# War and Women's Work: Evidence from the Conflict in Nepal

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Nidhiya Menon<sup>1</sup> and Yana van der Meulen Rodgers<sup>2</sup>

#### **Abstract**

This article examines how Nepal's 1996–2006 civil conflict affected women's decisions to engage in employment. Using three waves of the Nepal Demographic and Health Survey, we employ a difference-in-difference approach to identify the impact of war on women's employment decisions. Results indicate that women's likelihood of employment increased as a consequence of the conflict, a conclusion that holds for self-employment decisions and is robust to numerous sensitivity tests. The findings support the argument that women's additional employment—rather than greater dependence on remittances and subsistence work—serves as an important source of resilience during times of crisis.

#### **Keywords**

conflict, women's employment, added worker effect, geography, Nepal

Nepal's 1996–2006 civil war resulted from a movement by Maoist insurgents to take advantage of the growing dissatisfaction among the people, especially those living in rural areas, with the lack of economic reforms they had expected from a new democratically elected government. Beginning in the western region, the conflict engulfed a large part of the country in a relatively short period of time. The conflict ended after a prolonged state of emergency and absolute power by the monarch, when the

#### **Corresponding Author:**

Yana van der Meulen Rodgers, Women's and Gender Studies Department, Rutgers University, New Brunswick, NJ 08901, USA. Email: yrodgers@rci.rutgers.edu

<sup>&</sup>lt;sup>1</sup> Department of Economics, IBS Brandeis University, Waltham, MA, USA

<sup>&</sup>lt;sup>2</sup>Women's and Gender Studies Department, Rutgers University, New Brunswick, NJ, USA

Maoist party succeeded in brokering a peace agreement that led to a new constitution and the establishment of a people's republic. During this ten-year period, the conflict led to immense suffering in terms of thousands of deaths and injuries. It also caused economic disruption and placed hardships on the local population. These devastating consequences have led experts to rank Nepal's "People's War" as one of the most intense civil conflicts in the world in recent times (Murshed and Gates 2005).

The purpose of this research is to examine how civil war in Nepal affected women's decisions about participating in market work. In particular, women may join the labor force in an "added worker" effect as they try to compensate for declines in household income caused by losses in their husbands' earnings due to war-related disruptions, departures, injuries, or deaths. More generally, the expected outcome of household labor supply decisions during crisis periods is for women to smooth household consumption by joining the labor force, especially when social insurance schemes to cushion temporary shocks are absent. Empirical evidence from industrialized countries suggests that the added worker effect was strong during the Great Depression and World War II, but it has become less important over time as governments developed stronger social safety nets and as women's status in the labor market improved. A small number of econometric studies for developing countries have found added worker effects, but the effects have ranged considerably in magnitude and have focused primarily on economic crises rather than political conflicts.<sup>2</sup> For example, Parker and Skoufias (2004) found fairly large added worker effects for Mexico during the 1994 Peso crisis, and McKenzie (2004) found that increases in job entry for women helped to offset their employment losses during Argentina's 2002 financial crisis. In contrast, Cho and Newhouse (2013) found surprisingly mild added worker effects among women in a sample of seventeen middle-income economies during the Great Recession of 2009 compared to earlier crises. Cross-country regression estimates for larger samples of countries point to the countercyclicality of women's labor supply in developing countries, especially in Asia and Latin America (e.g., Bhalotra and Umana-Aponte 2010; Signorelli, Choudhry, and Marelli 2012). These studies make clear that the impact of conflict on women's employment is not conclusive and depends on mediating factors and economic circumstances.

Within this context, although Nepal's decadelong conflict is likely to have impacted women's employment, the direction or magnitude is not clear a priori. On one hand, conflict may have induced greater labor force participation for women through displacement of men in the household. Not only did the conflict cause widespread mortality, it also led to an increase in family separation rates and in disability among husbands. Mainly men left home on a temporary basis seeking work and security; it was not common for entire families to move as women often remained behind to look after land (Seddon and Adhikari 2003). Assessment results reported in the World Bank (2004) indicate that the absence of husbands and their income led to a dramatic increase in women's household and farmwork. However, the findings do not specify whether this increased total work burden coincided with higher rates

of productive employment. Closely related, Nepal's rural women may have increased their nonagricultural self-employment in an effort to hedge against rainfall variability and diversify their sources of income (Menon 2009). On the other hand, the income effect from remittances sent home could have acted as a disincentive for women to become employed. Moreover, the departure of a spouse who contributed to household farm production may have put more pressure on women to substitute away from employment to subsistence farming. Both these arguments help to explain Lokshin and Glinskaya's (2009) finding that Nepalese women withdrew from market work when men migrated.

This study employs a difference-in-difference approach to identify the impact of war on women's employment decisions using data from the Nepal Demographic and Health Survey (DHS) for 1996, 2001, and 2006. These data are used to test the hypothesis that with the displacement of male workers as a result of the Maoist insurgency, women's employment decisions exhibited an added worker effect. We find strong evidence that as compared to the beginning of conflict in 1996, women's employment probabilities are significantly higher in 2001 and 2006. These trends are evident in patterns of self-employment work as well. The results are interpreted as evidence of a labor supply rather than a labor demand effect. That is, women responded more to the need to work in order to support their households than they responded to the creation of new economic opportunities that may have arisen during the war. The analysis demonstrates that even with the use of robustness checks and alternative empirical methods, there is robust evidence that women's employment increased as a consequence of the conflict. These findings support the idea of household resilience during times of crisis. In particular, greater employment for women, rather than an increased dependence on remittances or subsistence farmwork, served as a vital coping mechanism during the decade of war.

