

Anticipation of migration and psychological stress and the Three Gorges Dam project, China

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Abstract

Findings from a prospective study of project-induced migration in China's Three Gorges Dam project are reported. The study tests the hypotheses that anticipation of involuntary migration is stressful and that the harmful effects are partially mediated and moderated by the resources migrants possess. Using data collected from a sample of designated migrants ($n = 975$) who will be forced to relocate because they live in an area, which will be flooded once the Three Gorges project is completed, and non-migrants ($n = 555$) in the same region, our analysis indicates that anticipation of involuntary migration is a robust predictor of mental distress. Anticipation of forced migration elevates depression (CES-D) not only directly, but also indirectly by weakening the social and the psychological resources (i.e., social support and mastery), which safeguard the mental well-being of migrants. However, our results show much less support for the hypothesis that resources moderate harmful effects of forced migration.

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Introduction

Moving has often been seen as a stressful life event because it disturbs the equilibrium between the mover and the environment and compels the mover to readjust (Ben-Sira, 1997; Bhugra, 2004; Lev-Wiesel, 1998). While this view has been proven useful to explain the prevalence of stress symptoms among voluntary migrants (Harrison et al., 1997; Noh & Avison, 1996) and refugees (Beiser, 1999; Eaton & Garrison, 1992; Porter & Haslam, 2001, 2005; Rumbaut, 1991), its applicability to project-

induced migrants, a different type of involuntary migrants, has seldom been demonstrated.

This study tests the hypotheses that anticipation of project-induced migration is a stressor which would negatively affect the mental well-being of migrants and that migrants with more protective resources should be less adversely affected. The study is guided by the *stress process model* (Pearlin, 1989; Thoits, 1995). The model suggests not only a potential link between exposure to stressors and depression, but also mechanisms through which presumed negative effects of stressors are mediated and moderated (Ensel & Lin, 1991; Wheaton, 1985). While the empirical validity of the model has been confirmed by studies conducted primarily in the west, the extent to which these conclusions can be

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generalized to a culturally distinct population is less certain.

This paper presents findings from an analysis of data collected from a sample of designated project-induced migrants in China. These people are designated for forced relocation because they live in an area that will be flooded by a man-made reservoir once the Three Gorges Project (TGP) under construction is completed in 2009. To test the hypothesis that anticipation of forced migration is stressful, a comparison group is included consisting of residents in the same region who are exempted from the relocation because of the higher elevation of their residence.

This study allows us to examine the stress process model in a different cultural setting and for a different type of migration. Evidence which supports the applicability of the model to migration comes predominantly from studies conducted in the west (Beiser, 1999); our knowledge about the utility of the model in the east is limited (Lin, 1989). Furthermore, while a majority of the extant studies focused on voluntary migration and the actual experiences of migration, our study examines the effects of the anticipation of involuntary migration. Although it is logical to predict the same psychological effects from either circumstance, we know little about whether it is the case (Billig, Kohn, & Levav, 2006).

Background and significance

In 1994, China began the construction of the TGP on the Yangtze River, the largest dam project in human history (New York Times, 2006). The TGP is intended to control recurring floods in one of China's most populated regions, to generate hydropower needed for economic expansion, and to facilitate development in China's massive interior by means of improved navigation. The completion of the project, however, will create a reservoir the size of Lake Superior, requiring the resettlement of at least 1.3 million people who live below the 175 m above-sea-level from hundreds of would-be flooded villages and towns in Hubei and Sichuan Provinces (Wang, 2001). Relocation began immediately for a small number of designated migrants who moved on their own; the timing of relocation for a majority of migrants, however, was determined by the progress of the dam construction and other related projects. Involuntary resettlement of such a magnitude is unprecedented. Its influences on the livelihood of

the displaced Chinese are expected to be extensive. Yet there is little systematic effort to measure its various impacts on the affected people.

One of the most important questions for migration research is the extent to which the process of migration changes the well-being of migrants (Beiser, 1999; Borjas, 1994; Bhugra, 2004; Porter & Haslam, 2005). Past studies of migration consequences, however, have suffered from intrinsic limitations of migration studies resulting from the selective nature of migrants (Borjas, 1987; Jasso & Rosenzweig, 1990), and the retrospective research designs researchers were often forced to use. Because migrants are often selective, it is problematic for researchers to attribute any observed post-migration differences between migrants and non-migrants in outcomes of interest to "migration effects" (Lieberson, 1985). Relying on retrospective measures creates additional challenges because the accuracy of such measures is often weakened by faulty memories and post-factum rationalizations (Campbell & Stanley, 1966).

The TGP provides an ideal research condition to potentially overcome these challenges. The construction of the dam requires the indiscriminate relocation of all those who are in the way. This allows us to measure migration consequences with little selectivity. In addition, the Project as a planned process permits us to take pre-migration measures prospectively, an unusual opportunity for migration studies.

As a first step toward assessing the impact of the TGP on those who are forced to relocate, we examine pre-migration distress. The planned post-migration survey is in progress and will be completed when all designated migrants who participated in our pre-migration survey have moved.

