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ABSTRACT

Self-Employment and Wage Earning: Hungary During Transition*

We examine the earnings determinants of the self-employed and wage earners in Hungary in the mid-1990's, taking into account two forms of selection: selection into working or non-working for every individual in our sample and selection into self-employment or wage-earning jobs for workers only. Previous studies use switching regression to examine the returns to individual characteristics taking into account only selection into self-employment or wage-earning jobs. We find that the estimated returns to individual characteristics when accounting for both forms of selection differ from estimates correcting for only selection into self-employment or wage-earning jobs. We also find that the earnings determinants of the two sectors are not significantly different from one another.

JEL Classification: C34, J31, P23

Keywords: self-selection, switching, self-employment, wage-earning jobs, economies in transition

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I. Introduction

This paper examines the earnings determinants of the self-employed and wage earners in Hungary in the mid-1990's. The importance of self-employment is reflected by the numerous studies on it using data from the United States and other advanced market economies. Self-employment is also viewed as important during transition to a market economy in Eastern European countries including Hungary and it is frequently touted as an alternative to regular wage-earning jobs.[1]

Previous literature on self-employment has recognized the bias caused by self-selection into wage/salary earnings jobs or self-employment. Therefore, the earnings equations for both sectors are estimated while correcting the selection bias. However, estimating the earnings equations while correcting bias due to only the selection into wage/salary earnings jobs or self-employment might still yield biased estimates of the earnings equations. This is because the conventional approach may not sufficiently capture the whole selection process.

As well documented in the literature (e.g., Boeri, Burda, and Köllö, 1998, pp. 10-17), the transition from socialist to market oriented economies was quite a bumpy road. During transition, disruptions to the economy typically arise resulting in a substantial decrease in employment. For example, the widespread shutdown of government-owned enterprises destroys jobs. In light of a depressed labor market, some people will not work; others will choose to work and either find jobs in the wage-earnings sector or start their own businesses.[2] These changes contribute to a low employment rate (employment-population ratio).

Table 1 contains several labor market characteristics for selected transition economies and

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[1]Measures promoting self-employment are actively pushed by policy makers attempting to lower the negative impacts of downsizing state-controlled firms. For example, in 1991 the Hungarian government encouraged self-employment by adopting a scheme whereby the unemployed invest their benefits and undergo training to start their own businesses (O'Leary, 1999).

[2]This scenario arises in other economies as well, but is more prevalent in economies under transition.

G7 countries. Column 3 contains the percentage of the "working age" population who are not working (those not in the labor force and the unemployed). For the transition economies, the figures range from a low 17 percent for the Czech Republic to a high of 41 percent for Bulgaria. For the four European G7 countries and the U.S., the values range from 27 percent for the U.S. to 44 percent for Italy. These values suggest that selection into working or non-working may be non-trivial and needs to be taken into account, in general. The last three columns of Table 1 also contain several estimates of the percentage of the working population who are self-employed.

This paper pays attention to the fact that the low employment rate in Hungary in mid-1990's cannot be ignored when earnings from self-employment and wage/salary jobs are studied. In estimating earnings equations, it is quite common to account for selection into work/non-work. However, the literature on self-employment typically ignores this selection issue in favor of selection into self-employment/wage work. This paper develops and estimates a model of earnings that accounts for both selection into work/non-work and selection into self-employment/wage work in order to study the earnings of self-employment and wage/salary earning jobs in Hungary in mid-1990's.[3]

We picture a two-stage selection mechanism; people first choose to work or not, then those who have chosen to work decide between self-employment and wage-earning jobs.[4] Below, we refer to the model of estimating earnings equations for the self-employed and wage earners while taking

[3]Selection into work/non-work does not refer to the choice of whether to participate in the labor market, instead it refers to the choice of taking employment or not. Formally participation is defined to include the employed and the unemployed. However, most studies of labor supply do not count the unemployed in the definition of participation even though they still use the term participation. That is, they study the employment decision, not the participation decision *per se*. In transition economies studies have shown that employment rates and labor force participation rates tend to be close (e.g., Boeri, Burda, and Köllö, 1998, p. 10) . We follow the practice of most studies and keep the analysis tractable by discussing the employment decision and not the participation decision.

