Occupational Injury and Illness Meet the Labor Market

Lessons from Labor Economics about Lost Earnings

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ABSTRACT: Recent labor economics studies in the United States and Canada have demonstrated that occupational injuries and illnesses often lead to substantial lost earnings for workers and their families. Other studies have shown substantial long-term lost earnings attributable to large-scale layoffs, where no health impairment has taken place. This article uses evidence from these and other studies of apparently different situations to draw inferences about how managers' actions and public policy choices can affect the costs of occupational injuries and illnesses. Although primary prevention remains the policy of choice, reduction in the impact of workplace injuries and illnesses can decrease the costs of these events and can provide substantial benefits. This article proposes two hypotheses and discusses the evidence for each: (*a*) Loss of the job held at the onset of illness or injury increases time off work and exacerbates workers' lost earnings. (*b*) Workers' losses may be substantially reduced by policies that encourage employers to rehire people recovering from or disabled by workplace injuries and illnesses.

KEYWORDS: disability; injuries; occupational diseases; cost of illness; displaced workers

INTRODUCTION

Every year, millions of people incur occupational injuries and illnesses. Many are minor and result in little or no time lost from work. For these injuries, no lost earnings result. For other injuries, workers may need more substantial medical treatment, may not be able to return to work immediately, or may have work limitations that make them less productive. Because of this reduced

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productivity, their postinjury wages may be lower than they would have been, they may have to work fewer hours, and they may incur more nonwork spells. These consequences of workplace injuries and illnesses can last a few days or a lifetime.

In large part, lost earnings are directly linked to the health consequences of injury or illness. But evidence suggests that workers with occupational injuries and illnesses may continue to incur lost earnings even if they have returned to their preinjury health status. In addition, among those who have long-term health limitations, labor market factors may affect the amount of earnings lost. In others, the medical aspects of workplace injuries may play a minor role in determining economic outcomes for workers and their families.

In this article, I will bring together some ideas from labor economics and data from studies by labor economists to shed light on how occupational injuries and illnesses affect workers' earnings. I will first present estimates of the extent of lost earnings caused by occupational injuries and illnesses. I will then briefly describe how economists think about the factors determining the size of these losses. In particular, I will focus on how job loss can increase the magnitude of the impact of health limitations on earnings. Finally, I will describe some policies that could improve economic outcomes for workers with occupational injuries or illnesses.

Lost Earnings Caused by Occupational Injuries and Illnesses

Research that uses modern statistical methods to estimate the labor market impacts of occupational injuries and illnesses is in its infancy. The first of these studies was published in 1998,[1] and a small number have been completed since. A consistent story emerges from these studies: many injured workers suffer substantial lost earnings.

Lost earnings are actual earnings minus what would have been earned if the injury or illness had not occurred. FIGURES 1 and 2, adapted from Reville,[2] display a conceptual model of lost earnings. FIGURE 1 shows earnings increases over time prior to injury or illness. If the worker remains in good health, earnings will continue to rise, as shown by the dashed line. However, after the onset of injury or of illness, work stops during recovery and earnings are zero until the worker begins to work again. At this point, if wages return to the original earnings path (indicated by the dashed line) the worker has incurred a temporary total disability. The shaded area measures lost earnings.

Some workers never return to the original earnings path. In this case, they have permanent disabilities, as is shown in FIGURE 2, where the shaded area of lost earnings continues indefinitely. FIGURE 2 does not tell us whether workers with long-term lost earnings have long-term health problems, but only whether they have returned to the original earnings path.

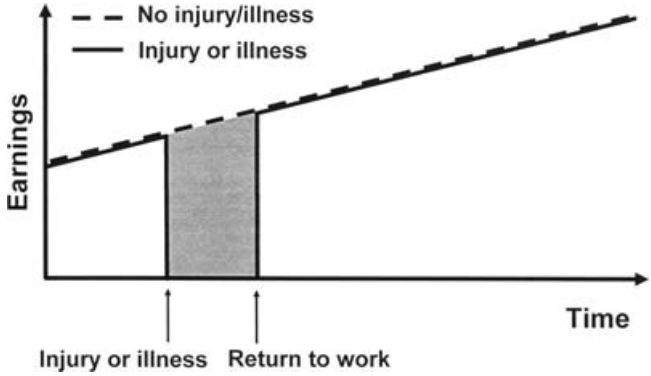

FIGURE 1. A conceptual model of temporary injury-related losses.