Theoretical framework

Research focuses on project-induced migration tends to be atheoretical (Cernea, 1993); there is no systematic conceptual framework designed specifically for this type of forced migration studies. However, there is a growing body of literature which has demonstrated the utility of the *stress process model* (Pearlin, 1989) for voluntary migration and refugee studies (Beiser, 1999; Ben-Sira, 1997; Noh & Avison, 1996). Because project-induced migrants share many similarities with refugees (Burton, 2006; Cernea, 1993; Porter & Haslam, 2005), it seems logical to apply the same

theoretical model that has been proven useful for refugee studies to project-induced migration.

The stress process model consists of three conceptual domains: stressors, stress mediators or resources, and stress outcomes (Pearlin, 1989; Thoits, 1995; Turner & Lloyd, 1999). The major tenet of the model is to relate manifestations of stress such as depression to stressors such as undesirable life events and chronic strains. Because depression is not inevitable for persons exposed to stressors, the model invokes psychosocial resources and suggests an indirect and conditional association between stressors and depression.

Involuntary migration as a stressor

Stressors refer to “any environmental, social, or internal demand that requires the individual to readjust his/her usual behaviour patterns” (Thoits, 1995, p. 54). Migration has often been seen as a stressor because it entails tremendous social and economic costs but with uncertain benefits (Beiser, 1999). Stress results from anticipation and actual experience of changes, and from post-migration readjustments. The link between migration and emotional distress has been established by voluntary migration studies (e.g., Bhugra, 2004; Noh & Avison, 1996) as well as involuntary migration studies (e.g. Porter & Haslam, 2005). Involuntary migrants are often victims of powerful external forces over which they have little or no control (Cernea, 1993), a condition that is particularly prone to stress (Pearlin, 1989).

Project-induced migrants are similar to refugees (Porter & Haslam, 2001, 2005) and victims of natural and man-made disasters (Burton, 2006; Cwikel, Abdelgani, Goldsmith, Quastel & Yevelson, 1997; Viel et al., 1997) because they all experience losses, life changes, and adaptation challenges during the resettlement. Such experiences not only affect mental well-being directly, but also lead to chronic strains in other spheres of life. Project-induced migration, however, differs from other types in that it is usually planned, and therefore anticipatory stress often begins before the relocation actually takes place (Scudder & Colson, 1982). Studies showed that the mental well-being of migrants is affected by expectations and attitudes (McKelvey, Mao & Webb, 1993; Tartakovsky, 2002), as well as anticipatory stress in the pre-relocation phase (Billig et al., 2006). In addition, developmental projects are volitional on the part of

the developers and they usually affect only certain segments of a population. These characteristics inevitably arouse a sense of injustice among those who are singled out (Albrecht, 1995; Murdock, Krannich & Leistriz, 1999). Furthermore, project-induced migration is an irreversible process regardless of how undesirable the migration outcomes turn out.

Project-induced migration often has negative economic and social consequences. Economically, migrants displaced by a developmental project often become homeless, landless, and jobless (Scudder & Colson, 1982). Migrants in the Three Gorges are expected to experience similar adversities. China is known for its high agricultural density and labor-intensive farming (Brown, 1995; Zhu, 1996). Farmers in the region average merely one *mu* (1/15 of a hectare) of farmland per capita. The Project is expected to submerge 25.9 thousand hectares of mostly fertile farmland. Together, it is estimated that 40% of the affected farmers will be ousted from farms and forced into occupations for which they have neither the skills nor the qualifications (Yangtze Valley Water Resources Protection, 1999) (hereafter YVWRP).

The likelihood that ousted farmers will be absorbed by non-farm industries, as promised by the government, is slim because factory jobs are scarce in this region (Li, 1998; Tao, 1994; Zhu, 1996). Although there have been government-orchestrated efforts to lure factory jobs to the region, they have been proven unsuccessful (People's Daily, 1999; South China Morning Post, 2006; Washington Post, 2006). As a result, many displaced farmers have become jobless and are forced to survive on meager government allowances (New York Times, 1999; Washington Post, 2006).

Involuntary migration in the Three Gorges also has grave social ramifications. Ninety-nine percent of residents in this region have never moved in their life time (Zhu, 1996). However, despite the preference of a majority of migrants to resettle close to their old home (Zhu, 1996), most of them would eventually be forced to relocate to some place afar due to the shortage of farmland (Tao, 1994). Furthermore, constraints at resettlement sites and logistic considerations necessitate breaking up many larger villages and sending villagers of the same clan in fragmented units to different destinations. The relocation not only uproots the migrants from their home for many generations, it also tears apart their close-knitted social networks.

In sum, the forced migration is expected to be a stressful process for the displaced because of its negative economic and social ramifications. Forced relocation as a stress process does not just start with a physical move, but begins mentally before migration actually takes place. Thus, it is not simply the actual experiences of hardships associated with the relocation but also the anticipation of them that can be conducive to distress.

