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Genetic Influences on Job and Occupational Switching

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It is well known that individuals appear to differ in their relative probabilities for switching jobs and occupations. Possible antecedents for the decision to switch or not switch, or to turnover or not turnover, have been studied for decades. For example, studies have examined the relations of job satisfaction and work values to turnover. However, no studies have examined the relation between an individual's genetic makeup and turnover even though evidence for the influence of genetic factors on both job satisfaction and work values exists. Using a sample of 1236 monozygotic and 1165 dizygotic white male twin pairs reared together, genetic influences on job and occupational switching were examined. Covariance structure analysis results revealed a significant genetic influence on the propensity to switch jobs and occupations. Job satisfaction and work values only partially mediated this relation. Future research suggestions and limitations are provided. © 1997 Academic Press

What factors predict whether workers remain in their jobs or move between jobs and occupations? Models and theories within the fields of economics and psychology have been developed to examine the factors associated with job turnover and tenure. In this paper we analyze the factors associated with the number of job and occupational switches that occur in a given period. Turnover, tenure, and job and occupational switching, however, are closely linked. Higher propensities to turnover result in both shorter job tenures and more job and/or occupational switching over time. Thus, the underlying mechanisms that influence job turnover and tenure will also affect job and occupational switching.

We regret to announce that Dr. Paul Taubman, our co-author, passed away on May 4, 1995. We thank two anonymous reviewers for their insightful comments and suggestions. Address correspondence and reprint requests to Brian P. McCall, Industrial Relations Center, University of Minnesota, 537 Management and Economics Building, 271 19th Avenue South, Minneapolis, MN 55455.

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Statistical models in the economic literature suggest that individuals might be characterized as ''movers'' or ''stayers'' (Goodman, 1961). However, there is little in these statistical models to suggest predictors of whether an individual moves or stays other than past behavior. More recently, economists have developed theoretical models of job matching or job shopping to explain job and occupational switching (Johnson, 1978; Jovanovic, 1979; McCall, 1991, 1994). Job shopping occurs when some uncertainty about the match of a job can only be resolved by performing the job and obtaining job-specific and occupational-specific information. Once this information is obtained, the individual must decide whether to stay, switch jobs, or switch occupations. Economists have established empirically that job and occupational matching are significant (see Flinn, 1986; McCall, 1990), and also that variables such as age, experience, and education influence an individual's propensity to switch jobs (Bartel, 1982; Datcher, 1983; Viscusi, 1979; Weiss, 1984).

Among psychologists, job and occupational switching is often examined vis-à-vis the prediction of turnover. This literature base is substantial; Porter and Steers (1973), Muchinsky and Tuttle (1979), and more recently Cotton and Tuttle (1986) summarized organizational, work, and personal factors associated with turnover. Among the various personal or individual factors found to be associated with turnover are such variables as intelligence, personality, interests, age, tenure, education, behavioral intentions, job satisfaction, and work values. A meta-analysis by Cotton and Tuttle (1986) revealed that overall job satisfaction was strongly correlated with turnover. Various work values also have been found to be associated with turnover including autonomy, responsibility, and variety of work (Muchinsky & Tuttle, 1979; Porter & Steers, 1973).

The Theory of Work Adjustment (TWA) provides an explanation for job and occupational switching (Dawis & Lofquist, 1984). The theory posits that the quality of the person-work environment fit, or congruence, affects job satisfaction and ultimately job or occupational switching (Breeden, 1993; Bretz & Judge, 1994; Dawis & Lofquist, 1984). Variables that have been hypothesized to affect person–work environment fit include personality and work values (Bretz & Judge, 1994; Dawis & Lofquist, 1984; Judge & Bretz, 1992; Loughead & Black, 1990).

What has not been previously examined by either economists or psychologists is whether an individual's propensity to leave or remain in a job or occupation is related to his or her genetic makeup. A growing body of research suggests that genetic factors are associated with variables that are related to job and occupational switching. Two such variables, job satisfaction and work values, are of interest in the present study.

Arvey and his associates (Arvey, Bouchard, Segal, & Abraham, 1989; Arvey, McCall, Bouchard, Taubman, & Cavanaugh, 1994) support the proposition that job satisfaction is significantly associated with genetic factors (i.e., the dispositional interpretation of job satisfaction). Arvey et al. (1989) found that a significant portion of the variance in intrinsic and general job satisfaction in a sample of 34 monozygotic twin pairs reared apart was associated with genetic factors. Arvey et al. (1994) also found a genetic influence on intrinsic and general satisfaction in a sample of 95 monozygotic and 80 dizygotic twin pairs reared together. Finally, Arvey et al. (1994) found that job satisfaction, was associated with genetic factors in a second study using 1236 monozygotic and 1165 dizygotic twin pairs reared together.

Two recent findings to the contrary should be noted (Gutek & Winter, 1992; Hershberger, Lichtenstein, & Knox, 1994). In a longitudinal study, Gutek and Winter (1992) measured satisfaction for the current job (pre-), and then measured satisfaction 2 years later for the current job (post-) and the job held 2 years ago (then). Results revealed that retrospective accounts of job satisfaction (then) were not significantly correlated with pre or post measures of satisfaction if the individual changed jobs. Due to the negligible correlation between the then and pre- and post-measures, Gutek and Winter concluded that support for the dispositional view of job satisfaction was not robust. However, the retrospective examination of job satisfaction over time may have confounded influences due to situational and dispositional factors (Arvey, Carter, & Buerkley, 1991). Twin designs are immune to this type of confounding. In support of past research, Gutek and Winter found a significant relation between current job satisfaction at the two different time periods (pre- and post-) for individuals who changed jobs and those who did not.