# **Conflict Background and Socioeconomic Context**

Nepal's civil war erupted in 1996 when members of the Communist Nepal–Maoist party struck a police station in Rolpa, a district in the western region of Nepal. The motivation behind the attack and the subsequent ten years of insurgency had several origins.<sup>3</sup> Anger from members of lower castes, lower-status ethnic groups, and marginalized regions against the elite for long periods of landlessness and relative deprivation helped to instigate and fuel the conflict. Closely related sources of the insurgency included frustration with the country's overall poverty, prolonged stagnation in the agricultural sector, and inadequate public spending on social services and infrastructure. While economic grievances served as crucial instigators of the conflict, political economy factors also played a role. These factors included dissatisfaction against the government for introducing a structural adjustment program, for targeting Maoist activists, and for engaging in extensive corruption and rent-seeking behavior. From 1996 onward, the Maoist party used this discontent to further their objectives of weakening and eliminating the monarchy. Primary among the tactics used were

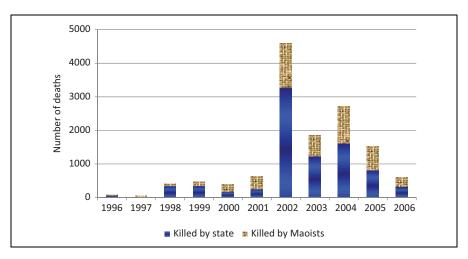


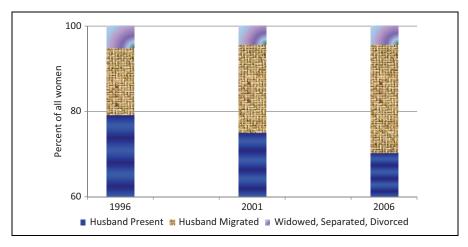
Figure 1. Conflict-related deaths in Nepal, 1996–2006.

Source: Authors' calculations based on Informal Sector Service Center (2010).

attacks on army bases, police posts, government officials, and banks. At the height of the conflict, the Maoists controlled most rural areas of the country. In 2006 when the conflict ended, a new constituent assembly was established, and a new interim constitution was adopted in 2007. In 2008, Nepal became a republic, and the Maoist leader was elected as the first prime minister.

Nepal's geographical terrain served as an important determinant of the intensity civil war violence. Since government forces outnumbered the insurgents, insurgent forces depended on forested terrain to help them maneuver. Moreover, Maoists found greater support for their cause among the poor and disenfranchised. This argument is consistent with Do and Iyer (2010), who find conflict-related deaths were substantially higher in districts with higher poverty, and in districts characterized by higher elevation and forest coverage. Their results indicate that geographic conditions explain approximately 25 percent of the variation across districts in conflict intensity, with the pre-1996 rate of poverty at the district level also serving as a positive predictor of conflict intensity. The relationship between the intensity of violence and Nepal's geography and terrain is supported in Bohara, Mitchell, and Nepal (2006).

The civil war entailed enormous social costs. The death toll reached over 13,300, with about two-thirds of those deaths caused by government forces and the remaining one-third caused by Maoist insurgents (Informal Sector Service Center 2010). As shown in Figure 1, the conflict-related deaths increased sharply in 2002, an escalation that coincided with prime minister's announcement of a state of emergency and his mobilization of the Royal Nepal Army to combat the insurgents. In addition, the drawn-out conflict caused substantial destruction to the country's infrastructure as well as the postponement of new projects. This crippling of the country's



**Figure 2.** Status of husbands' presence, Nepal DHS, 1996–2006.

Source: Authors' calculations based on MHP/NE/MI (2007), MH/NE/ORC (2002), and Pradhan et al. (1997).

Note: Weighted to national level with weights provided by the Nepal DHS in each year.

infrastructure not only restricted access to education and health systems, it also stifled economic development. Additional data indicate that the conflict tended to be more intense in the midwestern and far-western regions of the country.

Furthermore, existing migration rates increased to some extent as a consequence of the civil war (MHP/NE/MI 2007). Our calculations based on the Nepal DHS data indicate that during the conflict period, the proportion of women whose husbands had migrated grew over time, as did the proportion of women who reported themselves as their household's head. As shown in Figure 2, 16 percent of all ever-married women reported that their husbands had migrated in 1996; this proportion had risen by about ten percentage points by the end of the conflict period. Another 5 percent of all ever-married women reported the loss of their husbands due to death, divorce, or separation; this proportion did not change much during the conflict period. Closely related, the proportion of women who reported themselves as the household head more than doubled during the conflict period from 7 percent to 15 percent. Although much of this increase occurred due to the migration of husbands, some growth also occurred due to the death, divorce, separation, and incapacitation of husbands.

Hence the data show that over time, family separation rates increased, and conflict-induced mortality of men combined with substantial male migration left a growing proportion of women to manage their households. Nepal is certainly not alone in experiencing this dynamic—conflict in other countries has also spurred the disintegration of families through recruitment by armed groups, forced migration, abductions, and death of family members. Moreover, conflict has also imposed economic shocks and curtailed development at the macroeconomic level. On average, civil wars have caused a reduction in gross domestic product per capita growth of

2.2 percent per year in a sample of ninety-two countries between 1960 and 1989 (Collier 1999).

# Grouping of Districts into Conflict and Nonconflict Subregions

Our research design centers on the idea that regions in Nepal characterized by greater forest coverage, higher elevations, more rainfall, and fewer roads were more conducive to guerilla activity. Following the strategy developed in Angrist and Kugler (2008), we classified regions based on geography from a period that precedes the conflict. Geographical measures from a preconflict period were used as instruments to approximate conflict intensity from 1996 to 2006. In a "first-stage" procedure, we tested the predictive power of these instruments in explaining conflict intensity where conflict intensity was measured by the total number of casualties due to state and Maoist action from 1996 to 2006.<sup>5</sup>

The employment and conflict data are based on a geographical coding scheme that divides Nepal into seventy-five districts, which are further classified into five regions (eastern, central, western, midwestern, and far-western) and three categories of physical terrain (mountain, hill, and terai grasslands). We aggregated the seventy-five districts into fifteen subregions (the five regions interacted with the three types of terrain). We took this step primarily to reduce the number of regional parameters in the estimation of the labor supply equation which controls for region-specific effects using fixed effects. Since the districts are aggregated up to the subregion level, all the information contained at the district level is still reflected in the subregional coefficients.