[4]We refer to both wage and salary earning jobs as wage-earning jobs.

account of these two choices as a *modified switching regression model*. We refer to the model which only corrects for the choice between self-employment and wage-earning jobs as a *standard switching regression model*. The methodological contribution of this paper is developing the modified switching regression model by extending the standard switching regression model. We estimate the modified switching regression model using two estimation procedures: Heckman's two-step method and maximum likelihood (ML). As the results of this paper show, it is important to take account of the decision to work or not work, in addition to the choice between self-employment and wage-earning jobs when studying earning determination among the self-employed and wage earners in Hungary in the mid-1990's.[5]

The rest of the paper is organized as follows. In the next section, we develop the econometrics of the modified switching regression model with choices between working and not working and between self-employment and wage-earning jobs. The data are discussed in Section III. In Section IV we provide estimates of the earnings equation using simple OLS, the standard and our modified switching regression models. The results are also analyzed in this section. Concluding statements are presented in Section V.

II. Econometric Models

Papers that estimate the earnings equations of the self-employed/wage earners typically ignore those who are not working and estimate the earnings equations using the standard switching regression model (see, e.g., Rees and Shah, 1986; Gill, 1988; Yuengert, 1995; Earle and Sakova,

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[5]Earle and Sakova (2000) document a steady and sustained increase from 1988 to 1993 in the importance of self-employment in total employment, while at the same time there was a decline in the working to population ratio, for six Eastern European countries. They account for selection in estimating their earnings equation by using a multinomial logit. While they recognize the unemployed, they do not have those not-in-the-labor-force in their sample.

1999). The standard switching regression model accounts for the selection into the self-employment or wage-earning jobs. However, ignoring non-workers may lead to biased estimates of the earnings equations of both self-employed and wage earners. In the modified switching regression model, we estimate the earnings equation while taking account of two choices: the decision to work or not and the decision to work in self-employment or wage-earning jobs.

In this section, we develop the econometrics of the modified switching regression model. We take advantage of the property that both switching regression and selection bias correction models (Heckman, 1979) are based on limited dependent variable methods, and hence can be jointly estimated. First consider the standard switching regression model for the working sample.

The earnings function for the self-employed and wage-earners is,

$$Y_j = X\beta_j + e_j, \tag{1}$$

where j is 1 (self-employment) or 0 (wage-earning), Y is the natural-log of monthly earnings, X is the set of explanatory variables, and e is a stochastic term. The standard switching regression model points out that the estimates of equation (1) from ordinary least square (OLS) may be inconsistent due to selection into the self-employment and wage-earning jobs.

Individuals choose either self-employment or wage-earning jobs, according to an index function,

$$S^* = Q\theta + v, \tag{2}$$

where θ is a vector of coefficients and v is a stochastic term. Q can include individual characteristics as well as local demand conditions. Individuals choose self-employment if S^* is positive; otherwise, they become wage earners. Though S^* is unobservable, we can observe each individual's choice, a dichotomous variable S ($S = 1$ if $S^* > 0$, and $S = 0$ otherwise).

The standard switching regression model consists of equations (1) and (2) in order to take account of the selection into self-employment or wage-earning jobs. We can use either Heckman's two-step method (see Heckman, 1979) or ML methodology to obtain consistent estimates of earnings equation (1).

Using OLS to estimate earnings equation (1) may produce inconsistent estimates not only due to the choice between self-employment and wage-earning jobs but also due to the choice between working and not working. The standard switching regression model accounts for the first choice but overlooks the second choice and may lead to inconsistent estimates. To obtain consistent estimates of the coefficients in the earnings equation (1), we also account for the decision to work or not. The modified switching regression model introduces a second index function,

$$P^* = Z\gamma + u, \tag{3}$$

where γ is a vector of coefficients, Z is the set of explanatory variables, and u is a stochastic term. Individuals choose to work if P^* is positive; otherwise, they do not work. We observe the dichotomous variable P, which has a value of 1 if $P^* > 0$, and zero otherwise. As we point out in the previous section, the introduction of this selection equation enables us to consistently estimate the effects of observed characteristics on earnings. This is because individuals who are working may have (unobserved) characteristics in common, and this may in turn contribute to their earnings.

Heckman's two-step method or ML method can be used to estimate the modified switching regression model. The stochastic terms (e_j, v, u) are assumed to follow a joint normal distribution with mean zero and the following variance-covariance matrix:

$$\Sigma_j = \begin{bmatrix} \sigma^2_{e_j} & \sigma_{e_j v} & \sigma_{e_j u} \\ & \sigma^2_v & \sigma_{vu} \\ & & \sigma^2_u \end{bmatrix},$$

where σ^2_v and σ^2_u are normalized to 1, and j is 1 (self-employment) or 0 (wage earning).