Hershberger et al. (1994) failed to find a significant genetic influence on job satisfaction. However, their measure included both intrinsic and extrinsic satisfaction items. Previous research has indicated that extrinsic satisfaction is not genetically influenced (Arvey et al., 1989; Arvey et al., 1994). Furthermore, they measured the degree of agreement with the items as opposed to the degree of satisfaction. These differences may have resulted in the discrepant findings.

The link between job satisfaction and turnover is well established and robust (Muchinsky & Tuttle, 1979; Porter & Steers, 1973). Current research suggests that this link is indirect. That is, the satisfaction-turnover relation has been found to be mediated by withdrawal cognitions and job search behaviors (Hom & Griffeth, 1991; Hom, Caranikas-Walker, Prussia, & Griffeth, 1992; Kopelman, Rovenpor, & Millsap, 1992; Steel & Ovalle, 1984; Tett & Meyer, 1993). Unfortunately, this study is unable to investigate the mediation of these factors (i.e., they were not measured).

Researchers also have found that work values are significantly associated with genetic factors (Arvey et al., 1994; Keller, Bouchard, Arvey, Segal, & Dawis, 1992). Keller et al. (1992), in a sample of 23 monozygotic and 20 dizygotic twin pairs reared apart, reported that several of the work values measured by the Minnesota Importance Questionnaire (MIQ) showed a significant genetic influence. Arvey et al. (1994), in a study using 1236 monozygotic and 1165 dizygotic twin pairs reared together, found that 15 out of 16 work values were associated with genetic factors.

Work values have been shown to be related to turnover (Muchinsky &

Tuttle, 1979; Porter & Steers, 1973) and job and occupational switching (Bretz & Judge, 1994; Dawis & Lofquist, 1984; Judge & Bretz, 1992; Loughead & Black, 1990). Judge and Bretz (1992) investigated the affect of work values on job decisions. Given that work values are relatively stable and are related to job satisfaction, they hypothesized that matching processes are affected by work values. Results supported their hypothesis. Dawis and Lofquist (1984) noted that one aspect of personality structure that is important for person-work environment fit is work values. Thus, although the present study provides no direct measure of personality, work values can be conceptualized as a personality variable.

CONCEPTUAL MODEL

This study is motivated by the model developed by Arvey and Bouchard (1994) to describe how genetic backgrounds may operate to influence the variables and processes involved in organizational settings. The authors note that genes do not code for behavior per se. Rather, they provide molecular instructions that influence chemistries, physiologies, and psychologies of individuals. The chemistries, physiologies, and psychologies of individuals influence their cognitive functioning, personality, interests and values, and physical capacities. These, in turn, influence organizational outcomes such as job choice, job performance, satisfaction and attitudes, climate, tenure, and income. The outcome of interest for this study is job tenure operationalized as job and occupational switching. Two issues are explored. The first issue has to do with simply investigating whether a significant relation exists between job and occupational switching and genetic factors. The second issue has to do with examining potential mechanisms by which any genetic association might operate.

Based on the research literature cited above, any observed relation between genetic factors and job and occupational switching could be mediated via job satisfaction and work values (despite the fact that the Arvey and Bouchard, 1994, model does not propose job satisfaction as a mediator). That is, an individual's job satisfaction and work values may be partially determined by his or her genetic disposition; and job satisfaction and work values may partially influence an individual's propensity to switch jobs and/or occupations. Dissatisfaction with the job or occupation or an inappropriate match between work values and the job or occupation could lead an individual to switch. We also examine the potential mediating influence of education as well as control for the age of the twin pair.

EMPIRICAL MODEL

The path model used for the bivariate analysis is presented in Fig. 1. It portrays the relation between the phenotypes of two individuals who are either monozygotic (MZ) or dizygotic (DZ) twins. In this model, the correlation of the underlying genetic influence between twins depends on their zygosity. MZ twins share 100% of their genetic makeup. Therefore, the correlation of