Conflict measures cannot be used directly in the estimations since they are likely to be endogenous (i.e., they may be codetermined with other variables that might affect women's employment). For example, subregions with higher rates of poverty also had more intense conflict. But women may work more in regions with high rates of poverty, leading to spurious correlation between employment probabilities and conflict intensity. We hypothesize that geographical measures from a preconflict period provide the exogenous variation required to identify the effect of conflict on women's work. To test this hypothesis, we used the conflict and geographical indicators from Do and Iyer (2010) supplemented with additional geographical and weather data on Nepal from Sharma and Subedy (1994). In the first stage, the number of state-caused and Maoist-caused deaths from 1996 to 2006 was regressed on four indicators of geographical status and two indicators of weather status from 1994, a preconflict year. Indicators of geographical status include the proportion of a subregion that is forested, altitude of the subregion as a proxy for mountainous territory, the number of major rivers in a subregion normalized by area, and the total length of the road network normalized by the area of the subregion in 1994. Indicators of weather-related status at the subregion level include average annual rainfall normalized by area and average temperature. The geographical and weather-related

indicators, originally at the district level, were aggregated to subregion means using sampling weights provided in the Nepal DHS.

The first-stage results reported in Table 1 indicate a strong correlation between conflict-induced casualties and the proportion of a subregion that is forested in 1994. This conclusion holds when state-caused casualties and Maoist-caused casualties are measured separately and when they are combined. In regressions that include all six geographical and weather indicators, the coefficient on 1994 forest coverage is statistically significant. Forest cover remains significant when it is used as the only instrument in linear or binary form. These results confirm the theoretical intuition behind the correlation between 1994 forest cover and the number of conflict-induced casualties, thus validating our choice of this variable as an instrument <sup>6</sup>

To implement a difference-in-difference methodology similar to that in Angrist and Kugler (2008), we converted forest coverage into a 0-1 indicator where geographical subregions with forest coverage exceeding the 75th percentile value were classified as "more-forested" and subregions with forest coverage below the 75th percentile were classified as "less-forested." Since Nepal in general is quite heavily forested, a higher than average benchmark was required to indicate regions that have relatively more cover. The first-stage results are robust to transforming the dependent variable (total conflict-induced casualties) from levels into growth rates over time. Furthermore, our use of a categorical functional form for the first stage (as opposed to a linear functional form) is reaffirmed by a test that plots growth rates in casualties against a linear measure of forest cover in 1994. This test indicated that the relationship between growth rates and 1994 forest cover is not particularly linear; thus, a nonlinear form of the instrument was appropriate. In the context of our study, the "treatment" is conflict, and although women in general may work more when husbands have migrated or when they are heads of their households because husbands are disabled, the application of the difference-indifference method allows us to measure how much of the increase in women's labor force participation is due to conflict-induced changes in these variables.

# **Conflict and Women's Employment**

# Data and Descriptive Statistics

This study's employment data come from the Nepal DHS, a large nationally representative sample of women aged fifteen to forty-nine and members of their households. We used the three most recently available waves of the standard DHS for Nepal: 1996, 2001, and 2006. These waves correspond with the beginning, middle, and end of the civil war. The DHS provide detailed information on woman's employment status, education, age, marital status, region, and terrain of residence, religion, and ethnicity; her husband's education and his presence in the household; and household composition, access to electricity, and amenities. Our sample retains all ever-married women aged fifteen to forty-nine with measured values for

Table 1. First-Stage Results for Conflict Intensity, Nepal DHS, 1996-2006.

	Stat	tate-caused casualties	S	Mac	Maoist-caused casualties	ties		Total casualties	
	(1)	(2)	(3)	(E)	(2)	(3)	(1)	(2)	(3)
Intercept	2.505 (1.553)		-0.039 (0.263) 0.474*** (0.124) 1.039 (0.753)	1.039 (0.753)	0.083 (0.117)		3.544 (2.267)	_	0.760*** (0.179)
Forested	2.247*** (0.658)	_	.700** (0.637) 0.646** (0.277)	0.873** (0.319)	$\overline{}$	0.217 (0.127)	3.120** (0.961)	٠,	2.353** (0.909) 0.863** (0.400)
Roads	-0.197 (1.648)			0.212 (0.799)			0.015 (2.406)		
Elevation	-0.126 (0.108)			-0.047 (0.052)			-0.173(0.157)		
Rivers				20.021 (77.518)			20.768 (233.380)		
Temperature				-0.035 (0.034)			-0.137 (0.102)		
Rain				-0.315 (0.304)			-0.656 (0.915)		
$R^2$	669		.295	609	.288		.678		.264
F	H.67***	7.14**	5.44**	7.48**	5.27**	2.94	10.55**	6.70**	4.67**

includes each regressor measured as of 1994 as linear variables; model 2 includes only forested in 1994 as a linear variable; and model 3 includes only forested in 1994 as a binary variable. F statistics reported in the table are the partial F-statistic values for the "Forested" variable. All regressions have fifteen observations at the subregion level. Note: DHS = Demographic and Health Survey. Weighted to national level with weights provided by the Nepal DHS in each year. Standard errors in parentheses. Model 1 Source: Authors' calculations based on MHP/NE/MI (2007), MH/NE/ORC (2002), and Pradhan et al. (1997).  $^{***}p < .01. *^*p < .05. *^p < .10.$ 

employment status and for the other indicators in the empirical analysis, leaving us with approximately 25,700 observations in the pooled sample. The indicator for whether or not a woman is employed includes employment for cash earnings, inkind payments, and nonremunerated work. However, the data do not allow us to separate these types of work. Among the employed women in the pooled data, a large share (about 85 percent) worked either for themselves or for their family. We classified such women as self-employed and estimated separate regressions for the decision to be self-employed.<sup>7</sup>

Sample statistics in Table 2 indicate that a very high proportion of women in Nepal were employed throughout the period, and especially in 2001, when 83 percent of women were employed in some sort of job. Also, over time, a growing proportion of women lived without their husbands either due to the husband's migration or due to death, divorce, or separation. By 2006, almost one-third of ever-married women lived without their husbands present in the household. The majority of women had no education in all three years, although this proportion declined sharply over the ten-year period from 80 percent to 63 percent. Among other indicators, the vast majority of the sample lived in rural areas, with a greater tendency to live in terai grasslands as opposed to the mountains and hills. Socioeconomic status indicators show some improvements during the ten-year period, with more households having access to electricity and household amenities such as improved flooring, radio, and television. Finally, the bulk of the sample claimed Hinduism as their religion, with substantial diversity in ethnic groupings.