Stress mediators

Stress mediators refer to resources possessed by an individual which either function as a conduit, or a moderator, of the effects of stressors on stress outcomes (Ensel & Lin, 1991; Wheaton, 1985). They include both tangible and non-tangible goods that can be marshaled to counter the adverse effects of stressors. Two types of resources have been given most attention: social and psychological resources. Social resources include social capitals and social supports embedded in one's social network, whereas psychological resources refer to resilient personality traits. Stress mediators help explain why exposure to a stressor has a negative consequence for some people but not for others.

Although psychosocial resources have been loosely referred to as stress *mediators* by researchers (e.g., Pearlin, 1989), they also function as *moderators* (Ensel & Lin, 1991; Wheaton, 1985). Resources are said to play a mediating role (*mediation hypothesis*) because exposure to stressors often erodes psychosocial resources which are known to safeguard people from depression (Ensel & Lin, 1991). Thus, exposure to stressors leads to depression *indirectly* by reducing the person's psychosocial resources. In addition, resources also function as a moderator (*moderation hypothesis*) that buffers against the harmful effects of stressors (Ensel & Lin, 1991; Wheaton, 1985). Thus, the extent to which a person is harmed by a stressor may depend on the amount of resources s/he possesses.

Forced relocation in China's Three Gorges is expected to arouse distress among migrants not only because relocation is inherently stressful (direct effect), but also *indirectly* (*mediation hypothesis*) by shattering migrant's social network and their sense of self-directedness. The effects of forced relocation are also expected to be conditional upon the resources migrants possess (*moderation hypothesis*). Due to an uneven distribution of psychosocial resources in a population, the distribution of

depression is unlikely to be even (Mirowsky & Ross, 1986; Turner & Lloyd, 1999).

In addition to resources, coping strategies can affect stress outcomes (Pearlin, 1989). Coping "encompasses cognitive and behavioural strategies used to manage a stressful situation ... and attendant negative emotions" (Aldwin & Revenson, 1987, p. 338). Following Pearlin and Schooler (1978), we argue that whether or not an objective situation (i.e., forced migration) will have a negative consequence depends on one's subjective perception of the situation. Thus, migrants who are more supportive of the TGP are expected to find the relocation less stressful than their less supportive counterparts. Those who consider themselves better off than others are also expected to find the forced relocation less stressful.

Stress outcome

Stress outcomes refer to the manifestations of stress (Pearlin, 1989). While stress manifests itself in many forms, sociological studies of stress have focused predominantly on depression (Thoits, 1995; Vega & Rumbaut, 1991). We anticipated a significant difference between Three Gorges' designated migrants and non-migrants in the level of depression. We also anticipated migrants who reported higher levels of migration-induced stress to display a higher level of depression than their counterparts.

Data and methods

While the focus of this study is involuntary migrants in the Three Gorges region, we also included non-migrants from the region for comparison purpose. Our sample consisted of 975 designated migrants and 555 non-migrants recruited from five communities (clusters) randomly selected from Wanxian Relocation and Development Region (WRDR) which was formerly a part of the Sichuan Province where 80% of designated migrants resided (Weng, 1999). Although we planned to select clusters using the probability proportional to size technique, the plan was later modified because the ongoing out-migration has made it impossible to estimate cluster sizes accurately. Face-to-face interviews were conducted in late 2002 and early 2003 by 29 sociology graduate students from two universities. The survey has a response rate of 99%, a high rate which is typical of face-to-face interviews in rural China (Wang, 1996).

Our sample was made up of 51% urban and 49% rural residents. We oversampled urban residents to reduce costs because rural residents are more dispersed. Fifty-five percent of our respondents were female. The sample has an average age of 45 and an average educational attainment of 7.48 years. The apparent “overrepresentation” of women, older, and less-educated respondents probably reflects the high out-migration rate of the region even before the Project (Hwang, Qiao & Xi., 2004; Roberts, 1997; Solinger, 1999). A comparison of the demographic profile of our *sampled households* with the 2000 census results for the Wanxian Region (Chongqing Statistical Yearbook, 2003) indicated that our sample closely mirrors the population in terms of age, sex, educational compositions, and average family size. Preliminary analysis indicated that our migrants and non-migrants are comparable in basic demographic features such as gender, marital status, and educational attainment.

Outcome measure

Our migration outcome of interest is *depression*. Depression is measured by the 20-item CES-D scale (Radloff, 1977) which has known psychometric attributes and well-established reliability and validity (e.g., Vega & Rumbaut, 1991). The 20-item scale asks respondents if they have experienced any depressive symptoms during the past week using a 0–3 response format. The scale has a range of 0–60. Although there have been concerns about the appropriateness of the CES-D scale for Asians due to cultural differences in expressing depressive symptoms (Lai, 1995; Lin, 1989; Noh & Avison, 1996), research conducted in Canada reveals striking similarities across cultures (Beiser, Woodbury & Cargo, 1994). Community surveys in Hong Kong and urban China have proven the usefulness of the scale for Chinese populations (Lai, 1995; Lin, 1989).