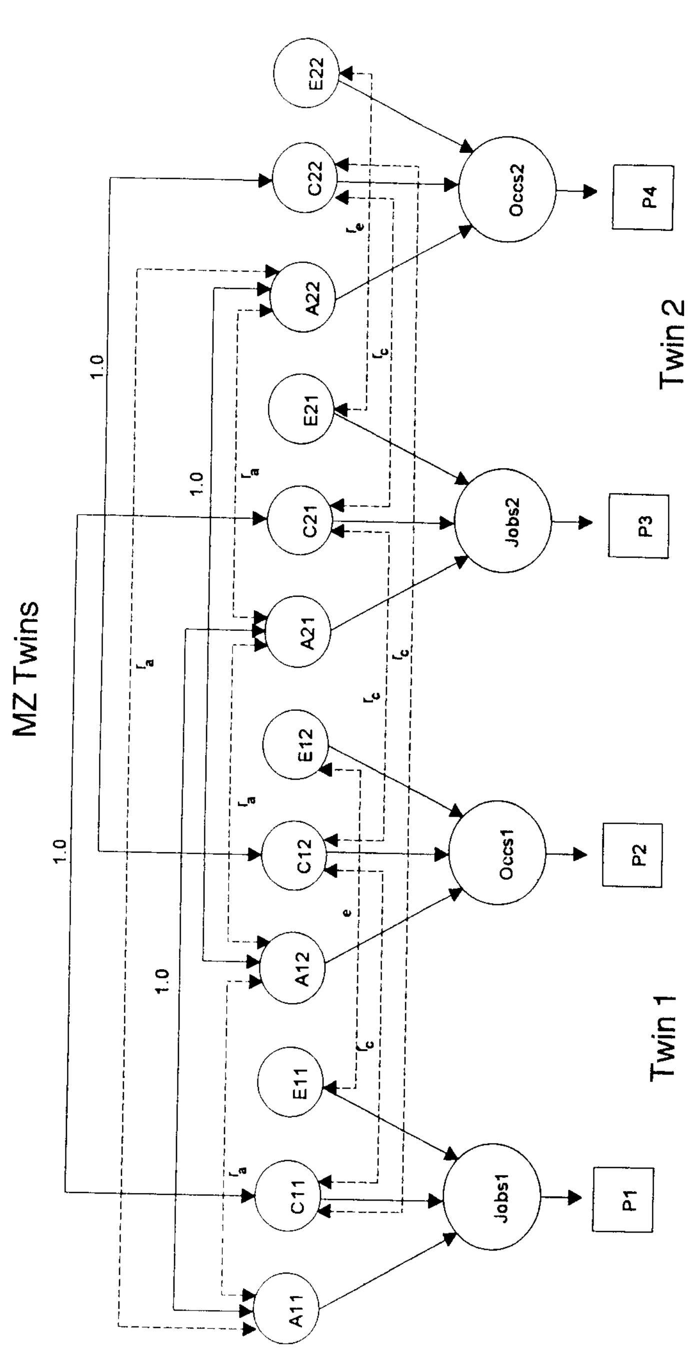

FIG. 1. Bivariate full model: A11, C11, E11 and A12, C12, E12 represent latent variables of additive genetic factors, shared environmental factors, and nonshared environmental factors for job and occupational switching respectively. The correlation constraints are indicated with an r_a for correlations between additive genetic factors, r_c for correlations between shared environmental factors, and r_e for correlations between nonshared environmental factors. JOBS1 and P1 represent the variable job switching and its measurement. OCCS1 and P2 represent the variable occupational switching and its measurement. Similar denotations are made for Twin 2.