The difference-in-difference methodology is appropriate in cases where the treatment and control samples are comparable in measured characteristics in the pretreatment time period (Meyer 1995). In order to ascertain that this comparability holds in the Nepal context, we calculated means of the individual and household indicators at the subregion level for 1996 and then compared the subregion means across the more-forested (conflict) and less-forested (nonconflict) classifications. Results in Table 3 indicate that when conflict began in 1996, the more- and less-forested subregions had very similar characteristics in terms of women's status, household socioeconomic status, and household composition. Hence, the prerequisite for use of the difference-in-difference methodology is satisfied.

# Women's Employment Decisions: Naive Probit Estimates

The next step is to examine the likelihood of a woman engaging in employment, conditional on an indicator for conflict as well as the full set of personal and household characteristics. We begin by specifying a standard labor supply equation for ever-married women of the following form:

$$y_{ijt} = a + bS_{ijt} + cX_{ijt} + \mu_i + m_t + \vartheta_{ijt}, \tag{1}$$

where *i* denotes a woman, *j* denotes a subregion, and *t* denotes time. The dependent variable  $y_{ijt}$  is a dummy that takes on the value 1 if the woman is employed and 0

Table 2. Women's Status and Household Factors, Nepal DHS, 1996–2006.

	199	96	200	01	200	06
	# of Obs (Unweighted)	% of sample (weighted)	# of Obs (Unweighted)	% of sample (weighted)	# of Obs (Unweighted)	% of sample (weighted)
Overall sample	8,373	100.0	8,719	100.0	8,632	100.0
Basic indicators o	f women's stati	ıs				
Employed						
Yes	6,634	77.3	7,341	82.9	6,481	73.6
No	1,739	22.7	1,378	17.1	2,151	26.4
Husband gone						
Yes	1,747	20.8	2,096	25.0	2,657	29.7
No	6,626	79.2	6,623	75.0	5,975	70.3
Education						
No schooling	6,689	80.0	6,265	72.0	5,371	62.6
Some or all primary	890	11.0	1,272	14.8	1,461	16.8
school						
Some secondary school	537	6.3	832	9.3	1,211	14.1
Completed secondary school +	257	2.7	350	3.9	589	6.4
Literate						
Yes	1,802	20.9	3,134	35.3	4,072	46.7
No	6,571	79. I	5,585	64.7	4,560	53.3
Age						
$Age \leq 20$	1,275	15.5	1,218	14.4	1,061	12.1
$20 < age \le 35$	4,467	53.4	4,744	54.2	4,646	53.4
Age > 35	2,631	31.2	2,757	31.4	2,925	34.5
Geographical indi Region						
Eastern	1,666	22.9	2,067	24.1	1,916	21.4
Central	2,489	33.4	2,388	32.1	2,213	33.2
Western	1,584	19.6	1,556	20.3	1,683	19.4
Mid-western	1,389	14.3	1,141	13.7	1, <del>4</del> 03	11.7
Far-western	1,245	9.8	1,567	9.8	1,417	14.2
Terrain						
Mountain	1,055	6.8	1,188	6.9	1,154	7.1
Hill	3,577	42.8	3,241	41.4	3,325	41.3
Terai	3,741	50.4	4,290	51.6	4,153	51.6
grasslands Urban						
Yes	946	8.4	1,153	9.6	2,279	14.8
No	7.427	91.6	7,566	90.4	6,353	85.2
Socioeconomic st		, 1.0	.,500	70.1	0,333	33.2
Husband's educ						
No schooling	3,367	40.7	3,131	37.3	2,182	26.2
Some or all	1,901	22.0	2,184	24.8	2,349	27.6
primary school	-,, -,		_,	•	_,	2

Table 2. (continued)

	199	96	200	) I	200	06
	# of Obs (Unweighted)	% of sample (weighted)	# of Obs (Unweighted)	% of sample (weighted)	# of Obs (Unweighted)	% of sample (weighted)
Some	1,625	19.4	2,050	22.8	2,458	28.2
secondary						
school						
Completed	1,480	17.9	1,354	15.1	1,643	17.9
secondary						
school +						
House has elec	ctricity					
Yes	1,552	17.3	2,068	22.5	4,064	47.4
No	6,821	82.7	6,65 l	77.5	4,568	52.6
House has imp	roved floor					
Yes	836	8.7	1,171	12.0	1,920	22.2
No	7,537	91.3	7,548	88.0	6,712	77.8
House has rad	io					
Yes	3,522	40.7	3,934	43.9	5,229	60.0
No	4,851	59.3	4,785	56.1	3,403	40.0
House has tele	evision					
Yes	641	6.9	1,245	13.4	2,396	29.1
No	7,732	93.1	7,474	86.6	6,236	70.9
Household comp	osition and ethr	nicity indicator	S			
Two+ children	n under five year	rs .				
Yes	1,102	13.0	960	11.1	740	8.0
No	7,271	87.0	7,759	88.9	7,892	92.0
Religion is Hin	du					
Yes	7,343	87.5	7,479	85.5	7,537	85.6
No	1,030	12.5	1,240	14.5	1,095	14.4
Ethnic group						
Brahmin	1,159	13.6	1,122	12.8	1,187	12.1
Chhetri	1,682	17.5	1,829	17.8	1,899	18.4
Occupational	1,248	14.6	1,720	21.1	1,173	12.6
All other	4,284	54.4	4,048	48.3	4,373	56.8

Source: Authors' calculations based on MHP/NE/MI (2007), MH/NE/ORC (2002), and Pradhan et al. (1997). Note: DHS = Demographic and Health Survey. Weighted to national level with weights provided by the Nepal DHS in each year.