If we could observe what the earnings of these workers would have been in the absence of injury or illness, then we could simply subtract them from actual earnings to determine how much was lost. However, a worker is either injured or uninjured at a moment in time. If we observe earnings after onset of an injury or illness (hereafter referred to as injury), we cannot know with certainty what their earnings would have been had they not been injured. We must find a way to estimate counterfactual earnings from another source.

Recent studies have estimated lost earnings of injured workers by identifying workers who are similar to the injured workers in all other observable respects but who were not injured. These recent studies use two methods to estimate uninjured earnings: matching and regression. The matching approach uses a comparison group of uninjured workers and matches each injured worker to one or more uninjured workers with similar relevant characteristics in the immediate preinjury period. Lost earnings are then the difference between the mean

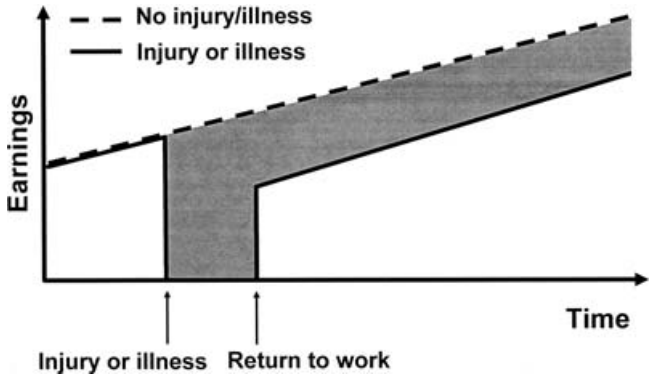

FIGURE 2. A conceptual model of permanent injury-related losses.

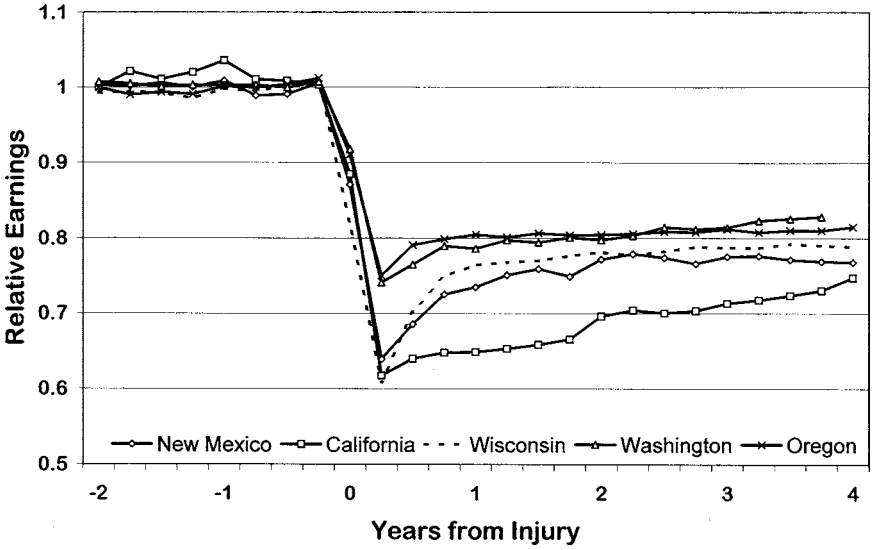

FIGURE 3. Earnings of workers with occupational injuries and illnesses relative to matched uninjured workers: five U.S. states. (From Reville *et al.*[3])

earnings of injured workers and comparable uninjured workers. Similarly, the regression approach compares regression-adjusted mean earnings between injured and uninjured workers to determine the extent of lost earnings.

Using the matching approach, the most comprehensive study of permanently disabling workplace injuries and illnesses to date[3] estimated lost earnings over a 10-year period. Different states define permanent disability in somewhat different ways, but permanently disabling injuries generally involve a functional impairment from which the worker does not fully recover and that leads to a long-term loss in earnings. Injuries are categorized as temporarily disabling if the worker fully recovers from the occupational injury or illness. In the five U.S. states studied, between 18% and 41% of workers with lost-time injuries are categorized as permanently disabled. The study found that these injured workers incur a substantial initial decline in earnings relative to the comparison group, followed by a period of recovery (FIG. 3). Despite some recovery of earnings, losses remain substantial even 4 years after injury. Average losses for workers in individual states range from 16% to 25% of earnings.