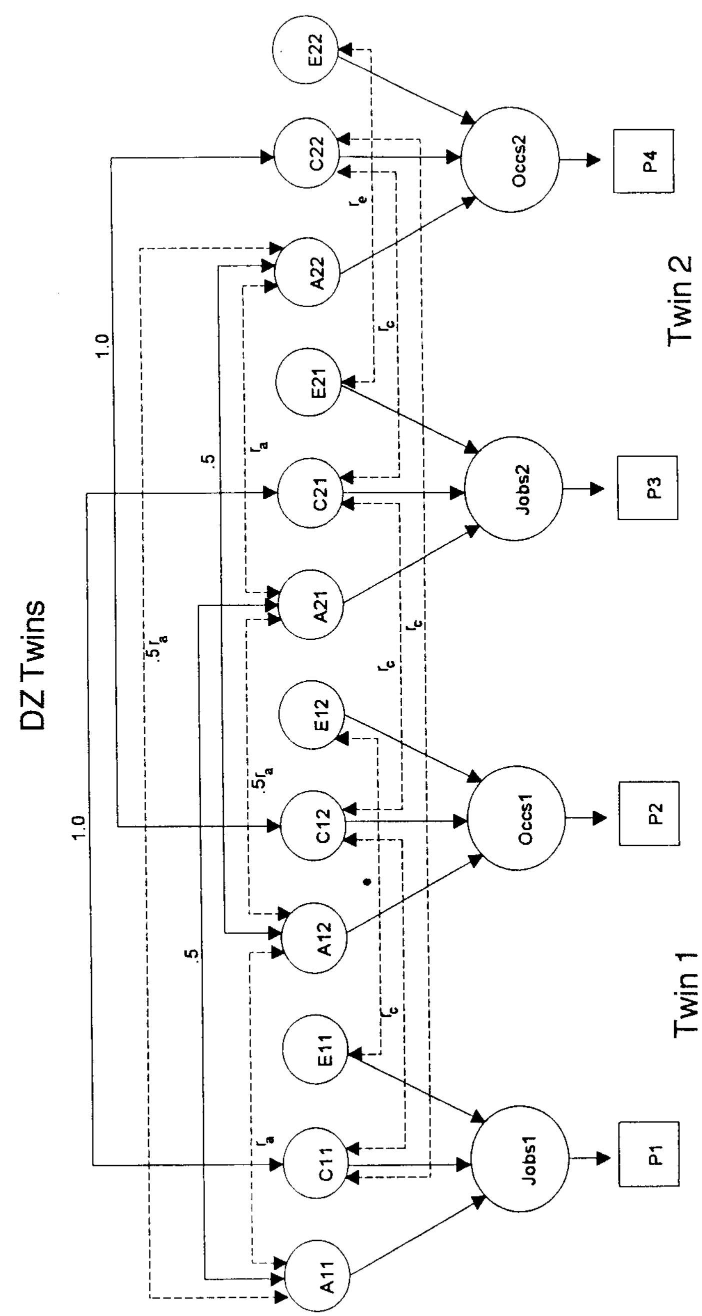

FIG. 1—*Continued*

the additive genetic factors for MZ twin pairs is constrained to be 1.0. DZ twins share, on average, 50% of their genetic makeup. Therefore, the correlation of the additive genetic factors for DZ twins is constrained to be 0.5. The correlational constraints for both shared environmental (all twin pairs were reared together) and nonshared environmental factors are similar for both MZ and DZ twin pairs. The correlation of shared environmental factors between both MZ and DZ twin pairs is constrained to be 1.0. The nonshared environmental factors reflect independent environmental influences (Heath, Neale, Hewitt, Eaves, & Fulker, 1989). Thus, the correlation of these factors between twin pairs is restricted to zero for both MZ and DZ twins.

This model represents the traditional MZ-DZ design (Loehlin, 1992). This design incorporates several assumptions including the following: trait-relevant environments are equally similar, the effects of nonadditive genetic factors is small, parents of the twins are not negatively or positively correlated for the trait of interest (this would decrease or increase the proportion of genetic similarity of the dizygotic twins), there are no gene–environment correlations or interactions, and twins are representative of the population. Models exist which relax some of these basic assumptions allowing one to examine the influences, for example, with shared environmental factors removed or nonadditive genetic factors present (Loehlin, 1992). The data were analyzed utilizing these other models and the results were similar. Therefore, only the results for the traditional model are presented.

Both univariate and bivariate models were estimated. The bivariate model allows for the possibility that the additive genetic, shared environmental, and nonshared environmental factors are correlated for job and occupational switching. That is, the model allows for the possibility that the underlying genetic, shared environmental, and nonshared environmental influences that determine job switching may also, in part, determine occupational switching (Heath et al., 1989). Both models revealed similar results; therefore only the bivariate results are presented.

METHOD

Sample and Procedure

The data were collected by the National Academy of Sciences and National Research Council (NAS-NCR). The sample consisted of 1236 MZ and 1165 DZ white male twin pairs who were World War II veterans, reared together, and born between the years 1917 and 1927. The data were drawn from a 1974 questionnaire and were originally used to study the relative genetic and environmental influences associated with educational achievement (Behrman & Taubman, 1989) and occupational status and mature earnings (Behrman, Hrubec, Taubman, & Wales, 1980).

Zygosity was determined primarily on the basis of answers to the following questions: "In childhood did your parents, brothers or sisters or teachers have trouble telling you apart?" and "As children were you and your twin alike 'as two peas in a pod' or only of ordinary family resemblance?" The latter question was the most important in determining zygosity (Behrman, Taubman, & Wales, 1977). Jablon, Neel, Gershowitz, and Atkinson (1967) compared a subsample of the NAS-NCR twins' self assessment with chemical analysis. Their results revealed that the self assessment was correct in 93% of the cases. Behrman et al. (1977) note that misclassification can be shown to result in an overstatement of the nonshared environmental variance and an understatement of the genetic variance.

Comparisons of means indicated that there were no significant differences in age between MZ and DZ twin pairs ($M_{MZ} = 51.12$, $SD_{MZ} = 2.93$, $M_{DZ} = 51.14$, $SD_{DZ} = 2.95$, $t = -.18$, $p = .86$), but the MZ twins achieved a significantly higher grade level ($M_{MZ} = 13.31$ years, $SD_{MZ} = 3.12$, $M_{DZ} = 13.08$ years, $SD_{DZ} = 3.22$, $t = -2.52$, $p < .05$). However, this difference is equivalent to only two months, assuming a 9-month academic year, and it was not coupled with a significant difference in earnings ($M_{MZ} = \$19{,}246$/year, $SD_{MZ} = 12{,}375$, $M_{DZ} = \$19{,}416$/year, $SD_{DZ} = 13{,}266$, $t = .43$, $p = .67$).

The majority of MZ and DZ twins were currently working at the time of the survey (94.12% MZ; 93.48% DZ). A small percentage were unable to work or were retired (3.55% MZ; 3.39% DZ). The remainder were not working (but with a job) or unemployed (2.32% MZ; 3.12% DZ). The results of a chi-square test indicated no differences in work status for MZ and DZ twin pairs (χ^2 (6) = 5.40, $p = .49$).

Current occupations were similar for MZ and DZ twins pairs. The majority of MZ and DZ twins were in professional and managerial jobs (51.81% MZ; 49.43% DZ). Other occupations included sales (21.47% MZ; 22.09% DZ), operatives (9.69% MZ; 10.93% DZ), clerical (7.90% MZ; 7.93% DZ), farming (4.13% MZ; 4.21% DZ), and service, labor, and housework (4.99% MZ; 5.41% DZ). The results of a chi-square test indicated no differences in current occupation for MZ and DZ twin pairs (χ^2 (8) = 7.95, $p = .44$).