otherwise. The notation  $X_{ijt}$  is a set of individual and household characteristics that influence women's decisions to work and includes age, education, an indicator for more than two children of preschool age within the home, and other indicators of quality of the dwelling of the household (such as having electricity and improved flooring). The vector  $S_{ijt}$  is a catch-all variable that indicates the effect of conflict-related measures over and above the variables in  $X_{ijt}$ . The variable includes a normalized measure of the number of conflict deaths from 1996 to 2006 first in of itself. Then it measures conflict impacts using the proportion of households in which the husband has migrated, and the proportion of households in which the woman is

**Table 3.** Average Subregion Characteristics by More- and Less-Forested, Nepal DHS, 1996 (in percentage).

	Less = forested subregions	More = forested subregions	Difference
Basic indicators of women's status			
Employed	85.7 (4.3)	81.1 (9.2)	4.6 (9.5)
Self-employed	92.2 (2.3)	93.3 (3.6)	-I.I (4.9)
Education	,	` '	, ,
No schooling	82.6 (2.6)	86.7 (2.5)	-4.1 (5.3)
Some or all primary school	9.8 (1.2)	7.6 (1.6)	2.2 (2. <del>4</del> )
Some secondary school	5.4 (I.0)	4.3 (1.3)	1.0 (2.2)
Completed secondary school+	2.2 (0.7)	1.4 (0.9)	0.8 (1. <del>4</del> )
Literate	18.7 (3.0)	15.8 (2.8)	3.0 (6.1)
Age	` '	,	( )
$Age \leq 20$	14.8 (1.1)	18.0 (1.3)	-3.2(2.3)
$20 < age \le 35$	52.6 (0.7)	52.4 (3.1)	0.1 (1.9)
Age > 35	32.6 (0.9)	29.5 (1.8)	3.1 (1.9)
Geographical indicator	, ,	, ,	, ,
Urban	6.4 (2.7)	3.5 (2.9)	2.9 (5.5)
Socioeconomic status indicators			
Husband's education			
No schooling	42.8 (2.9)	41.0 (3.3)	1.8 (6.0)
Some or all primary school	24.0 (1.8)	24.5 (3.3)	-0.5(3.9)
Some secondary school	18.5 (1.2)	19.3 (2.3)	-0.7(2.6)
Completed secondary school $+$	14.6 (1.9)	15.2 (1.8)	<b>−0.6 (3.9)</b>
House has electricity	15.1 (3.8)	5.8 (5.1)	9.2 (7.9)
House has improved floor	8.2 (2.0)	3.5 (3.0)	4.7 (4.1)
House has radio	39.8 (2.4)	42.3 (4.6)	-2.5~(5.2)
House has television	5.0 (2.2)	2.7 (2.4)	2.4 (4.6)
Household composition and ethnicit	ty indicators		
Two+ children under five years	13.1 (1.3)	15.5 (6.1)	-2.4(3.8)
Religion is Hindu	86.3 (3.5)	97.2 (2.5)	−10.9 (7.0)
Ethnic group			
Brahmin	14.2 (1.8)	11.0 (2.6)	3.2 (3.8)
Chhetri	20.1 (4.4)	43.1 (13.3)	<b>−23.0**</b> (10.6)
Occupational	17.8 (4.1)	15.6 (5.6)	2.2 (8.5)
All other	47.9 (7.9)	30.3 (20.8)	17.6 (18.2)

Source: Authors' calculations based on MHP/NE/MI (2007), MH/NE/ORC (2002), and Pradhan et al. (1997). Note: DHS = Demographic and Health Survey. Weighted to national level with weights provided by the Nepal DHS in 1996. Standard errors in parentheses. \*\*\*p < .01. \*\*p < .05. \*p < .10.

widowed, divorced, separated, or the head of her household for a reason other than the husband's migration. Finally,  $\mu_j$  is a subregion-specific effect that is common to all individuals,  $m_t$  is a time-specific effect that is common to all individuals, and  $\theta_{ijt}$  is a woman-specific idiosyncratic error term.

Given the binary nature of the dependent variable, we used a probit model to estimate the standard labor supply model in equation (1), treating conflict as exogenous. These estimates, referred to as *naive probits*, were used as a benchmark against which to compare estimates from the preferred difference-in-difference method. The difference-in-difference approach conditions on the endogeneity of the conflict-related variables, thus allowing us to estimate the causal effect of conflict on the likelihood of women's employment.

The naive probit regression results (Supplemental Appendix Table 1) indicate that as compared to when Nepal's civil war began, the probability of women's employment rose in subregions with greater conflict-related casualties in 2001 and 2006. The probability of self-employment in areas with more casualties was higher as well, although the coefficient in 2006 is measured with less precision. Older women were more likely to be employed, whereas some level of schooling exerted significant negative effects on employment probabilities. For women whose husbands have migrated, employment probabilities were significantly larger in subregions with higher civil war mortality in 2001 and 2006. However, there are no discernible effects of the conflict variables on self-employment probabilities. Coefficients for women whose husbands are absent for reasons other than migration suggest that employment probabilities are larger for these women in conflict areas in 2006 as compared to 1996, whereas self-employment probabilities are relatively higher in conflict areas in 2001 as compared to 1996. In general, the naive probits exhibit little precision for the marginal effects of age and education in this subgroup.

# Difference-in-Difference Approach

In implementing the difference-in-difference approach, the standard labor supply equation for ever-married women was amended as follows:

$$y_{ijt} = d + \sum_{s} \alpha_{0s} F_{js} + f X_{ijt} + \mu_i + m_t + \varepsilon_{ijt}.$$
 (2)

The dependent variable is the same binary variable as in equation (1) for whether the woman is employed. The notation  $X_{ijt}$  is the same set of exogenous individual and household characteristics,  $\mu_j$  and  $m_t$  are the subregion-specific effect and the time-specific effect, and  $\varepsilon_{ijt}$  is an idiosyncratic error term. The term of interest,  $\Sigma_s \alpha_{0s} F_{js}$ , represents the difference-in-difference term; it is measured as a set of interactions of the dummy variables for the conflict years and the dummy variable for relative forest cover, the instrument. In the estimations, the coefficients on the interaction terms (once they are converted into marginal probabilities) are interpreted as the marginal effects of conflict on the likelihood of women being employed.