An earlier study of all injuries and illnesses involving at least 1 week of lost work[4] used a regression approach and found 10-year losses of about 5% of earnings. This figure includes many workers with short-term disabilities. However, for the 35% of injured workers losing at least 8 weeks work or receiving permanent disability benefits, lost earnings are much higher—about

18% (author's calculations). A recent study of permanently disabled workers in Ontario estimated even greater losses.[5] On average, Ontario workers with permanent partial disability (PPD) benefits have losses averaging about 40% of preinjury earnings. Like similar workers in the United States, substantial losses persist through the follow-up period of up to 10 years. The higher proportionate losses in Ontario may reflect the fact that only about 10% of workers with lost-time injuries in Ontario receive PPD benefits. Because a much larger proportion of U.S. injured workers obtain PPD benefits, recipients with less severe injuries might not qualify for these benefits if they were injured in Ontario. Ontario PPD cases would tend to be more severe on average, leading to higher average losses.

These North American studies only include a small number of people with chronic occupational illnesses, because these conditions rarely enter the workers' compensation systems in the United States and Canada. However, there are some qualitative similarities between people with chronic occupational diseases and injured workers with permanently disabling conditions. First, many chronic occupational diseases cause long-term functional impairment. Second, workers with chronic occupational diseases tend to be older and have greater job tenure than the average injured worker. The same is true of workers receiving permanent disability benefits. Of course, there are substantial differences as well. As a consequence, we do not know whether the lost earnings of workers with chronic occupational illnesses would be similar to those described in this article.

Factors Influencing Injured Workers' Earnings

Labor markets consist of workers who supply labor, employers who demand labor, and institutions (including laws and regulations) that provide the framework within which wages are determined and jobs and workers are matched. Economists think of wages as largely reflecting workers' productivity. A simplified model of employer behavior leaves out some important considerations, but in many situations is a useful device. It begins with the assumption that employers compete to hire workers and are willing to pay higher wages to more productive workers. Productivity can be affected by education, training, talent, skills, health, motivation, and the match between workers and their jobs. The first six of these are aspects of what economists call human capital.

Anything that diminishes human capital or interferes with its use typically reduces earnings. Workplace injuries can do this in several ways. First, and most obviously, they can impair health and cause functional limitations that directly affect ability to work. These limitations can take many forms. Poor health can cause workers to be off work, can limit their ability to work fulltime, can cause them to be less effective while performing work tasks, can keep them from doing some tasks, and so on. In addition, poor health can distract from the

ability to think clearly, focus on job demands, and communicate with others.[6] Poor health can also make it more difficult and costly to maintain and improve skills and can decrease the number of jobs available to apply these skills. The higher cost and lower value of skills can lead employers to invest less to acquire such workers.

The injury and events following the injury can affect workers' employment and earnings over and above the direct impacts on health and thereby on productivity. When injured workers lose much time from work during recovery, employers may incur additional costs by hiring temporary workers or paying overtime. In this case, employers may choose to hire permanent replacements, causing the injured workers to lose their jobs. Reville *et al*.[3] look at New Mexico workers with PPD cases who have returned to work. These injured workers are 10% less likely to be working for the at-injury employer in the years after injury than matched uninjured workers. Similarly, Galizzi and Boden[7] find that the first postinjury job was for a new employer for 17% of workers with lost-time injuries in Wisconsin. In Oregon, 90% of workers with short-term injuries return to the employer, compared to only 75% of those with PPD benefits (author's calculations).

Factors other than reduced productivity can affect employers' willingness to hire and retain workers and the wages offered to them. A workplace injury may be seen, often incorrectly, as an indication that a worker is "injury-prone." Alternatively, the employer may be suspicious that people filing workers' compensation claims are malingering. Thus, some employers will treat a workplace injury as an indicator of a problem employee. To the extent that this happens, it will reduce the willingness of the at-injury employer to retain the injured worker and will reduce wage offers by other potential employers, limiting future employment and earnings.