Measures

Job and occupational switching. Of interest for this study were the responses to the questions, "How many times have you changed employer since 25 years of age?" and "How often have you changed occupation after 25 years of age?" These questions were answered and coded on a 4-point (0 = 0 times, 1 = 1–5 times, 2 = 6–10 times, and 3 = More than 10 times) and 3-point (0 = 0 times, 1 = 1–3 times, and 2 = More than three times) scale, respectively. We specifically defined job switches as changes in employer and not changes within a firm because changes within a firm are regarded as returns for staying in the job (Bartel & Borjas, 1981). No information was available regarding the validity and reliability of these measures. However, to determine whether the recall of the exact number of job and/or occupational switches affected the results, estimates were also obtained using dichotomous variables that were coded 0 when the individual reported zero switches and 1 when the individual reported one or more switches. The estimates using these dichotomous variables did not differ appreciably from those discussed below.

Job satisfaction. Job satisfaction was measured with the item: ''How do you feel about the job you now have?'' This question was answered and coded using a 4-point Likert-type scale (1 = Like it very much, 2 = Like it fairly well, 3 = Dislike it very much, 4 = Dislike it somewhat). Although this was a single item measure of job satisfaction, this same item was determined to be significantly genetically influenced in the Arvey et al. (1994) study, in support of the dispositional interpretation of job satisfaction. No information was available regarding the validity and reliability of this measure.

Work values. Work values were measured with a series of yes/no questions regarding 16 characteristics associated with work. More specifically, participants were asked: ''As best you can remember, what factors influenced your decision to enter the occupational field you are in at the present time?'' The characteristics included ''Chance for interesting work,'' ''Job security,'' and ''Family business'' among others (see Table 1). Answers of ''yes'' were coded as 1 for the analysis. These single item measures were determined to be significantly genetically influenced in the Arvey et al. (1994) study (with the exception of ''Family business''). No information was available regarding the validity and reliability of these measures.

Analysis

As a first test of the genetic influence on job and occupational switching, Spearman rank and polychoric correlations for MZ and DZ twin pairs were compared. Spearman rank correlations utilize the ranks of the data instead of the original data and are appropriate when the data do not meet the appropriate assumptions of normality (Fowler, 1987). Polychoric correlations are appropriate when the variables of interest are ordinal and are used to correct for possible poor categorization of the data (Hayduk, 1987; Joreskog & Sorbom, 1993).

As a second test of the genetic influence on job and occupational switching, a structural additive genetic model (Model I) was estimated using LISREL 8 (Joreskog & Sorbom, 1993). The model assumes that three factors influence an observed measurement or phenotype in an additive fashion: additive genetic, shared environmental, and nonshared environmental factors. Model I was estimated using the multiple group procedure as described in the LISREL 8 manual (Joreskog & Sorbom, 1993, pp. 52–84) where the twin groups, MZ and DZ, make up the two groups. Polychoric correlations (calculated using listwise deletion) were used in the analysis and the estimates were obtained using weighted least squares for this model (see the Appendix for the polychoric correlation matrices).

The appropriateness of the bivariate model was tested by fixing the correlational relations between the additive genetic, shared environmental, and nonshared environmental factors for job and occupational switching to zero. A significant reduction in fit, would indicate that the bivariate model was appropriate.

Finally, a model (Model II) was developed that investigated whether there were any mediating factors through which the observed genetic influences were operating. As previously discussed, two potential groups of mediating variables are job satisfaction and work values. Furthermore, age and education were examined as potential covariates. (Controlling for the race and gender of a twin pair was not necessary because the sample was all white males.) If the genetic influence on job switching and occupational switching operates solely through its influence on these variables, then partialling them out would eliminate the genetic influence observed for either job or occupational switching.

Model II was also estimated using the multiple group procedure. However, for Model II the residuals from the regression of job switching and occupational switching on the job satisfaction variable, the 16 work value variables, age, and educational level achieved were analyzed using LISREL 8 (Joreskog & Sorbom, 1993). Because the residuals were continuous, covariances rather than polychoric correlations were used in the analysis and estimates were obtained using maximum likelihood estimation.

For both Model I and Model II, the analyses were conducted using a single-entry procedure, where each twin was entered only once, and a double-entry procedure where each twin was entered twice, once as the first twin and once as the second twin (DeFries & Fulker, 1988). Results were similar. Therefore, only the results from the single-entry procedure are reported.

To determine a best fitting model for Model I and Model II, the change in the χ^2 statistic was calculated. This statistic can be used when models are nested. A reduced model, which entails restricting some of the parameters in the full model to zero, significantly reduces the fit of the model to the data when the difference between the χ^2 statistics of the reduced and full models exceeds the appropriate critical value. Thus, Models I and II consisted of full and reduced models incorporating (1) additive genetic, shared environmental, and nonshared environmental factors (full model); (2) additive genetic and nonshared environmental factors only (reduced model); (3) shared environmental and nonshared environmental factors only (reduced model); and (4) nonshared environmental factors only (reduced model).