To ensure that a scale is applicable to our sample, we reexamined the issue by comparing measures of depression with or without the four items that had been identified as biased (Lai, 1995). However, we found little differences between the two scales computed with ($\alpha = 0.87$) or without ($\alpha = 0.88$) the four positive affect items.

Measures of stressor

Our key independent variables are two alternative measures of forced migration as a stressor. The first

is *migration status*; a dummy variable that differentiates designated migrants (coded 1) from non-migrants (coded 0). Our second variable is a direct measure of *migration-induced stresses* that counts the number of harms the designated migrant expects the relocation will bring to his/her family. The list includes loss of home or properties, income loss, occupational change, worsening of housing conditions, severing ties with relatives, difficulties getting along with new neighbors, and having to leave the ancestor’s land. The variable has an empirical range of 0–6.

Chronic strain is another source of depression that is often confounded with other stressors (Pearlin, 1989). Our measure asks respondents to indicate whether or not they are experiencing any of the following 10 chronic problems: marital dissatisfaction, divorce, widowhood, chronic disease, disability, unemployment, debt, troubles with neighbors, co-workers, and local cadres. The sum of the 10 items yields a count measure. Because many of these problems can result from forced migration, it is reasonable to view chronic strains as secondary stressors (Pearlin, 1989). While it is conventional for researchers of stress to control for life events, we did not include the variable in our analysis because many stressful life events overlap with our chronic strains measure. While life events occur somewhat randomly, chronic strains are imbedded in social structure and therefore are more likely to have a non-random effect that cannot be ignored.

Measures of resources as mediators/moderators

Our mediators include social support, mastery, self-esteem, and positive comparison as a coping strategy. *Social support* was measured by Lin, Ye, & Ensel’s (1999) *perceived routine support* scale, which quantifies the extent to which the respondent perceives that s/he is able to obtain useful instrumental, informational, and emotional support from her/his own social network in addressing problems commonly encountered in daily life. The scale was reliable with a Cronbach’s α of 0.83.

Psychological resources were measured by the *mastery* scale (Pearlin & Schooler, 1978) and Rosenberg’s (1965) *self-esteem* scale. The mastery scale used is identical to the original one; our self-esteem scale was slightly modified. One item in the original scale, “I wish I could have more respect for myself,” was deleted because it failed to significantly discriminate the top and bottom quarters of the respondents grouped by the summated score. The

Cronbach's α 's for the two scales were 0.74 and 0.77, respectively. Although mastery and self-esteem are culturally loaded concepts, which may have different meanings in different cultures, their use here is justified by the high reliability and construct validity.

Finally, we measured *positive comparison* to capture the effect of coping (Pearlin, 1989). *Positive comparison*, or the subjective evaluation by the respondent that he/she is better off relative to others in similar situations, is a concept opposite to relative deprivation used widely in migration literatures (Stark & Taylor, 1989). We used a four-item scale: Compared to those whom you know, would you say that you are (a) much worse, (b) somewhat worse, (c) about the same, (d) somewhat better, or (e) much better in terms of (1) income; (2) occupation; (3) social prestige; and (4) social connections (*guanxi*)? Responses to the four questions were summed to form a scale with scores ranging from 4 to 20. The scale had a Cronbach's α of 0.79.

Variables unique to the Chinese context

In addition to the aforementioned measures, we also included three variables which are unique to our specific context: *support for the TGP*, *cadre/party membership*, and *urban vs. rural residence*.

The extent to which a person would be distressed by the involuntary relocation was predicted to correlate negatively with his/her support of the Three Gorges project. Our *support for the Project* scale consists of two questions: Do you expect the TGP will bring (i) more benefits than harm (1), (ii) equal amount of benefits and harm (0), or (iii) more harm than benefits (−1), first to the country as a whole; and secondly to the region? The two items are moderately correlated ($r = 0.43$). The summated scale has a theoretical range of −2 to +2, with a higher score indicating greater support for the Project.

Cadre or party membership is a political resource of great significance in China (Bian & Logan, 1996; Walder, 1995). Despite a classless ideology, class differences were never eradicated in China. Some critics of the TGP maintain that because local officials have been delegated undue power to distribute relocation funds, grafting of these resources by cadres for private gains has occurred frequently (New York Times, 1999; Wei, 1999; Wu, 1998). Thus, cadre or party membership should safeguard migrants from the negative impact of relocation. *Party/cadre membership* is a dummy variable, which indicates

whether or not the respondent is a member of China's ruling party or cadre.

Residential location is another factor that is unique to China and may have great implications for this study. The urban/rural difference is "the most important social distinction in modern China" (Potter & Potter, 1990), a distinction which is perpetuated by China's household registration system and has translated into China's persisting urban–rural inequality (Cheng & Sheldon, 1994; Solinger, 1999; Yang, 1993) and differential treatment of Three Gorges' urban and rural migrants. While urban migrants are routinely guaranteed new housing at resettlement communities with complete modern infrastructures, rural migrants are typically deprived of such privilege (Shi, 1999). In addition, whereas 40% of the affected farmers are expected to give up farm occupations and forced to take a non-farm job (YVWRPB, 1999), urban migrants, in contrast, are required to make little adjustment because plants and offices of urban workers are easily portable (Li, 1998). *Residence* is dummy coded with 1 indicating urban and 0 otherwise.

