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Attitudes towards economic risk and the gender pay gap

Anh T. Le [a], Paul W. Miller [a,*], Wendy S. Slutske [b], Nicholas G. Martin [c]

[a] School of Economics and Finance, Curtin University, Australia
[b] University of Missouri, United States
[c] Queensland Institute of Medical Research, Australia

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ABSTRACT

This paper examines the links between gender differences in attitudes towards economic risk and the gender pay gap. Consistent with the literature on the socio-economic determinants of attitudes towards economic risk, it shows that females are much more risk averse than males. It then extends this research to show that workers with more favorable attitudes towards risk are associated with higher earnings, and that gender differences in attitudes towards economic risk can account for a small, though important, part of the standardized gender pay gap.

1. Introduction

A great part of research in labor economics has aimed to understand aspects of earnings inequality. These studies have addressed differences across birthplace groups, differences according to race, and differences between males and females, as well as differences between more narrowly defined groups, such as according to sexual orientation and handedness. Among these topics, it is the analysis of gender differences which has generated the greatest interest.

Studies of gender differences in earnings have typically been based on a Blinder (1973)/Oaxaca (1973) type decomposition. The studies differ in their emphasis; with the roles of intermittent labor market experience (Polachek, 1975), self selection (Miller, 1987a), and the wage structure (Blau and Kahn, 1997) being among the many issues examined. Invariably, regardless of the statistical approach, specification of the estimating equation, data set used or time period covered, women are shown to earn less than men, *ceteris paribus*. This finding emerges even in countries such as Australia, which has a history of comparable worth principles underpinning institutionalized wage setting.

The origins of this standardized female wage differential appear elusive. In the current paper we examine the extent to which it may be linked to gender differences in attitudes towards economic risk (see Schubert et al. (1999), Powell and Ansic (1997) and Eckel and Grossman (2002) for studies of gender differences in risk aversion). Attitudes towards economic risk are used to reflect differences in individual decision-making processes that might help account for the variation in earnings across individuals.

A behavioral genetics approach is first taken, based on Le et al. (2010), to review findings on gender differences in attitudes towards economic risk. The risk variable is then related to earnings using estimating equations based on both human capital and behavioral genetics models. The results suggest that more positive attitudes towards economic risk-taking are associated with higher earnings, but the partial effect of risk attitudes on earnings would have to be over eight times greater than that estimated to fully account for the standardized gender pay gap.

The structure of the paper is as follows. Section 2 outlines the behavioral genetics model used. Section 3 describes the data set. The results of the statistical analyses are presented in Section 4, while concluding comments are given in Section 5.

2. Methodology

The findings reported below are based on both behavioral genetics and human capital models. The human capital model of earnings determination is well known to economists, and is not outlined here.

* Corresponding author. School of Economics and Finance, Curtin Business School, Curtin University, GPO Box U1987 Perth WA 6845, Australia. Tel.: +61 8 9266 7758; fax: +61 8 9266 3026.
E-mail address: Paul.Miller@curtin.edu.au (P.W. Miller).

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Economists will generally not be familiar with the behavioral genetics model employed below in the study of both variations in attitudes towards risk and earnings determination, and so a brief outline is provided. This model uses data on both identical and non-identical twins to assign the variation in a variable, such as economic risk taking or earnings, to either additive genetic effects (A), shared environmental effects (C), or unshared environmental effects (E). This decomposition enables the quantification of heritability (h^2) as $h^2=A/(A+C+E)$ and common environmentality (c^2) as $c^2=C/(A+C+E)$.[1] Unshared environmental effects (e^2) are thus given as $e^2=1-h^2-c^2$. There are various statistical methodologies that can be used to implement this decomposition, and the one used here is the multiple regression framework proposed by DeFries and Fulker (1985). We use this model because it also facilitates a more detailed study of the determinants of earnings than that permitted by the conventional human capital model.

The model of DeFries and Fulker (1985) is based on the following estimating equation:

$$Y_{ij} = \alpha_0 + \alpha_1 Y_{-ij} + \alpha_2 R_{ij} + \alpha_3 Y_{-ij}R_{ij} + \alpha_4 X_{ij} + \varepsilon_{ij}, j = 1, \ldots, n \quad (1)$$

where Y_{ij} is the outcome measure (economic risk taking, earnings) for individual i in twin pair j, Y_{-ij} is the outcome measure of the individual's co-twin, R_{ij} is a coefficient of genetic relationship, which is defined using the fractions of gene frequencies derived in simple biometrical models, namely 1 for identical twins and 0.5 for non-identical twins, $Y_{-ij}R_{ij}$ is an interaction term between the Y_{-ij} and R_{ij} variables that is the crucial part of the estimating equation which enables heritability to be assessed, X_{ij} is a set of other variables (*e.g.*, gender, age, and educational attainment) that are held to influence the outcome analysed, and ε_{ij} is a stochastic disturbance term.