Three statistical indices were used to determine the fit of the full and reduced models for Model I and Model II. The Akaike information criterion (AIC) was calculated for each model specification (see Akaike, 1970). The AIC index considers both model fit and parsimony with regard to the number of parameters. Improvements in fit result in larger negative values of the AIC. Two incremental fit indices were calculated: the Comparative Fit index (CFI; Bentler, 1990) and the Tucker-Lewis index (TLI; Tucker & Lewis, 1973). The CFI is a normed fit index that measures comparative fit (Gerbing & Anderson, 1992). Its values are constrained to be between 0 and 1. The TLI, a non-normed fit index that measures relative fit, is useful for comparing the fit of models across samples of unequal sizes. Both indices are sensitive to sample size (Marsh, Balla, & McDonald, 1988) and require values of .90 or higher for model acceptance.

TABLE 1
Means and Standard Deviations of Job and Occupational Switching and Job Satisfaction and the Proportion of the Sample Responding "Yes" to Work Value Variables

Variable	Total sample X̄	SD	N[a]	MZ sample X̄	SD	N[a]	DZ sample X̄	SD	N[a]	T Value
Job switching	.75	.66	3865	.76	.66	2004	.74	.66	1861	−0.87
Occupational switching	.57	.60	3869	.57	.60	2008	.58	.58	1861	0.57
Job satisfaction	1.51	.66	4598	1.49	.65	2383	1.52	.68	2215	1.49

Work values	Total Proportion "yes"	N	MZ Proportion "yes"	N	DZ Proportion "yes"	N	χ^2 MZ-DZ
Type of school training	.40	4030	.41	2101	.39	1929	1.72
Type of military training	.17	3949	.17	2060	.16	1889	3.28
Personal or political contacts	.33	3940	.33	2049	.33	1891	0.08
Pay offered including fringes	.52	4071	.52	2114	.52	1957	0.03
Prospects of eventual financial success	.57	4044	.57	2095	.58	1949	0.14
Chance for interesting work	.85	4232	.85	2198	.85	2034	0.01
Chance for independent work	.53	4020	.53	2087	.53	1933	0.03
Person to person contact	.58	4063	.58	2122	.58	1941	0.30
Chance to help others	.43	3961	.43	2005	.43	1906	0.08
Represented a challenge	.71	4072	.70	2121	.71	1951	0.08
Job security	.73	4217	.73	2200	.74	2017	0.50
Provided much free time	.21	3873	.21	2017	.22	1856	0.05
Liked that kind of work	.88	4253	.89	2225	.87	2028	2.22
Family business	.13	3879	.13	2019	.13	1860	0.03
Status	.19	3760	.20	1964	.19	1796	0.89
No other options	.13	3308	.13	1727	.13	1581	0.00

[a] Sample size differs due to missing data.

Finally, the parameter estimates, standard errors, and the proportion of phenotypic variance attributable to the additive genetic, shared environmental, and nonshared environmental factors were calculated for the full and best fitting models for Model I and Model II.

RESULTS

Table 1 indicates that the mean value of the job and occupational switching variables did not depend significantly on the zygosity of the twin (job switching: $M_{MZ} = .76$, $SD_{MZ} = .66$, $M_{DZ} = .74$, $SD_{DZ} = .66$, $t = -.87$, $p = .39$; occupational switching: $M_{MZ} = .57$, $SD_{MZ} = .60$, $M_{DZ} = .58$, $SD_{DZ} = .61$, $t = .63$, $p = .53$). As a further test of whether MZ and DZ twin pairs differed in the levels of job and occupational switching, χ^2 tests were calculated. The χ^2 tests revealed that the MZ and DZ samples did not significantly differ in the levels of job switching (χ^2 (3) = 1.55, $p = .67$) or occupational switching (χ^2 (3) = 1.41, $p = .70$). Thus the propensity to switch jobs or occupations was not influenced by zygosity. This lends support to the notion that there were no systematic differences in the treatment of MZ and DZ twins at least as it relates to job and occupational switching. Moreover, MZ and DZ twin pairs did not differ significantly in job satisfaction ($M_{MZ} = 1.49$, $SD_{MZ} = .65$, $M_{DZ} = 1.52$, $SD_{DZ} = .68$, $t = 1.49$, $p = .14$), and the 16 work values (see Table 1).

TABLE 2
Results of Model Fitting Comparing Full and Reduced Models for Model I and Model II

	χ^2	*df*	*p*	Model fit indices AIC	CFI	TLI	Reduced model fit vs full model $\chi^2\Delta$	*df*	*p*
Model I: Full and reduced models									
1. Additive genetic & shared environmental & nonshared environmental factors	1.864	11	0.998	−20.136	1.000	1.009			
*2. Additive genetic & nonshared environmental factors	2.423	14	0.999	−25.577	1.000	1.000	0.559	3	0.906
3. Shared environmental & nonshared environmental factors	9.883	14	0.771	−18.117	1.000	1.004	8.019	3	0.046
4. Nonshared environmental factors	95.424	17	0.000	61.424	0.930	0.951	93.560	6	0.000
Model II: Full and reduced models									
1. Additive genetic & shared environmental & nonshared environmental factors	15.932	11	0.144	−6.068	0.991	0.990			
2. Additive genetic & nonshared environmental factors	16.195	14	0.302	−11.805	0.996	0.997	0.263	3	0.967
3. Shared environmental & nonshared environmental factors	24.837	14	0.036	−3.163	0.981	0.983	8.905	3	0.031
4. Nonshared environmental factors	44.375	17	0.000	10.375	0.951	0.965	28.443	6	0.000

Note. AIC, CFI, and TLI represent Akaike Information Criterion, Comparative Fit Index, and Tucker-Lewis Index, respectively. *Indicates best overall fitting model.