Other controls

People of different statuses are also known to be differently exposed to stressors and possess different resources that can counteract the effects of stressors (Pearlin, 1989). We control for *gender* (1 = female), *marital status* (1 = currently married, and 0 = other) and two interval-level variables, *age* and *educational attainment*. These factors have been shown to correlate with exposure to stressors, stress mediators, and various measures of stress outcome (Mirowsky & Ross, 1986; Turner & Lloyd, 1999).

Analytical strategy

The OLS regression will be used to test the hypotheses. First, we will test the hypothesis that anticipation of migration heightens depression even after controlling for other factors. Secondly, the moderation hypothesis will be examined by adding stressor–resource interactions to the model. Finally, we test the mediation hypothesis by examining the indirect effects of the stressor via resources.

Results

Before we turn to multivariate analysis, it is helpful to examine selected bivariate associations

(Table 1) as the first step toward testing these hypotheses. First, migration status and depression were positively correlated; suggesting that average depression was significantly higher for designated migrants than non-migrants. In addition, depression was positively correlated with migration-induced stresses, a direct measure of stressor, and with chronic strains, a measure of secondary stressors. However, respondents with more social and psychological resources and those who resorted to positive comparison tended to show lower depression than their counterparts. Furthermore, depression was correlated negatively with support for the Project, party/cadre membership, being married, and educational attainment; and positively with urban residence, being female, and age. The positive correlation between urban residence and depression was most likely spurious, a point which we will return to in multivariate analyses.

Table 2 presents the results of multiple regression analysis, controlling for various factors. The results indicate that anticipation of involuntary migration was a significant and robust predictor of depression. Without any control, designated migrants displayed an average depression score, which is 2.29 points higher than their non-migrant counterparts, a small but statistically significant difference. The results from models 2–4 suggest that the gross difference between the two groups in depression was due, in part, to chronic strains. Removing the latter's effect narrowed the gap from 2.29 to 1.08 (model 2), and to 1.06 (models 3 and 4). The difference in depression between migrants and non-migrants, however, remained statistically significant even after 12 factors were controlled.

The association between the four resources and depression were consistently negative and significant and were little affected by other variables. Among the four resources, mastery was most strongly associated as seen in the standardized regression coefficients (-0.30 in models 2 & 3; -0.29 in model 4). Although the addition of the three variables unique to China failed to substantially improve the R^2 , two of the three variables attained statistical significance. Both support for the Project and urban residence were found to reduce depression significantly. The urban–rural difference is congruent with our knowledge about China's growing urban–rural inequality (Yang, 1993) and its potential ramifications for migrants (Li, 1998).

Depression was also significantly associated with gender and marital status (see model 4). The average

depression of women was 0.94 *higher* than men and that of married persons was 1.26 *lower* than their non-married counterparts.

Because the stress–depression relation could arise from experienced stress rather than migration status, we conducted analyses with a *direct* measure of migration-induced stresses. Because the direct measure was available only for designated migrants, non-migrants were excluded from the analysis. The results of the new analysis are presented as model 4a in Table 3. Our findings show that a one-unit increase in migration-induced stress raised depression by 0.59 units. In other words, designated migrants who anticipated more harms from the Project were significantly more depressed than their counterparts who anticipated less. It is noteworthy that depression resulted not only from migration-induced stresses, but also from the more pervasive chronic strains as a secondary stressor. However, because the two were confounded, it is impossible to sort out what proportion of the secondary stressor was attributable to the primary one.

The associations of other variables were similar to those reported in Table 2. All resources showed some significantly negative association with depression. Urban residents, on average, had a depression score 0.18 *lower* than their rural counterparts. Depression levels were also higher for female and older respondents. The model explains 39% of the variation.

Testing mediation and moderation hypotheses

In addition to its *direct* negative effect, migration-induced stresses can also affect depression *indirectly* by weakening these resources (*mediation hypothesis*) or resources may *interact* with stressors in such a way as to moderate its harmful effects on those who possess more resources (*moderation hypothesis*). Model 5 in Table 3 reports the results for testing the moderation hypothesis by allowing stressor to interact with the four resources.¹ The moderation hypothesis is supported if the stressor exerts a significant positive effect on depression but such effect is significantly reduced by the interaction terms.

¹Because the inclusion of four interaction terms in a model would inevitably generate multicollinearity, we addressed the problem by mean-centering the component variables of the interaction terms. The regression coefficients in models 4a and 5 are therefore not comparable (Tabachnick & Fidell, 2001).