The difference-in-difference results are shown in Table 4. We ran models for the employment decision as well as the decision to become self-employed for all women (columns 1 and 2), and we ran models for two subsamples: women whose husbands

Table 4. Marginal Probabilities for Likelihood of Employment, Nepal DHS, 1996–2006.

	All women	ımen	Women with husbands migrated	sbands migrated	Widow/s divorced	Widow/separated/ divorced/HH head
	Employed	Self-employed	Employed	Self-employed	Employed	Self-employed
Interaction terms (reference = conflict_1996)	nflict_1996)					
Conflict_2001	0.098** (0.032)	0.063*** (0.010)	0.134** (0.032)	0.001 (0.018)	0.099** (0.023)	0.001 (0.018) 0.099** (0.023) 0.149*** (0.012)
Conflict_2006	0.095*** (0.016)	0.046*** (0.012)	0.136*** (0.017)	-0.013 (0.020)	0.079* (0.029)	0.090* (0.031)
Education (reference $=$ no schooling)	(gui					
Some or all primary school	-0.024*** (0.009)	0.025*** (0.008)	-0.041 ** (0.017)	0.034*** (0.009)	-0.016 (0.031)	0.034*** (0.009) -0.016 (0.031) 0.079*** (0.020)
Some secondary school	-0.054 *** (0.013)	0.013 (0.012)	-0.063** (0.028)	0.020* (0.010)	-0.031 (0.039)	-0.062 (0.061)
Completed secondary school+	-0.076 *** (0.021)	-0.325*** (0.043)	-0.153*** (0.049)	-0.365*** (0.054)	-0.052 (0.048)	-0.043 (0.078)
Age (reference $=$ age $\leq$ 20)						
$20 < age \le 35$	0.109*** (0.016)	0.004 (0.011)	0.086*** (0.027)	0.005 (0.012)	0.108** (0.047)	0.069** (0.032)
Age > 35	0.146*** (0.019)	0.038*** (0.011)	0.128*** (0.026)	0.016 (0.016)	0.110* (0.072)	0.134*** (0.045)
Socioeconomic status	Yes	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes	Yes
Year and subregion dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R <sup>2</sup>	.194	.207	.236	.275	174	.202
Z	25,724	21,807	5,253	4,430	1,404	1,282

Note: DHS = Demographic and Health Survey; HH = household. Weighted to national level with weights provided by the Nepal DHS in each year. Standard errors, in Source: Authors' calculations based on MHP/NE/MI (2007), MH/NE/ORC (2002), and Pradhan et al. (1997).

parentheses, are clustered by region-year. In each regression the key difference-in-difference terms are the binary variable for more- or less-forested interacted with the year dummies. The Widow/Separated/Divorced/HH Head subsample excludes women whose husbands have migrated.

 $^*p < .10. *^*p < .05. *^*p < .01.$ 

had migrated (columns 3 and 4), and women who were either widowed, separated, divorced, or living with an incapacitated husband (columns 5 and 6). In all six columns, the conflict indicator is the binary variable for more- or less-forested interacted with year dummies. In the table, 1996 is the excluded category—thus, conflict interaction terms are measured with reference to the beginning of the civil war in 1996. All standard errors are clustered at the subregion and year level.

Column 1 indicates that women living in a conflict subregion had an increased likelihood of becoming employed in 2001 and 2006, and the same is true of the decision to become self-employed. Both key terms in the first two columns for all women are positive and statistically significant at the .05 level or higher. The magnitudes of the coefficients indicate that compared to 1996, the probability of employment was .098 higher for women in conflict areas in 2001 and .095 higher in conflict areas in 2006. The decline in 2006 compared to 2001 is consistent with the fact that conflict peaked in the 2001–2002 period. Effects are similar for self-employment, although the magnitudes of the coefficients are smaller.

Table 4 also shows very similar results for the employment decisions of women whose husbands have migrated and of women who manage their households due to other reasons. These results support the added worker effect; in particular, the hardship associated with civil war served as a strong incentive for women to become employed. The coefficients on the conflict instruments in column 4 are measured with less precision, indicating that women with husbands who had migrated were not more likely to be self-employed possibly due to the high start-up costs of self-employment activities.<sup>9</sup>

#### Robustness Checks

This closing section reports the results of various robustness checks for the main results. First, instead of using the forest coverage variable to directly instrument for conflict, we estimated marginal probabilities for the likelihood of employment using predicted values of conflict. This approach is consistent with a standard two-stage framework. This alternative set of estimations was conducted by constructing the predicted value for conflict in a first-stage regression and then including the predicted value for conflict interacted with year dummies in a second-stage regression. In the first stage, we regressed the total number of casualties on a linear version of the forest variable to generate a predicted value. This predicted value was converted into its categorical counterpart based on the 75th percentile threshold. The predicted variable was then interacted with year dummies and included in a second stage for employment likelihoods. A similar procedure was followed in an alternative set of first-stage regressions that conditioned on forest coverage and other geographical variables, all in linear form. The standard errors are bootstrapped to adjust for use of first-stage predicted values in the second stage.

The second-stage marginal probability results for the likelihood of employment (Supplemental Appendix Table 2) closely mirror those described for the main

difference-in-difference results. In particular, the likelihood of engaging in employment increased for women in conflict-intense areas in 2001 and 2006, as compared to 1996. Furthermore, conditional on being employed, women were also more likely to engage in self-employment if they lived in subregions with high levels of conflict.

Another robustness check for the main results is to identify the impact of conflict on women's employment using an alternate empirical specification: instrumental variable regressions. This strategy was implemented by running a set of instrumental variable regressions for women's decisions to engage in employment and in selfemployment. For each of these outcomes, we ran three models: the first model measured conflict as total mortality, the second model proxied for conflict as the proportion of husbands who had migrated at the year and subregional level, and the third model proxied for conflict as the proportion of women who managed their households due to death, divorce, separation, or incapacitation of their husbands at the year and subregional level. For each of these models, we instrumented for the conflict measure with the binary variable for more- or less-forest coverage interacted with a dummy variable that combined 2001 and 2006. 10 Results (Supplemental Appendix Table 3) indicate that when conflict is measured by total casualties or is proxied by husband's migration status, civil war strife increased the likelihood of women engaging in employment and in self-employment. The coefficients on the interaction terms for conflict are large, positive, and statistically significant, supporting the hypothesis of an added worker effect for women in Nepal.