Results of z tests revealed that the product moment correlations for MZ twins were significantly greater than the correlations for DZ twins for both job switching ($r_{MZ} = .26$, $r_{DZ} = .15$; $p < .01$, one-tailed) and occupational switching ($r_{MZ} = .20$, $r_{DZ} = .12$; $p < .05$, one-tailed). Similar results were found for the polychoric correlations (job switching: $r_{MZ} = .36$, $r_{DZ} = .18$; $p < .01$, one-tailed; occupational switching: $r_{MZ} = .26$, $r_{DZ} = .14$; $p < .01$, one-tailed). Although these correlations were low, the correlations for the MZ twins were approximately twice those of the DZ twins. These findings indicated that a genetic component exists for both job and occupational switching and were consistent with the additive genetic model (Arvey & Bouchard, 1994).

The covariance structure analysis results for Model I are provided in Table 2. The full model (incorporating additive genetic, shared environmental, and nonshared environmental factors) was compared to each of the three reduced models.

The χ^2 statistic did not reject the full model, the model with additive genetic and nonshared environmental factors only, nor the model with shared and nonshared environmental factors only as can be seen by the p values

TABLE 3
Weighted Least Squares Model Fitting for Model I and Model II: Parameter Estimates, Standard Errors, and Percent Variances for the Full and Best Fitting Models

	Additive genetic			Shared environmental			Nonshared environmental		
	PE	SE	VE	PE	SE	VE	PE	SE	VE
Model I: Full and best fitting models									
Full model									
Job switching	.590	.041	.348	.031	.091	.001	.807	.032	.651
Occupational switching	.494	.130	.244	.131	.400	.017	.860	.029	.740
Best fitting model									
Job switching	.598	.034	.358				.801	.030	.641
Occupational switching	.514	.038	.264				.858	.027	.736
Model II: Full and best fitting models									
Full model									
Job switching	.450	.050	.206	−.100	.114	.001	.879	.029	.784
Occupational switching	.295	.243	.008	.230	.255	.053	.920	.030	.859
Best fitting model									
Job switching	.450	.049	.207				.882	.027	.794
Occupational switching	.388	.058	.153				.914	.028	.847

Note. PE, SE, and VE represent parameter estimates, standard errors, and variance estimates, respectively.

associated with the χ^2 statistic. However, an examination of the change in χ^2 associated with dropping factors from the full model indicated that moving from the full model to the model with the shared and nonshared environmental factors only or to the model with the nonshared environmental factors only led to significant reductions in fit at the 5% level. Moving from the full model to the model with additive genetic and nonshared environmental factors only did not result in a significant reduction in fit ($p = .91$).

The AIC index indicated that the model with additive genetic and nonshared environmental factors only fits the data best. The CFI indicated that the full model, the model with additive genetic and nonshared environmental factors only, and the model with shared and nonshared environmental factors only were equivalent. However, the CFI is constrained to be between the values of 0 and 1. According to the TLI, the best fitting model was the additive genetic and nonshared environmental factors only model. According to Gerbing and Anderson (1992) one goal should be to explain as much of the variance as possible with the fewest number of parameters. Thus, the best interpretation of these data was that the model that included the additive genetic and nonshared environmental factors provided the best fit with the data.

Table 3 presents the parameter estimates for both the full model and the best fitting model (i.e., the model with additive genetic and nonshared environmental factors). The parameter estimate for the additive genetic factor was significantly

different from zero in all models. The variance estimate, which provides the percentage of variance explained by the factor, indicated that approximately 36% of the variance in job switching and 26% of the variance in occupational switching was explained by genetic variation in the best fitting model.

The results also indicated that there was a significant correlation between the factors that determine job switching and occupational switching. A test of whether the additive genetic, shared environmental, and nonshared environmental influences for job and occupational switching were jointly uncorrelated was rejected at the 1% significance level. Thus, the bivariate model was appropriate.

The covariance structure analysis results for Model II (mediating factors partialled out) indicated that the full model and the model with additive genetic and nonshared environmental factors only were not rejected at the 5% level on the basis of a χ^2 test (Table 2). The best-fitting model according to the difference in χ^2, the AIC, the CFI, and the TLI was that which included additive genetic and nonshared environmental factors only. The findings in Table 3 indicated that there remained a significant genetic influence for both job and occupational switching when work values, job satisfaction, age, and education were partialled out. Nevertheless, some of the genetic variation in both job switching and occupational switching appeared to be a result of the genetic variation in work values, job satisfaction, age, and education because the amount of variation attributed to the additive genetic factor dropped from .36 to .21 and from .26 to .15 for job switching and occupational switching, respectively, for the best fitting model.