Table 1
Means, standard deviations, and bi-variate correlations for dependent and independent variables ($n = 1530$)

| | Migration status | Migration-induced stress ^a | Chronic strains | Social support | Mastery | Self-esteem | Positive comparison | Support for TGP | Party/cadre | Residence | Gender | Age | Marital status | Education | Mean | SD |
|---------------------------------------|------------------|---------------------------------------|-----------------|----------------|---------|-------------|---------------------|-----------------|-------------|-----------|--------|--------|----------------|-----------|-------|-------|
| Depression | 0.11* | 0.14* | 0.39* | -0.31* | -0.50* | -0.41* | -0.36* | -0.13* | -0.10* | 0.05* | 0.12* | 0.13* | -0.12* | -0.20* | 21.48 | 10.31 |
| Migrantion status (Migrant = 1) | | - | 0.09* | -0.09* | -0.04 | -0.04 | -0.07* | -0.07* | 0.00 | 0.06* | -0.04 | 0.09* | -0.03 | -0.03 | 0.64 | 0.48 |
| Migration-induced Stress ^a | | | 0.10* | -0.06* | -0.13* | -0.01 | -0.13* | -0.23* | 0.02 | 0.15* | -0.00 | 0.00 | -0.04 | 0.09* | 1.04 | 1.19 |
| Chronic strains | | | | -0.18* | -0.29* | -0.13* | -0.37* | -0.09* | -0.02 | 0.34* | 0.08* | 0.26* | -0.21* | -0.09* | 1.60 | 1.24 |
| Social support | | | | | 0.27* | 0.23* | 0.29* | 0.11* | 0.05* | -0.01 | -0.02 | -0.14* | 0.08* | 0.17* | 33.37 | 7.49 |
| Mastery | | | | | | 0.40* | 0.33* | 0.08* | 0.05* | -0.06* | -0.05* | -0.09* | 0.05* | 0.17* | 22.08 | 4.83 |
| Self-esteem | | | | | | | 0.29* | 0.06* | 0.13* | 0.11* | -0.09* | -0.03 | 0.01 | 0.25* | 33.65 | 5.06 |
| Positive comparison | | | | | | | | 0.14* | 0.17* | -0.21* | -0.17* | -0.08* | 0.11* | 0.17* | 10.80 | 2.83 |
| Support for TGP | | | | | | | | | 0.06* | -0.11* | -0.09* | 0.05* | 0.04 | -0.02 | 1.65 | 0.75 |
| Party/cadre membership | | | | | | | | | | 0.10* | -0.18* | 0.17* | 0.05* | 0.14* | 0.13 | 0.37 |
| Residence (Urban = 1) | | | | | | | | | | | 0.02 | 0.16* | -0.07* | 0.34* | 0.51 | 0.50 |
| Gender (Female = 1) | | | | | | | | | | | | -0.07* | 0.00 | -0.12* | 0.55 | 0.50 |
| Age | | | | | | | | | | | | | -0.05* | -0.39* | 45.07 | 13.77 |
| Marital status (Married = 1) | | | | | | | | | | | | | | 0.03 | 0.89 | 0.32 |
| Education | | | | | | | | | | | | | | | 7.48 | 3.93 |

*Indicates a coefficient is significant at the 0.05 level.

^aMigration-induced stress is measured only for designated migrants. Therefore, all correlations with this variable were based on a sample size of 975.

Table 2
Regression analysis of involuntary migration as a stressor ($n = 1530$)

| Variable | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|-------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| | Coeff. | β | Coeff. | β | Coeff. | β | Coeff. | β |
| Stressor | | | | | | | | |
| Migration status (Migrant = 1) | 2.29* | 0.11 | 1.08* | 0.05 | 1.06* | 0.05 | 1.06* | 0.05 |
| Chronic strains | | | 1.85* | 0.22 | 1.97* | 0.24 | 1.83* | 0.22 |
| Mediators: resources and coping | | | | | | | | |
| Social support | | | -0.15* | -0.11 | -0.15* | -0.10 | -0.14* | -0.10 |
| Mastery | | | -0.63* | -0.30 | -0.63* | -0.30 | -0.64* | -0.29 |
| Self-esteem | | | -0.42* | -0.20 | -0.39* | -0.19 | -0.39* | -0.19 |
| Positive comparison | | | -0.32* | -0.09 | -0.31* | -0.09 | -0.28* | -0.08 |
| Variables unique to Chinese context | | | | | | | | |
| Support for TGP | | | | | -0.66* | -0.05 | -0.64* | -0.05 |
| Party/cadre membership | | | | | -0.78 | -0.03 | -0.62 | -0.02 |
| Residence (urban = 1) | | | | | -0.97* | -0.05 | -0.85* | -0.04 |
| Other controls | | | | | | | | |
| Gender (female = 1) | | | | | | | 0.94* | 0.05 |
| Age | | | | | | | 0.02 | 0.02 |
| Marital status (married = 1) | | | | | | | -1.26* | -0.04 |
| Education | | | | | | | -0.05 | -0.02 |
| Constant | 20.02* | | 54.44* | | 54.81* | | 54.45* | |
| Adj. R^2 | 0.01 | | 0.39 | | 0.40 | | 0.40 | |

*Indicates a coefficient is significant at the .05 level using one-tailed t -test.