To gain insight into the impact of job loss on employment and earnings, we turn to studies of workers who lost their jobs as a result of plant closings or layoffs. As the next section describes, job loss unrelated to poor health or disability can lead to substantial lost earnings. When job loss follows occupational injury or illness, the economic consequences are likely to be magnified.

Impact of Job Loss on Earnings

In research done over the last 30 years, economists have learned a great deal about how job loss affects earnings. Much of this research has focused on displaced workers in the United States. By definition, displaced workers have lost their jobs because of large-scale layoffs or plant closings. They have not been fired, which might indicate that they were less productive than other workers; and they have not quit, which might occur because they had found better jobs. There is no reason to think that displaced workers are less healthy than nondisplaced workers with similar nonhealth characteristics although this

issue has not been studied. Even so, displaced workers represent the best opportunity to study the pure effect of job loss on earnings. A plant closing is, for these purposes, a "natural experiment."

The impact of displacement on earnings is the difference between actual postdisplacement earnings and what the same workers would have earned had they not been displaced. The methods used to estimate counterfactual earnings are parallel to those used to measure earnings lost as a consequence of workplace injuries: researchers have typically used the earnings of nondisplaced workers with similar characteristics to estimate counterfactual earnings. Disparities in observed worker characteristics between displaced and nondisplaced workers are handled either by matching or regression. In the United States, most displaced workers have a substantial period of nonemployment after displacement. During this time, they engage in job search, which can take many months. In some cases, they look for a while and then stop looking, but in most cases they find another job. In the United States, the Displaced Worker Survey (DWS) gathers data from workers who have been displaced during the 3 years prior to interview. Depending on the interview year, between 60% and 75% of respondents are employed at the interview date.[8] Studies of displaced workers in France and Germany suggest that displaced workers are less likely to experience nonemployment than their U.S. counterparts, possibly because the United States has less stringent requirements to notify workers of impending plant closures or mass layoffs. Of those who have a period of nonemployment, employment rates after 12 months are only 55% in France and 60% in Germany.[9]

A study of long-tenure Pennsylvania workers in the 1980s found that displacement-related losses were long lasting. Six years after displacement, workers were earning an average of about 25% of predisplacement earnings.[10] The time profile of postdisplacement losses is very similar to those of injured workers with PPD benefits, as can be seen by comparing FIGURES 3 and 4. Another study[11] found similar long-term losses—between 17% and 25%—among workers displaced from jobs in California's durable goods manufacturing industries during the early 1990s. Farber[8] examined the losses of displaced workers who had full-time employment both before displacement and when they were interviewed. Overall, despite being fully employed, their lost earnings averaged 17% at interview—an average of 2 years after displacement.

There have been a few non-U.S. studies of displacement. A study of postwar West German workers displaced in 1988–1996[12] found lower losses than in the United States. In the year of displacement, losses averaged 13.5% of predisplacement earnings but shrank to 6.5% after 2 years. A study of Swedish displaced workers[13] looked only at employment, not lost earnings, and found an employment decline relative to matched controls of 4%–6% that continued for the full 13 years of follow-up. This is comparable to findings about employment in the United States, where, except for workers over 55 years of age, most

