerage system in Ferozabad town and absolutely no modern sanitation. Both males and females were observed using the side roads. Electricity is not regular and there are power cuts for long hours and even days. Most of the factories work during the daytime, hardening takes place throughout twenty four hours, work is continuous for both children and adult and there is little likelihood of any rest periods.

The children themselves had not much idea about their expectations and the future. Every one that we could talk to wanted to study. A few who went to school also and those who did not attend had the feeling that they would continue to work in the glass industry and that education would not make much of a difference. A few expressed that they would like to study in the college and not continue with working in this industry. Some thought that even after college there was little likelihood of getting a decent job and they would remain stuck with what they were doing. They did realize though that if they knew the work and had schooling it would help them in setting independent units of their own and possibly become a businessmen. An older boy of eighteen having done 10th class (high school), said

*"I am already involved in family business of bangles (distributors) and continuing with school till 12th. Going further to college means a loss of Rs. 20–30 per day. And if ultimately I have to do this business at all I want to know enough to run the business".*

	Glass factory only bangles	Sadai	Joining	Hardening	Cutting	Colouring	Total
Avg. no of rooms	2.8	1.0	1.1	1.1	1.2	1.2	1.2
Floor space (sq.mtr)	1097.4	13.7	10.7	36.7	9.9	23.5	84.0
Air space (cu.mtr)	5576.5	40.8	32.8	131.7	36.1	72.7	396.5
<b><u>Avg. area per person</u></b>							
Floor space (sq.m)	8.9	11.6	1.8	2.9	2.0	5.8	3.5
Air space (cu.m)	45.2	34.4	5.4	10.4	7.2	17.7	12.3
<b>Total no. of enterprises</b>	<b>16</b>	<b>51</b>	<b>65</b>	<b>56</b>	<b>64</b>	<b>67</b>	<b>268</b>

Table 7 estimates the average number of rooms for all six stages of production as 1.2 with a range of 1.0 for Sadai and 2.8 for bangles factory. The floor space on the average is 84.0 sq. meter with a range of 9.9 sq. meter in case of cutting and 1097.4 sq. meter for the bangle factory. The air space (cu. meter) on an average is 396.5 cu. meter. It is least (32.8 cu. meter) in joining and highest (5576.5 cubic meter) in bangle factory.

One way of helping an industry such as the glass industry, which has hazardous and unhealthy working conditions, would be to improve its production technology and/or work environment. These, in turn, could have a favorable impact on the goal of eliminating child labour. In the short-run, the health of those children who continue to work would improve. In the long run, the demand for child labour should decrease as the increased capital investments made create a need for more skilled and responsible adult workers. Also, in the longer run, the number of adult labourers interested in doing this work should increase along with improvement in working conditions and probable increases in wages resulting from the need for greater skills and responsibility.

### **Cost Implications of Eliminating Child Labour**

An important issue for the employer as regards the elimination of child labour is how much the cost of production would increase if children could no longer be employed. There are two possible scenarios possible here. The ban on child labour could be effectively enforced and not evaded by a significant number of employers. Alternatively, enforcement could be only partially successful in that a significant number of enterprise would evade the law and employ children. This could take place among currently-operating enterprises which are less visible; or currently-operating enterprises which are more willing to pay bribes; or new informal-sector enterprises which spring up – probably in different or more remote locations – in order to take advantage of the cost problems faced by child labour-free enterprises.

In our opinion, the glass bangles industry would be relatively easy to police in its present form, since it is concentrated in one urban centre. This is particularly true for glass factories, which are large enterprises employing over 100 workers and which are very visible because of their need to have chimneys. In any case, glass factories are registered with the government under the Factories Act.