Heckman's two-step method first estimates a bivariate probit model which consists of the two index equations (2) and (3); two selection bias correction terms (λ_{Aj} and λ_{Bj}) are computed from the bivariate probit (for details, see Fishe, Trost and Lurie, 1981; Ham, 1982; Tunali, 1986). In the second step, OLS is used to estimate the earnings equation (1), now augmented by λ_{Aj} and λ_{Bj} to correct the bias due to the two selections.[6] The selection bias correction terms are defined as follows:

$$\lambda_{A1} = \phi(-\tilde{S}) \cdot \left[1-\Phi\left(\frac{-\tilde{P}-\rho_{vu}(-\tilde{S})}{(1-\rho_{vu}^2)^{0.5}}\right)\right] \cdot \Psi(\tilde{S},\ \tilde{P},\ \rho_{vu})^{-1}, \text{ and}$$

$$\lambda_{B1} = \phi(-\tilde{P}) \cdot \left[1-\Phi\left(\frac{-\tilde{S}-\rho_{vu}(-\tilde{P})}{(1-\rho_{vu}^2)^{0.5}}\right)\right] \cdot \Psi(\tilde{S},\ \tilde{P},\ \rho_{vu})^{-1}, \text{ for } j = 1,$$

and

$$\lambda_{A0} = -\phi(-\tilde{S}) \cdot \left[1-\Phi\left(\frac{-\tilde{P}-\rho_{vu}(-\tilde{S})}{(1-\rho_{vu}^2)^{0.5}}\right)\right] \cdot \Psi(-\tilde{S},\ \tilde{P},-\rho_{vu})^{-1}, \text{ and}$$

$$\lambda_{B0} = \phi(-\tilde{P}) \cdot \Phi\left(\frac{-\tilde{S}-\rho_{vu}(-\tilde{P})}{(1-\rho_{vu}^2)^{0.5}}\right) \cdot \Psi(-\tilde{S},\ \tilde{P},-\rho_{vu})^{-1}, \text{ for } j = 0,$$

where $\tilde{P} = Z\gamma/\sigma_u$, $\tilde{S} = Q\theta/\sigma_v$, and ϕ and Φ are standard univariate normal probability density and cumulative distribution functions and Ψ is a standard bivariate normal distribution function.[7]

We also adopt a (full information) ML method in addition to Heckman's two-step method for our study. ML is an attractive method for estimating an earnings equation and two indices

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[6] The OLS estimates for λ_{Aj} and λ_{Bj} are $\rho_{e_j v} \cdot \sigma_{e_j}$ and $\rho_{e_j u} \cdot \sigma_{e_j}$, respectively, where $\rho_{e_j v} = \sigma_{e_j v}(\sigma_{e_j}\sigma_v)^{-1}$ and $\rho_{e_j u} = \sigma_{e_j u}(\sigma_{e_j}\sigma_u)^{-1}$.

[7] In the standard switching regression model, only λ_{Aj} is computed. It is defined as $\phi(-\tilde{S}) \cdot \Phi(\tilde{S})^{-1}$ when j is 1, and $-\phi(-\tilde{S}) \cdot \Phi(-\tilde{S})^{-1}$ when j is 0, where $\tilde{S}=Q\theta/\sigma_v$ using the probit estimates of θ/σ_v. The OLS estimate for λ_{Aj} is $\rho_{e_j v} \cdot \sigma_{e_j}$.

jointly (see, e.g., Blank, 1990; and Co, Gang, Yun, 2000).[8] This procedure accounts for the endogeneity of the two choices. The obtained estimators are not only consistent, but also have other desirable properties of ML (they are asymptotically efficient and normally distributed). ML becomes easy to implement when the stochastic terms are assumed to follow a multivariate normal distribution.