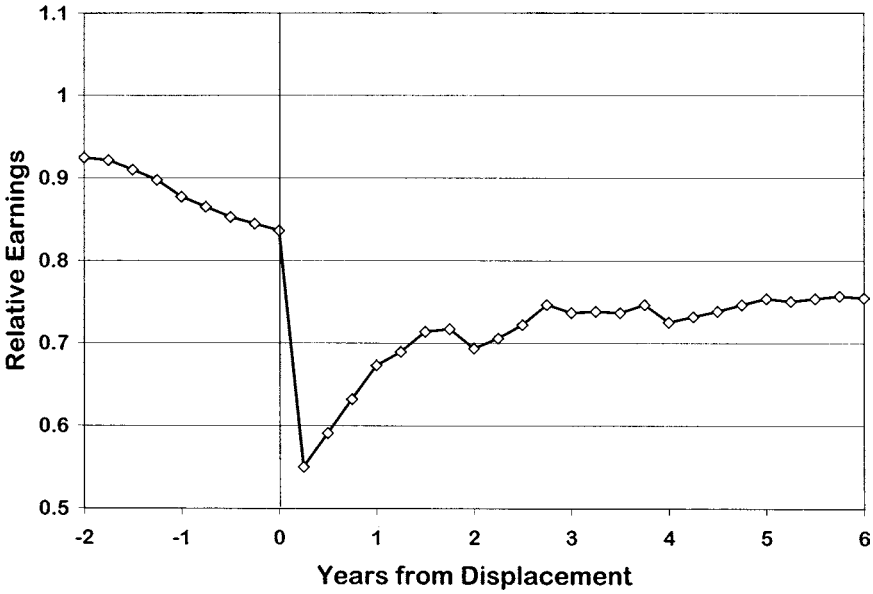

FIGURE 4. Earnings of displaced workers relative to matched non-displaced workers. (Adapted from Jacobson et al.[10])

long-term losses derive from lower postdisplacement wages rather than continuing employment declines.[14–16] A study of Slovenian workers displaced in the early 1990s found a much larger impact in this transition economy than in Western Europe or the United States.[17] Two years after displacement, only one-third of the displaced Slovenian workers had jobs. Those who found jobs faced an average reduction in earnings of 70% compared to otherwise similar nondisplaced workers. The higher costs of displacement may have been related to less-developed labor market and a fairly high unemployment rate.

The overall message from these studies is clear: losing a job puts many workers at risk of a substantial period of nonemployment and, after that, a long-term risk of reduced earnings. What happens when this job loss occurs after a substantial period off work because of an occupational injury or illness?

Displaced Workers: Uninjured and Injured

Workers who lose their jobs because of mass layoffs or injuries have some important features in common. First, to find another job, workers just engage in job search. It may take many months before an acceptable job is found. Second, a portion of the skills and knowledge built up at the old job may not add to productivity at the new job, so the portion of wages associated with that skills and knowledge is lost. Also, if the time off work is long, the worker is

not acquiring new skills and may see some old valuable skills and work habits decline. All of these factors will tend to reduce earnings.

Injured workers who lose their at-injury jobs may face problems not encountered by displaced workers. Workers experiencing a long recovery period may not be able to engage in a comprehensive job search, so the period off work will be greater than for otherwise comparable displaced workers. To the extent that their injuries have lasting consequences, they suffer productivity losses over and above the loss of specific human capital incurred because of job loss. We would also expect a longer period between job loss and employment for injured workers because, unlike many displaced workers, injured workers do not receive prior notice of the impending event.

There is limited evidence about the impact of job loss on injured workers. This research is particularly difficult because job loss and lost earnings are both affected by the severity and duration of injury-related health conditions. Because the data typically used by economists to estimate lost earnings lack good measures of injury severity, researchers cannot tell whether job loss caused subsequent reductions in earnings or whether injury severity caused both the job loss and earnings reductions. Galizzi and Boden[7] estimated the impact of job loss on injured workers, but data lacked direct measures of injury severity. To deal with the bias induced by unobserved severity, they used an instrumental variables approach to determine the impact of job loss on duration off work after injury. They found that loss of the pre-employment job dramatically increased durations off work. Reville *et al*.[18] used a different approach. To control for severity, they stratified injured workers with PPD benefits by their medical disability assessments, which were summarized as percentage disability ratings. They then compared lost earnings of workers who were employed with the at-injury employer 1 year post injury with all those in the same medical disability rating. They found substantially smaller losses—for most groups 30%–40% less—among those who were back to work with the at-injury employer (FIG. 5).

Impact of Workplace Accommodations

Given the value of maintaining employment continuity, a logical question is: What can be done to increase the proportion of injured workers who return to the at-injury job? There is evidence that better medical care and tighter coordination between medical providers and employers reduces time off work and may thus increase the probability of return to the at-injury job.[19,20] Another effective policy is employer accommodation for disabled workers. Burkhauser *et al*.[21] studied the impact of employer accommodations on job tenure after the onset of a disabling health condition. They estimate that offering job accommodations increases postdisability job duration for the average disabled worker from 2.6 to 7.5 years. Using data from the 1978 Survey of Disability