Given the definition of R_{ij}, α_3 will be twice the difference between the identical (MZ) and non-identical (DZ) twins in the regression coefficients on the outcome (Y) measure for the co-twin. In other words, $\alpha_3=2(\alpha_{MZ}-\alpha_{DZ})$, which given the model formulation can also be expressed as $\alpha_3=2(r_{MZ}-r_{DZ})$, where r is the correlation coefficient. Thus, α_3, under the standard assumptions of an additive model, random mating, and non-common environment of a DZ twin is not correlated with his/her co-twin's genes, provides a direct estimate of heritability (h^2) of the outcome measure being analysed (see footnote 1).[2]

α_1 in Eq. (1) is an estimate of the twin resemblance that is independent of the genetic resemblance captured in the model terms in R_{ij}. α_1 is therefore an estimate of common environmental influence, c^2.[3]

This model has been extended to address differential heritability (by cognitive ability, age, and gender) by a number of authors. Differential heritability by gender (DeFries et al., 1993) can be addressed through the inclusion of a set of interaction terms between gender (F_{ij}) and the three behavioral genetics terms (Y_{-ij}, R_{ij}, and $Y_{-ij}R_{ij}$) in the basic DeFries and Fulker (1985) model. Thus, the extended model of DeFries and Fulker (1985), with the focus on gender, is:

$$Y_{ij} = \beta_0 + \beta_1 Y_{-ij} + \beta_2 R_{ij} + \beta_3 Y_{-ij}R_{ij} + \beta_4 F_{ij} + \beta_5 F_{ij} Y_{-ij} + \beta_6 F_{ij} R_{ij} + \beta_7 F_{ij} Y_{-ij} R_{ij} + \beta_8 X_{ij} + \varepsilon_{ij}. \quad (2)$$

In this model, where F_{ij} is a dichotomous variable, defined to equal one for females and zero for males, β_3 is the estimate of heritability for males and β_7 is the estimate of the differential effect of h^2 for females compared to males. Similarly, β_1 is the estimate of common environmental influence for males, and β_5 is the estimate of the differential effect of c^2 for females compared to males.

Each of these models can be extended by the inclusion of the covariates typically considered in standard analyses of the outcome under consideration. Variables for age, gender and educational attainment are included in the equations presented below. This extension of the model changes the interpretation of the estimates for the common environment and heritability variables. Specifically, where the personal characteristics added to the model are correlated with the genetic endowments that are identified by the co-twin's outcome variable, the genetic effects identified by the model will be distorted (see Miller et al., 2001). For example, if there is a positive association between parents' genetic endowments and the added regressors, the effects of the co-twin's genotype will tend to be minimized in the model, providing a conservative estimate of the genetic effect on economic risk taking or income in the analysis. For this reason, results from both the basic and extended models of DeFries and Fulker (1985) will be presented.

All estimations presented below are based on the double-entry data method of Cherny et al. (1992). This method accommodates the fact that there is no single way of categorizing members of a twin pair as "twin" and "co-twin" by entering the data for each member of a twin pair in the estimating equation twice — once as twin (Y_{ij}) and once as co-twin (*i.e.*, Y_{-ij}).

Note that the regression models outlined above do not constrain the estimates of h^2 and c^2 to be in the unit interval. In many applications it is possible to find negative estimates of c^2.[4] Cherny et al. (1992) have shown, however, that if the estimate of c^2 is not significant, the corresponding model term can be omitted from the estimating equation and the estimate of h^2 obtained from this modified model will be unbiased. This practice is followed below when negative values of c^2 are obtained.

Among the assumptions underlying this behavioral genetics model, the one that is often contested is the absence of assortative mating. Assortative mating will increase the genetic variance between families, so that what is estimated as shared environment is confounded with extra additive genetic variance. Martin (1978) provides a post-estimation adjustment for assortative mating, based on the marital correlation for the particular dependent variable (risk or earnings) being analysed.[5] This enables a component of the estimate of shared environment to be assigned to heritability. However, in the estimations below, the shared environment component of the variance in either attitudes to risk or earnings is estimated as zero, and so Martin's (1978) adjustment is not required.

3. Data

The data used in this study are from the Australian Twin Study of Gambling, and are described in Slutske et al. (2009) and Le et al. (2010). The data were collected over 2004–2007 from members of the Australian Twin Registry Younger Twin Cohort. This comprises a volunteer panel of twins born between 1964 and 1971. The sample size for the Study of Gambling is 4764, covering 3750 twins from

[1] The estimation of heritability by comparing resemblances between twins relies on the fact that identical (monozygotic or MZ) twins are twice as genetically similar as non-identical (dizygotic or DZ) twins, and so heritability is approximately twice the difference in correlation between MZ and DZ twins, $h^2=2(r_{MZ}-r_{DZ})$. In these studies, $c^2=r_{DZ}-0.5h^2$, and $e^2=1-r_{MZ}$.

[2] See Miller et al. (2001) for a discussion of these and other assumptions in the variance components models.

[3] See Le et al. (2010) for discussion of the statistical properties of these estimators, and of the power of the multiple regression model compared to maximum likelihood estimation of the genetic and common environmental parameters from the covariance structure of the data.

[4] This can indicate the presence of genetic non-additivity, including genetic dominance (allelic interaction) or epitasis (gene*gene interaction).

[5] For example, in a study of the heritability of educational attainment (Miller et al., 2001), the marital correlation in education levels was 0.426, and three-quarters of the shared environment component of the variance in educational attainments was therefore held to be more appropriately viewed as a part of the heritability component. See also Baker et al. (1996) for an application of this post-estimation adjustment.