The results lend only limited support for the moderation hypothesis. Although the effect of stress remained positive (0.63) and those of the resources negative (range from -3.13 to -0.95) after interaction terms were added to the model, only one of the four interaction terms (i.e., stressor \times self esteem) was negative and statistically significant (-0.75). Our failure to find significant interaction effects for other resources was probably due to multicollinearity. The inclusion of multiple interaction terms in model 5 inevitably inflated the standard errors of the interaction terms and their components, as indicated by the high values of variance inflation factors associated with these terms.

Table 4 presents findings for testing the mediation hypothesis. The hypothesis would be supported if the path coefficient linking stress and depression were reduced once resources are entered into the equation. When all four mediators were entered first, there was a 39% reduction in the effect of the stressor on depression.

Following Turner & Lloyd (1999), we conducted one-tailed t -test of statistical significance for the

four indirect effects (i.e., $\beta_a \beta_b$). The t -tests were conducted by dividing each of the indirect effects, $\beta_a \beta_b$, by its corresponding standard error, $\sigma_{\beta_a \beta_b}$, estimated by using a formula suggested by Krull & MacKinnon (2001)

$$\sigma_{\beta_a \beta_b} = \sqrt{\sigma_{\beta_a}^2 \beta_b^2 + \sigma_{\beta_b}^2 \beta_a^2}$$

These results show that social support, mastery, and positive comparison all played a significant ($\alpha = .05$, one-tailed t -test) role in mediating the effects of migration-induced stresses on depression but self-esteem did not ($t = 0.21$). These results are congruent with our arguments that stresses associated with anticipation of forced migration weaken psychosocial resources, which safeguard people from depression. Designated migrants suffered a drop in social support because they were more likely to have relatives and friends who had already moved. The reduction of mastery among designated migrants is also expected because the relocation order from the authority reminds them of their powerlessness. Furthermore, while positive comparison is an

Table 3
Regression analysis of migration-induced depression among designated migrants ($n = 975$)

| Variable | Model 4a | | Model 5 | | VIF |
|---|----------|---------|---------|---------|------|
| | Coeff. | β | Coeff. | β | |
| Stressor | | | | | |
| Migration-Induced Stress | 0.59* | 0.07 | 0.63* | 0.07 | 1.11 |
| Chronic Strains | 1.67* | 0.21 | 1.65* | 0.20 | 1.49 |
| Mediators: resources and coping | | | | | |
| Social Support | -0.13* | -0.10 | -1.15* | -0.11 | 2.16 |
| Mastery | -0.63* | -0.30 | -3.13* | -0.30 | 2.45 |
| Self-esteem | -0.38* | -0.19 | -1.21* | -0.12 | 2.19 |
| Positive comparison | -0.33* | -0.09 | -0.95* | -0.09 | 2.44 |
| Variables unique to Chinese context | | | | | |
| Support for TGP | -0.18 | -0.01 | -0.10 | -0.01 | 1.11 |
| Party/cadre membership | -0.36 | -0.01 | -0.13 | 0.00 | 1.13 |
| Residence (urban = 1) | -0.18* | -0.06 | -1.17* | -0.06 | 1.47 |
| Other controls | | | | | |
| Gender (female = 1) | 0.96* | 0.05 | 1.00* | 0.05 | 1.10 |
| Age | 0.05* | 0.06 | 0.04* | 0.06 | 1.53 |
| Marital status (married = 1) | -1.33 | -0.04 | -1.49* | -0.05 | 1.11 |
| Education | 0.00 | 0.00 | 0.00 | 0.00 | 1.74 |
| Interactions with migration-induced stress | | | | | |
| Social support | | | 0.10 | 0.02 | 2.07 |
| Mastery | | | 0.05 | 0.01 | 2.36 |
| Self-esteem | | | -0.75* | -0.11 | 2.26 |
| Positive comparison | | | -0.04 | -0.01 | 2.05 |
| Constant | 52.88* | | 18.50* | | |
| Adj. R^2 | 0.39 | | 0.40 | | |

*Indicates a coefficient is significant at the .05 level using one-tailed t -test.

Table 4
Indirect effects of migration-induced stress on depression via mediators

| Mediators | β_a^a | β_b^b | $\beta_a\beta_b^c$ | t^d |
|---------------------|-------------|-------------|--------------------|-------|
| Social support | -0.06 | -0.10 | 0.01 | 1.75* |
| Mastery | -0.13 | -0.30 | 0.04 | 3.74* |
| Self-esteem | -0.01 | -0.19 | 0.00 | 0.21 |
| Positive comparison | -0.13 | -0.09 | 0.01 | 2.51* |

*Indicates a coefficient is significant at the 0.05 level using one-tailed t -test.

^a β_a indicates the path coefficient from migration-induced stress to mediator.

^b β_b indicates the path coefficient from mediator to depression.

^c $\beta_a\beta_b$ indicates the indirect effect of migration-induced stress on depression via mediator.