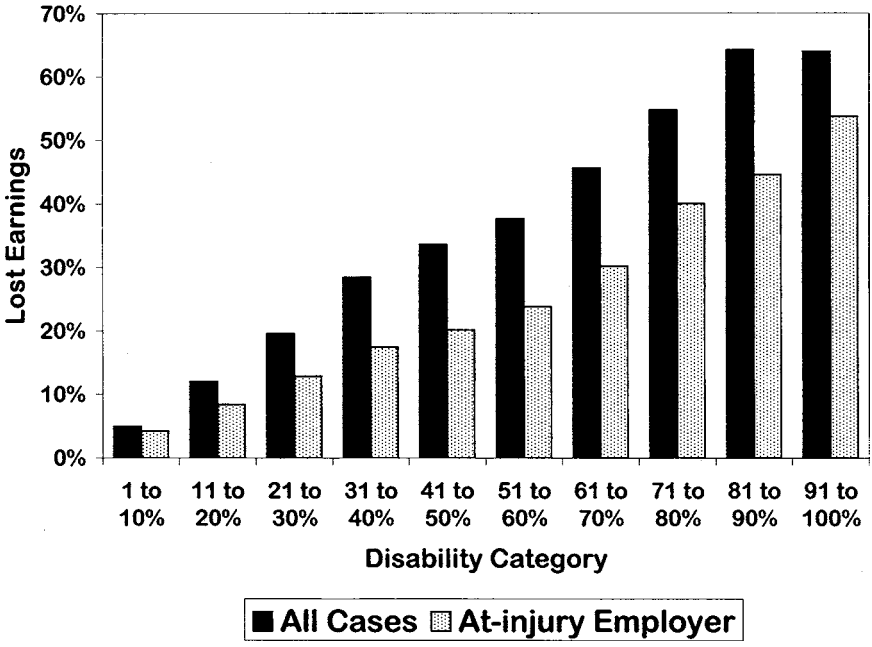

FIGURE 5. Three-year lost earnings of injured workers by disability category and return to the at-injury employer, California. (Adapted from Reville *et al.*[18])

and Work and the 1992 Health and Retirement Study (HRS), Burkhauser and Butler[22] find that employer accommodations for disabled men significantly increase the time between the onset of disability and application for Social Security Disability Insurance (SSDI). Based on the HRS, employer accommodations would reduce the number of SSDI applications in the 5 years after onset of disability by about 30%. Krause *et al.*,[23] in a review of studies of the effectiveness of workplace accommodations for injured workers, concludes that modified work programs tend to reduce lost workdays by about half. While appropriate accommodations allow some injured workers to return to the at-injury job without undue risk, not all injured workers can or should return to the at-injury job. Even with accommodations, job demands or risk at that job may be excessive.

DISCUSSION

This article, based largely on reviewing studies by labor economists, has shown that injury-related lost earnings are substantial. It has also presented evidence that lost earnings are exacerbated when workers do not return to their at-injury jobs. Finally, it has indicated that workplace accommodations are

effective in increasing the probability that workers will return to work for the at-injury employer.

There are a variety of reasons that some injured workers are offered accommodations and others are not. In some employment situations, accommodations are infeasible or impractical either because of the nature of the job or the skills and motivation of the injured worker. In others, employer policies offer limited or no support for measures to re-employ workers with health limitations. Work accommodations may or may not be supported by laws and regulations. Despite the passage of the Americans with Disabilities Act, U.S. law tends to offer few incentives for the rehiring of workers by the at-injury employer.[24] Some U.S. states have put programs into place that provide financial incentives for providing job accommodations for injured workers,[25] but these states are in the minority.

Lost earnings and the return-to-work of injured workers have largely been studied in the North American context. Studies of displaced workers in other countries appearing in a recent book[26] cover only a year or two after injury but still provide interesting insights. These studies show little or no wage decline (relative to nondisplaced workers) among displaced workers in France and Germany. Larger declines are documented in the United States, Canada, and the UK. The important difference between these two groups is probably not language, but a combination of a narrower wage distribution and stronger employment protection laws in France and Germany. For countries with less wage disparity, greater employment protections, and more comprehensive social insurance programs, concerns over job loss may be of less importance. However, many countries have less well-developed labor market institutions and limited social insurance programs. For them, the North American findings presented here may well be applicable.

Finally, although lost earnings are the focus of this article, they are not the only important consequence of occupational injuries and illnesses. Injuries and illnesses may also cause a substantial decline in the quality of life of workers and their families,[27,28] may lead to the breakup of marriages,[29] and may have other important economic and noneconomic impacts that are outside the scope of this article.

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