The third check of the main difference-in-difference results was a set of linear two-stage least square estimates for the likelihood of employment at the subregion level. This robustness check entailed transforming all the variables into subregion averages by year and employing two alternative instruments for conflict: both the linear and the binary versions of forest coverage. Each instrument was interacted with the conflict year dummies to capture differential effects over time. Moreover, conflict was measured in three different ways: total mortality; the proportion of women with husbands who had migrated; and the proportion of women managing without their husbands due to his death, divorce, separation, or incapacitation. Overall, these results (Supplemental Appendix Table 4) show further support for the hypothesis of an added worker effect, especially by the end of the conflict in 2006.

The fourth check of our difference-in-difference approach tests the robustness of the exclusion restriction. That is, we need to ensure that forest cover has no independent effect on the dependent variable and affects women's employment only through its effect on conflict. It is possible that forest cover may be associated with poverty and other determinants of women's shadow wages. To ensure that the instruments are randomly assigned, interactions of year and all variables from the first stage were included in the main difference-in-difference model for employment, along with a measure of district-level poverty from a preconflict period (1995–1996). We estimated separate employment effects for women in households where the husband had migrated, and in households where women were widows or separated or heads of households due to the husband's incapacitation. If the exclusion restriction is

violated, then the main results in Table 4 should tend to be zero when we control for these additional variables. <sup>12</sup> Upon reestimating, the previous results continue to hold and indeed, become stronger for two of the three subsets of women analyzed. <sup>13</sup>

The final set of tests dealt with checking for bias from two sources: selection due to migration and bias arising from omitted variables and serial correlation. Migration was already well entrenched, and the "remittance economy" of Nepal was well established before the conflict began in 1996 (Seddon, Gurung, and Adhikari 1998). Conflict, in of itself, did not cause migration to begin. It is true that civil war somewhat increased existing rates of displacement, but this increase occurred mainly in the far-western and mid western regions of the country. Moreover, it was mainly men who migrated, leaving women, children, and the elderly behind to tend household land. Since we measure employment probabilities for women, the probability of selection from migration in our sample is likely to be small. Finally, since our instrument (forest cover) picks up effects specific to regions from which migration may have occurred (these areas tend to be relatively heavily forested), any potential bias is likely to be conservative in terms of our estimates. If our estimates are influenced by migration, then given that remittances from male migrants are likely to reduce women's employment probabilities, correcting for selection bias should strengthen our results.

We implemented two further controls for selection bias. First, selection bias would be evident if women whose husbands had migrated were systematically different in terms of their employment decisions compared to women whose husbands had not migrated. To check for such a difference, we reestimated the above set of specifications for the subsample of women whose husbands did not migrate and found that the results are substantively the same as those in the full sample. Table 4 reports results for the subsample of women whose husbands had migrated and again, the results are comparable to those in the full sample. In the second additional check for selection bias, we included husband's migration status directly among the control variables of equation (2).<sup>14</sup> Although this variable is statistically significant, the coefficients on our instruments remain positive and significant, indicating that our main results continue to hold.

Next, we considered separate effects for employment decisions that excluded self-employment and found the main results described earlier to be broadly consistent with this new specification. With the restriction to those who are nonself-employed, the marginal effects on our instruments remain positive in sign. However, we lose some precision in estimates, given the small sample size. Finally to ensure that the results are not confounded by bias due to omitted variables and serial correlation, we included separate linear trends for each subregion and found that if anything, our main results become even stronger. <sup>15</sup>

The difference-in-difference results as well as the robustness checks described above show that women's employment probabilities increased over the course of the war in Nepal. We interpret this as indicative of household resilience in that women were able to fill the lacunae in labor market opportunities that arose with male displacement as a consequence of conflict. However, it is possible that the types

of jobs women engaged in were low skilled and low wage and that after the conflict, employment probabilities for women returned to their preconflict levels. 16 Given data limitations, we are not able to ascertain whether employment probabilities did indeed return to status quo levels after 2006, but we can check the types of jobs women held during the course of the war. Sample means for women's top five occupations (Supplemental Appendix Table 5) indicate that the vast majority of women worked in agricultural self-employment, with the proportion of women engaged in this occupation peaking during the height of the conflict in 2001. <sup>17</sup> Consider also unskilled manual labor, which is low-wage work. In the more forested regions where conflict was relatively intense, 1.1 percent of employed women engaged in unskilled manual work in 1996. However, by 2001 and extending into 2006, this work category did not appear among women's top five jobs. In the less-forested regions also, the proportion of employed women engaged in this low-wage category declined from 1.7 percent in 1996 to 0.5 percent in 2001, and by 2006, was absent among the top five occupations. Hence, there is some qualitative evidence that women were not engaged in increasingly low-skilled manual work as their employment probabilities rose from 1996 to 2006. We view this finding in and of itself in a positive light.

# **Conclusion and Implications**

Consistent with the frequent observation that war is development in reverse, the civil war in Nepal entailed thousands of casualties, and the economic repercussions of the war weakened the country's social fabric as households and communities struggled to survive. An important question raised by these changes is whether women engaged in more employment (the added worker effect) as a consequence of conflict. We find that this added worker effect indeed occurred: women who lived in areas with high-conflict intensity engaged in more work over the course of the civil war in relation to comparable women in regions of low-conflict intensity. Similar trends are evident in the case of self-employment.