If all enterprises in the glass industry do indeed stop using child labour, there is likely to be an increase in the cost of the final product if more expensive adult labour replaces cheaper child labour. This, in turn, would cause the retail price to rise (as we assume that profit margins are not high and cannot be reduced in a highly competitive industry such as the glass bangles industry) and consequently total demand for the product would be reduced. The size of the decrease in total demand would depend on the price elasticity of demand for the product, and availability of competitively priced substitute

products and the possibility of substitute production from technologically superior enterprises. For glass bangles from Ferozabad, there does not appear to be any close substitution products or alternative sources due to (i) the religions and cultural significance in India of glass bangles, (ii) the lack of import or exports in this industry, and (iii) the availability of only one production technology in India. The price elasticity for glass bangles, however, may be reasonably high as this is a low cost product consumed by the masses.

The alternative scenario of only some enterprises eliminating child labour is more troublesome for employers as this might cause offending enterprises to have a competitive advantage.

In the remainder of the section, we estimate how much of the total cost of a glass bangle is contributed by labour costs and how much of this is paid to child labourers. Based on this information, we then estimate: how much the price of glass bangles would increase if the use of child labour were eliminated. These calculations are highly approximate as they are based on a number of assumptions. For this reason, we report the basis for such assumption as well as the degree of confidence we have in their accuracy. We feel that the final estimates have an acceptable degree of accuracy – providing a range of what could be called ballpark figures – as they are based on our survey data and in-depth discussions in Ferozabad.

Table 8 used various scenarios/assumptions to estimate how much bangle costs would rise if child labour were eliminated. At the bottom of the table, assumptions and remarks are provided in order to assist the reader. An alternative approach – which we did not use – would have been to estimate all costs, labour and non-labour, at each stage of production\*.

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\* This approach would have had the advantage of allowing us to check for internal consistency in their estimates, since non-labour costs plus labour costs plus profits must equal total cost. It would also have the advantage of allowing the analyst to get a rough estimate of profit rates. This more complex and complete approach is not followed in the present study (although it is used in the companion study of carpet industry in India) for several reasons. For informal sector establishments, doing bangle straightening, joining, hardening and colouring, it is difficult to estimate profits, since the imputed value of the building and the value of the close supervision and work done by the owner and his family are difficult to separate from the owner's profits and own living quarters. Also, we did not feel that the cost of inputs used by informal sector establishments were always accurately reported to us in the survey. Thirdly, the profit margin of informal sector establishments in the glass bangles industry is determined to a substantial extent by their ability to reduce breakage rates, and this factor is likely to vary greatly by establishment. Fourth, profit margins are in any case, likely to be low in the highly competitive and atomized informal sector.

Glass factories are large and costly operations as they require large initial capital investment for land, buildings and furnaces, as well as large running expenses for raw materials and maintenance of the furnaces for twenty-four hours per day. This detailed information on costs was difficult to obtain with a reasonable degree of accuracy as factory were reluctant to report this information. Based on informal discussion some information is available which has been discussed earlier. In short, for the present study we did not feel that it was worth the considerable effort required to estimate all of the non-labour costs for each of our six production stages.

We felt that we could obtain reasonable estimates of labour costs and their percentage in the total cost more easily and more directly by combining labour cost estimates at each production stage with estimates of the final costs of bangles. Furthermore, we did not think it necessary to distinguish between profits and non-labour costs (i.e., the difference between final bangle cost and total labour costs) as we were mainly concerned with how much the cost of a glass bangle would rise if child labour were eliminated; at the same time, we felt that profit margins were not very large nor very flexible and could not be "squeezed" very much.

According to our estimates, labour payments made to daily wage workers account for between 22 and 45 percent of the cost of production for different types of glass bangles, being around 20–25 percent for gold painted bangles and around 40–45 percent for plain or cut bangles without gold paint. These estimates were arrived at by dividing the estimated total labour cost per tora of production by the cost of one tora production. Payments to child labourers are estimated to account for a much lower percent of a bangle's cost. We estimate this to be about 15 percent of total labour cost and so about 4 to 7 percent of producing a glass bangle.