^dWhile standardized regression coefficients are used to compute the path coefficients, unstandardized regression coefficients and their corresponding standard errors are used for testing the statistical significance of the indirect effects.

effective strategy to cope with stress, designated migrants who anticipated harm from the TGP cannot help but realize their relative disadvantages when

compared to others. On the other hand, the subjective evaluation of self worth is an enduring personality trait that cannot be easily changed by external events. This probably explains the insignificance of self-esteem.

Discussions

As part of a larger effort to measure the social, economic, and psychological impacts of the TGP using a panel design, this study focuses on the mental health impact. Because the planned post-migration survey is not yet been completed, we report only data from the pre-migration survey. Although the full advantages of prospective measures would not be realized until data from post-migration survey become available, the lack of selectivity in our migrants sample permits us to address the migration effects with greater confidence.

Focusing on depression as an indicator of mental health, our analysis indicated that anticipation of forced relocation has an undisputable adverse effect

on involuntary migrants. Compared to non-migrants in the same region, designated migrants show a significantly higher level of depression. The difference between the two groups in depression is somewhat diminished but never eliminated even after controlling for 12 variables that had previously been shown to correlate significantly with depression.²

The average depression level associated with our sample is considerably higher than the typical levels observed in the United States for various non-clinical populations (Vega & Rumbaut, 1991; Radloff, 1977). The higher depression level observed, however, is understandable because the TGP project is economically and socially disruptive not only for the designated migrants but also for non-migrants who live in the affected region. For example, communities adjacent to the areas that would be flooded are disturbed not only by the related construction activities in or near their communities needed to accommodate relocation, they are also disturbed by tensions arising from the government's imposed sharing of limited resources with their new neighbors. Thus, even for those residents who are exempted from the government-imposed relocation, their lives would be affected by the TGP as a result of ripple effects. Some experts suggested that the official number of migrants underestimates the TGP's true impact because it excludes secondary migrants the project generates (Wei, 1999). In addition, the region from which the sample is drawn, is economically depressed compared to other parts of China as a result of withholding investments in anticipation of the man-made flooding (Ouyang & Jiang, 2002).

Our results also show that among designated migrants, those who reported more migration-induced stresses are more depressed. Chronic strains are responsible for a large part of the observed depression among designated migrants. Because chronic strains can result from prolonged anticipation of the forced relocation, it seems useful to view them as a spin-off of forced migration instead of as a distinctive stressor separable from the latter.

Anticipation of forced migration is found to exert a significant indirect effect on depression, mainly via the mediation of social support, mastery, and positive coping. Although self-esteem fails to play

a significant mediating role, it is the only stress mediator that shows a strong moderating effect.

While our findings corroborated hypotheses derived from the stress process model, the testing of these causal hypotheses are not conclusive due to the cross-sectional nature of the data. Until the panel data we are still working on becomes available, any statements of causality are only suggestive.

There have been concerns about the appropriateness of CES-D for Asians (Lai, 1995; Lin, 1989; Noh & Avison, 1996) arguing, for example, that while North Americans psychologize distress, Asians somatize it (Lin, 1989). In addition, some Asian cultures emphasize control of emotions (Tseng & Wu, 1985). However, Beiser's (2005) systematic examination concludes that evidence of culture come mainly from clinical results; while community-based research reveals more similarities across cultures than differences. Asians are also known to have difficulties expressing positive affect (Lai, 1995; Lin, 1989; Noh & Avison, 1996; Tseng & Wu, 1985). However, our alternative measures showed little differences in reliability between the two scales computed with or without the four positive affect items. Although the stress process model is rooted in western culture our analysis demonstrates that the theoretical model is adequate for our Chinese sample.

This study also enriches the stress process model by identifying a set of factors unique to China but that also have important implications for stress research. Our findings provide some support for the arguments that migrants who support the Three Gorges project are less depressed by the relocation and that rural migrants are more distressed than their urban counterparts. Although the theoretical importance of party/cadre membership as political resources in China has been long recognized in sociological literature (Bian & Logan, 1996; Walder, 1995), we are unable to find empirical support for the claim the members of China's ruling party and cadre are spared from the migration-induced depression.

Our finding concerning urban–rural difference in depression is particularly noteworthy because it corroborates our belief that China's existing urban–rural inequality (Cheng & Sheldon, 1994; Solinger, 1999) has translated into differential treatment of urban and rural migrants and has exacerbated rural migrants' disadvantages. Our finding that designated migrants' depression was

²Although sample size may have played a role in these tests, we believe the effect of the variable is robust using even the most rigid definition of robustness.

negatively correlated with their support of the TGP has important policy implications for China's ongoing relocation effort as well as for future development projects. While development projects are often economically justified, implementing them often put those resided in the affected areas in harmful situation. Rallying the support of those affected by the project by providing them adequate compensation and sustainable assistance is not only essential for successful project implementation, but would also ameliorate the psychological harm the project brings to them.

Finally, our findings add credence to the sociological wisdoms that depression is socially distributed (Pearlin, 1989; Turner & Lloyd, 1999). Social demographic factors such as gender, age, marital status, and educational attainment are found to have significant effects on depression in the anticipated manner.

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