These main results are robust to alternative measures of conflict intensity, sample composition, and estimation strategies. Moreover, we find that conflict-induced impacts on women's work intensities were substantially different than those originating from an economic shock such as job loss for a male member. Whereas the economic shock of an unemployed man in the home produced little to no impact on women's employment decisions, the Nepalese conflict had strong, positive, and significant effects on women's employment and self-employment probabilities. We interpret these findings as indicative of household resilience in the face of war and view the qualitative evidence that the proportion of women engaged in unskilled manual labor declined from 1996 to 2006 as a beneficial development for employed women. However, it is possible that women's employment probabilities returned to preconflict levels after the war because of reduced male displacement and due to a combination of societal and policy pressures. Hence, there may have been few institutionalized changes that permanently transformed women's labor market and

economic status in postwar Nepal. Unfortunately, given data constraints, we are not able to confirm such developments beyond 2006.

The result of an increase in women's employment likelihoods has important policy implications for immediate changes as well as long-term strategies. In the aftermath of civil war, viable economic policies are required to address the concerns that originally contributed to instigating conflict. In the case of Nepal, such policies should be tailored toward reducing inequities between different factions. For instance, aid agencies working in tandem with public institutions would do well to concentrate on the quick creation of jobs, and aim first to fulfill the short-term needs of the affected populations (Ghani and Iyer 2010).

Job creation would be especially useful for women in the aftermath of the civil war, particularly to curtail a possible movement back to the status quo. Our results indicate that women's incentives in terms of employment have changed, and they would be receptive to new opportunities as long as they had the freedom to pursue them. Such jobs would also have the potential to reduce poverty and inequality (Acharya 2008).

Targeted use of microfinance to support and incentivize women would further aid in ensuring food security and economic welfare. This intervention would be especially helpful since there is evidence that agricultural self-employment was the top occupation of women throughout the course of the war. Depending on the types of activities in which women choose to engage, public provision of vocational training and dissemination of know-how on accounting and management practices would also be of value. Furthermore, public and nongovernmental institutions could play key roles by providing subsidies that facilitate the purchase of new profit-enhancing technologies such as computers and cell phones and by offering support for the marketing and sale of products created by women-run businesses.

#### **Authors' Note**

This sentence should appear in the statement of funding support. The data used in this article are available through the Demographic and Health Survey website (http://www.measuredhs.com) free of charge. The authors will assist other scholars who have downloaded the data to reproduce the data set used here.

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#### Supplementary Material

The online appendices are available at http://jcr.sagepub.com/supplemental.

#### **Notes**

- 1. Studies using econometric methods to demonstrate an added worker effect in industrialized countries include Finegan and Margo (1994) and Acemoglu, Autor, and Lyle (2004) for the United States and Prieto-Rodriguez and Rodriguez-Gutierrez (2003) for Western Europe. Such effects did not persist in the case of Germany's mandatory employment scheme at the end of World War II; women's labor force participation actually fell in the long run, possibly due to discouragement from the challenging conditions of the mandatory reconstruction work (Akbulut-Yuksel, Khamis, and Mutlu Yuksel 2011).
- Two notable studies based on descriptive analyses of the effects of war on women's employment in developing countries include Date-Bah (2003) and Kumar (2001).
- 3. This summary of causes of Nepal's conflict draws on Deraniyagala (2005), which highlights the links between relative deprivation, political forces, and social and historical inequities in instigating conflict; Murshed and Gates (2005), which demonstrates that inequalities in assets (proxied by land holdings) and in income (proxied by human development indicators) served as causal factors of the intensity of conflict across geographical districts; and Sharma (2006), which blames the eruption of Nepal's civil war on the government's failed development strategy, corruption, and shortsightedness about the potential dangers of socioeconomic exclusion.
- 4. See, for example, de Walque (2006) on Cambodia, Ibáñez and Vélez (2008) on Colombia, Blanc (2004) on Eritrea, and Verwimp (2003) on Rwanda.
- 5. In a separate set of regressions, we tested the predictive power of our instruments from 1994 in explaining the growth in conflict intensity over the 1996–2006 period. Results indicate that the 1994 instruments are good predictors of the subsequent growth in conflict intensity.
- 6. The form of the "Forested" variable that is used as the instrument can be seen in the third column of the final panel of Table 1. We implement various robustness checks for this choice.
- 7. We coded as self-employed those individuals who reported that they worked for themselves or for their family. The reference group is individuals who worked for someone else.
- 8. This specification excludes the woman's potential wage, a variable that could also determine women's participation in the labor market (as in Dex et al. [1995] and Prieto-Rodriguez and Rodriguez-Gutierrez [2003] in their studies of the added worker effect). Because the Nepal DHS does not include information on cash earnings in the three years of our analysis, we cannot follow this approach.

9. Because the two subsamples of women with husbands not present are not representative of all women, the estimates in columns 3 through 6 may be subject to selectivity bias. We address this issue by noting that male migration was already well entrenched in Nepal before the conflict began. Furthermore, a specification check of the average proportion of husbands who had migrated regressed on the forest–year interaction terms, and the full set of regressors at the year/subregional level finds no evidence of confounding effects from the preconflict instruments in 2001 or 2006. A similar test for women who are widowed, separated, or household heads for a reason other than husband's migration also indicates that selection does not affect the results.

- 10. We needed to combine the 2001 and 2006 dummies in order to achieve model convergence.
- 11. Another check involved using district-level means of a wealth index in the 1996 DHS data constructed from factor scores as another indicator of poverty. These results were similar to those from the district-level measure of poverty for a preconflict period.
- 12. Since more forested regions could be poorer, we included the forest variable directly in the difference-in-difference model as a final control for effects related to poverty. The forest variable is negative and significant in these runs, indicating that in more-forested areas, women are less likely to be employed. However, our main results as measured by the coefficients on the forest–year interaction terms remain positive and significant. Thus, even with the inclusion of the forest variable directly in the model, our previous results continue to hold.
- 13. These regressions, including those with district means of the DHS 1996 wealth index from factor scores, are available upon request.
- 14. This approach is similar to the strategy followed to address selection bias from migration in Angrist and Kugler (2008).
- 15. These regressions, as well as those testing for selection bias, are available upon request.
- 16. We thank a referee for drawing our attention to this possibility.
- 17. Note that the types of occupations do not differ much between less and more forested areas.

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