These low percentages of production cost attributable to wage payments made to child labourers are traceable mainly to three factors. First, labour costs comprise less than one-half of the cost a bangle. Second, children comprise only about 20 percent of workers. Third, children are among the lowest paid workers, because (i) they do the lowest paid jobs when they are in teams of workers as in the glass factory and hardening enterprise and (ii) they are relatively concentrated in the lower paid production stages in the informal sector enterprises.

These figures would seem to imply that the elimination of child labour should not have a major impact on the cost of producing glass bangles. This would especially seem to be the case as we were repeatedly told during our in-depth discussions that all workers were paid by piece rate, and there was no difference in the piece rate received by children and adults.

In order to provide the reader with an idea (in rough orders of magnitude) of what the elimination of child labour might imply in terms of an increase in the cost of one dozen bangles (as most consumers buy bangles by the dozen) which consumers might pay (and what this might be in terms of percentage increase), we have made three different calculations using three different assumptions (Table 8). Assumption 1 assumes that a sufficient number of adult workers from the large labour reserve in India are available and willing to work at the present, market determined wage rate. In this scenario, there would be no cost effect as adults would replace children at the same piece rate payment. Assumptions 2 and 3 assume that adult workers would need to be paid a higher wage (10 and 20 percent respectively) in order to attract the additional adult workers required to replace the child workers (carriers and sorters in glass factory;

stackers in hardening; workers in joining, straightening, colouring and cutting). The concept underlying Assumptions 2 and 3 is fairly strong as it assumes that all adult workers currently doing the same work activity as children would also receive the stipulated pay increase even though they are presently willing to work for a lower wage rate. On the other hand, Assumptions 2 and 3 recognize an important effect child labour has on labour markets and wages – the weakening of labour's bargaining position and so the market determined wage rate.

<i>Table 8: Estimated effect on cost of bangle of eliminating child labour<sup>(d)</sup> (in one dozen bangles)</i>									
Product	Absolute (Rs) effect wholesale/ production	Retail					Percentage effects <sup>(e)</sup> wholesale & retail		
		Un ltd. a	Ltd.1	Adult LF <sup>(b)</sup> 2	Unltd a	Ltd. b		Unltd a	Ltd. b
					1	2		1	2
Plain	0	0.02	0.03	0	0.10	0.20	0	2.22.	4.44.
Cut simple	0	0.03	0.06	0	0.17	0.34	0	5	9
Cut (fancy)	0	0.04	0.07	0	0.22	0.43	0	2.6	5.3
Coloured (gold) simple	0	0.05	0.11	0	0.32	0.63	0	2.1	4.2
Coloured (gold) fancy	0	0.05	0.12	0	0.36	0.73	0	2.0	3.9

Notes:

a Assumes that supply of adult labour is nearly unlimited and so children can be replaced by adults at current wage or piece rate.

b Assumes that wage rate for activities done by children would need to be raised by 10 and 20 percent respectively in order to attract adult labourers. This implies that all labourers would be paid this higher wage. (In hardening and glass factories, this would apply only to carrying and sorting and stacking).

c Retail price assumed to be 2 times higher than wholesale prices based on pricing of one dozen bangles in Baroda. It is assumed that same percentage mark-up between retail and wholesale/production process would apply, implying that retail price would go up by same percent as production cost.

d Cost estimates done in units of one dozen bangles as this is typical quantity bought by consumers.

e Assumption of child labour is CL2. See table 2 for this definition.

The cost of glass bangles is hardly affected by the elimination of child labour in all three of our scenarios. Based on Assumption 1, the cost of a glass bangle remains unchanged as the large adult labour reserve in India is tapped<sup>5</sup>. Based on Assumptions 2 and 3, production costs go up by only about 2–3 paise a dozen for plain bangles and 6–12 paise for coloured and detailed cut bangles. Even at the retail level (which we assume has a 200 percent mark up compared to wholesale)<sup>6</sup>, we find that the cost of a

<sup>5</sup> There could even be a small decrease in costs; in this scenario. Since children may be slightly less productive in terms of output per hour for straightening, joining and cutting (as we were told in our case studies), elimination of child labour would imply that the capital and other fixed costs would be spread over a greater output.