DISCUSSION

The data offered support for the hypothesis that job and occupational switching are influenced by genetic factors. In a sample of 1236 monozygotic and 1165 dizygotic twin pairs, genetic factors accounted for 36% of the variance of job switching and 26% of the variance of occupational switching. Further analysis revealed that the factors that determined job switching also determined occupational switching, providing support for the bivariate model. Finally it was determined that genetic influences did not operate solely through work values, job satisfaction, age, or education; 21 and 15% of the variance in the level of job switching and occupational switching, respectively, was attributed to genetic factors when these variables were partialled out. Although these percentages were low, a significant genetic influence remained. Future research is needed to better determine the practical significance of the genetic influence and whether other mediating factors account for the remaining genetic influence.

Limitations of this study are worth mentioning. It should be noted that the measures of job and occupational switching, included both voluntary (employee controlled, e.g., quitting) and involuntary (employer controlled, e.g., plant layoffs) switching. Although researchers in the past have combined both types of switching (e.g., Mincer & Jovanovic, 1981), other researchers have noted the importance of analyzing them separately (e.g., Bartel & Borjas, 1981). Future research in this area might analyze voluntary and involuntary switching separately to determine whether both are influenced by genetic factors.

A second limitation was the retrospective measurement of job and occupational switching. However, as previously noted we also analyzed the data as dichotomous variables (0 = zero switches, 1 = one or more switches) and found similar results. Therefore we ascertained that the retrospective nature of the data was not a concern in this study.

Third, job satisfaction was measured with only one item assessing satisfaction with the current job. It is possible that a better developed measure may result in stronger mediation. Future research should utilize a more comprehensive job satisfaction measure composed of both intrinsic and general job satisfaction.

The design of the study (twins reared together as opposed to twins reared apart) may be considered a fourth limitation. However, this design allowed us to utilize dizygotic twins as the control group to determine the association between genetics and job and occupational switching. If the assumptions previously mentioned hold, the design was appropriate for this determination. As noted, we examined alternative models relaxing these assumptions and the results were similar. Nevertheless, future research should determine whether similar findings hold for twins reared apart.

While this research has highlighted an association between genetic influences and job and occupational switching, the mechanism by which such a relation operates has not been illuminated. We investigated the possibility of work values and job satisfaction as mediators. The results indicated that they partially mediated this relation. Other potential mediators of this relation include personality variables (e.g., risk aversion, sociability and conscientiousness), ability factors, and environmental perceptions.

Personality variables have been shown to be genetically influenced (e.g., Arvey & Bouchard, 1994; Plomin & Rende, 1991). Moreover, research suggests that personality variables may influence job and occupational switching (e.g., Bretz & Judge, 1994; Dawis & Lofquist; 1984; Judge & Bretz, 1992; Muchinsky & Tuttle, 1979; Porter & Steers, 1973). Risk aversion is one potential personality variable that may mediate this relation (Loughead & Black, 1990). The economic literature suggests that risk aversion may play an important role in the decision whether to switch jobs or occupations (McCall, 1994). Unfortunately, there are currently no studies that have examined whether risk aversion is a genetic personality trait.

Ability factors, particularly intelligence, may also mediate this relation. Ability factors have been shown to be genetically influenced (e.g., Arvey & Bouchard, 1994; Chippuer, Rovine, & Plomin, 1990; Plomin & Rende, 1991) as well as influence job and occupational switching (e.g., Bretz & Judge, 1994; Cotton & Tuttle, 1986; Dawis & Lofquist, 1984; Judge & Bretz, 1992; Muchinsky & Tuttle, 1979). We attempted to control for intelligence with educational attainment. However, educational attainment may not provide the best proxy for intelligence. Future research is needed to examine other potential mediating factors.

Finally, it has been noted that "there is an active interplay between the genetic and environmental factors or genotype-environmental covariation that shape the resulting individuals' future preferences, skill development, choices, and so forth" (Arvey & Bouchard, 1994, p. 72). Recent research supports this assertion. For example, Plomin and Rende (1991) noted that two environmental measures, perceptions of controllable life events (e.g., conflict with a boss or coworker) and perceptions of social support, show significant genetic influence. Furthermore, Hershberger et al. (1994) found significant genetic influences on variables assessing supportiveness of the work climate and the annoyance of physical stressors in the work environment. Unfortunately, little research has been conducted examining the interplay of genes and environment (i.e., environmental perceptions) in the work place with such employment outcome variables as job and occupational switching. Future research is needed to determine whether perceptions regarding the work environment are the mechanism through which the genetic influence on both job and occupational switching operates.

In conclusion, we now have empirical evidence of a genetic influence on job and occupational switching, and by extension, job turnover and tenure. Future research needs to examine in greater depth the personal attributes and environmental features of organizations that elicit responses of this nature.

APPENDIX

Polychoric Correlation Matrices for the Bivariate Models

	MZ Twins (N = 871)					DZ Twins (N = 778)			
	1	2	3	4		1	2	3	4
1. Job switching: Twin 1	1.000				1. Job switching: Twin 1	1.000			
2. Occupational switching: Twin 1	0.691	1.000			2. Occupational switching: Twin 1	0.700	1.000		
3. Job switching: Twin 2	0.356	0.241	1.000		3. Job switching: Twin 2	0.179	0.082	1.000	
4. Occupational switching: Twin 2	0.200	0.256	0.655	1.000	4. Occupational switching: Twin 2	0.116	0.135	0.670	1.000

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