<sup>6</sup> This 200 percent which we assumed is probably a large overestimate as many of the expenses involved in moving a glass bangle from the production stage to the retailer remain unchanged (for example, transport and overheads). In any case for the poor Indian women, the retail mark up on the wholesale price is undoubtedly much lower than 200 percent, since poor women buy their bangles from informal sector vendors and not formal sector shops.

dozen glass bangles goes up by only 10–20 paise for plain bangles and 12–27 paise for coloured and detail cut bangles. In percentage terms we find only a 0, 2 and 4 percent increases in the cost of glass bangles in our three scenarios.

The conclusion from these calculations clearly indicate that there is no cost based economic justification for child labour. The glass bangle industry's ability to survive and remain viable does not appear to be threatened by the elimination of child labour which would imply the need to replace child labourers by adult workers.

### Policy Implications

Study shows that the children occupy an important role in the glass bangle production, but that they have skills that could be easily replaced by adults. However, the cost of the bangle would be affected by an increase in the price of per dozen bangles, but only by 2 to 4 percent according to our estimates, which gives no economic justification to employ child labour.

One way of helping the glass industry, which has hazardous and unhealthy working conditions, would be to improve its production technology and/or work environment. These, in turn, could have a favorable impact on the goal of eliminating child labour. In the short-run, the health of those children who continue to work would improve. In the long run, the demand for child labour should decrease as the increased capital investments made creates a need for more skilled and responsible adult workers. Also, in the longer run, the number of adult labourers interested in doing this work should increase along with improvement in working conditions and probable increases in wages resulting from the need for greater skills and responsibility.

The United Nations Development Programme (UNDP) has established a technical cooperation project in Ferozabad to assist the glass industry to improve its production. However, the project deals only with glass factory establishments and not at all with informal sector establishments doing straightening, hardening, joining, cutting and colouring. This project seems to deal almost exclusively with the larger glass factories having tank/refractory furnaces as project staff indicated that factories producing glass bangles only do not come to them for testing. Perhaps it could think of extending its coverage to improving productivity and working conditions in the informal sectors enterprises where the majority of child labourer work.

During our fieldwork we asked owners if they knew of improved techniques for doing their work. We also kept our eyes open to see if there were some establishments which had different and better production techniques. In the informal sector establishments doing straightening, joining, cutting, colouring and hardening, we did not observe a better, more efficient technology. Rather, a number of owners asked us if we could recommend to them a more efficient technique.

Again it has to be emphasized that both direct and indirect programs have to be launched. Strict enforcement and media campaigns have to go along with concrete poverty alleviation programs, health and family programs and vocational training.

Educational facilities needs to be strengthened. There are corporation schools which charges no fees, but a private 'maintenance' fee is charged from the students. It has an overall bad reputation of teachers not taking classes and buildings being in disrepair which deters the children from attending these schools. The private schools charge a fees of Rs. 15–50 per month. Although teachers are more regular, the buildings are small rooms and also in disrepair.

As the wage rates are generally piece rate and a typical worker earns on an average of Rs. 20–30 per day, this small income must be contrasted for child labourers of a payment of fees and no wages. At times, a compromise is worked out where some hours may be spent in the class while the rest of the day is spent between work and play. This may not be very feasible specially for those working in a factory or hardening where its a team effort and work is done continuously for 6–8 hours each day.

Simultaneously, the factory owners have to take the initiative of first not employing child labour and providing proper ventilation and safety at the work place. They must also educate and counsel their junior partners in the informal sector in the other stages of production.

The government can help the industry by conceding to a long standing demand of laying a gas pipeline which would help in decreasing pollution, increasing the quantity and quality of the glass produced. Furthermore, improved sewerage and electricity, and movement of factories to the fringes of Ferozabad would also help.

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