The likelihood function for the modified switching regression model is,[9]

$$L = \prod \left[\Psi\left(\frac{Q\theta+\mu_{v|e_1}}{\sigma_{v|e_1}}, \frac{Z\gamma+\mu_{u|e_1}}{\sigma_{u|e_1}}, \rho_{vu|e_1}\right) \cdot \frac{1}{\sigma_{e_1}} \cdot \phi\left(\frac{e_1}{\sigma_{e_1}}\right)\right]^{S\cdot P} \cdot \left[\Psi\left(-\frac{Q\theta+\mu_{v|e_0}}{\sigma_{v|e_0}}, \frac{Z\gamma+\mu_{u|e_0}}{\sigma_{u|e_0}}, -\rho_{vu|e_0}\right) \cdot \frac{1}{\sigma_{e_0}} \cdot \phi\left(\frac{e_0}{\sigma_{e_0}}\right)\right]^{(1-S)\cdot P} \cdot \left[\Phi\left(-\frac{Z\gamma}{\sigma_u}\right)\right]^{1-P} \tag{4}$$

where,

$\rho_{e_jk} = \sigma_{e_jk}(\sigma_{e_j}\sigma_k)^{-1}$, $\mu_{k|e_j} = \rho_{e_jk}\sigma_k\sigma_{e_j}^{-1}e_j$, $\sigma_{k|e_j} = \sigma_k(1-\rho_{e_jk}^2)^{0.5}$, $\sigma_{vu|e_j} = \sigma_v\sigma_u(\rho_{vu}-\rho_{e_jv}\rho_{e_ju})$, and $\rho_{vu|e_j} = \sigma_{vu|e_j}(\sigma_{v|e_j}\sigma_{u|e_j})^{-1}$ for $k = v$ or u, and $j = 1$ or 0.[10]

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[8]ML has been infrequently employed in models with more than one selection mechanism. We suspect this is because: 1) researchers have gotten used to the two-step procedure and like to see the λ's included and interpreted; and 2) as the likelihood function typically varies from specification to specification, many researchers feel more comfortable with a standard approach and form. The popularity of Heckman's two-step method can also be attributed to its availability in computer packages. Recent developments in optimization programs enable us to use ML easily. Here we offer an ML implementation that is tractable and easily reproduced in problems with a similar structure.

[9]Equation (4) is the functional expression of the following,

$$L = \prod \left[Pr(S{=}1, P{=}1|Y_1)\cdot Pr(Y_1)\right]^{S\cdot P} \cdot \left[Pr(S{=}0, P{=}1|Y_0)\cdot Pr(Y_0)\right]^{(1-S)\cdot P} \cdot \left[Pr(P{=}0)\right]^{1-P}.$$

[10]The likelihood function for the standard switching regression model is,

$$L=\prod \left[\Phi\left(\frac{Q\theta+\mu_{v|e_1}}{\sigma_{v|e_1}}\right) \cdot \frac{1}{\sigma_{e_1}} \cdot \phi\left(\frac{e_1}{\sigma_{e_1}}\right)\right]^{S} \cdot \left[\Phi\left(-\frac{Q\theta+\mu_{v|e_0}}{\sigma_{v|e_0}}\right) \cdot \frac{1}{\sigma_{e_0}} \cdot \phi\left(\frac{e_0}{\sigma_{e_0}}\right)\right]^{(1-S)}$$

where $\mu_{v|e_j} = \rho_{e_jv}\sigma_v\sigma_{e_j}^{-1} e_j$, $\sigma_{v|e_j} = \sigma_v(1-\rho_{e_jv}^2)^{0.5}$, and $\rho_{e_jv} = \sigma_{e_jv}(\sigma_{e_j}\sigma_v)^{-1}$, $j = 1$ or 0.

The likelihood function (4) shows the contribution of individuals who are working and self-employed (P=1, S=1), individuals who are working and wage earners (P=1, S=0), and individuals who are not working (P=0), respectively. By maximizing the likelihood function, we obtain estimators of the index functions (γ and θ), the earnings function (β_j), and variance and correlation coefficients.

III. Data

Our data comes from the Hungarian Household Panel Survey, conducted by the Social Research Informatics Centre, Budapest University of Economics (see Sik, 1995, for a description). The first wave of the survey was drawn in 1992. We draw our sample from the 1994 wave of the survey, supplemented with information from the 1993 wave.[11] Our sample consists of individuals between 18 and 65 years old in 1994. The age restriction is imposed in order to confine our attention to persons who generally have a significant attachment to the labor market. An individual is classified as self-employed if he or she reports self-employment as his/her main activity. Farmers are excluded from our sample, as in most studies of self-employment/wage earnings. Out of 1,601 working adults, 121 individuals or 7.6% are identified as self-employed. This is broadly consistent with other studies. For example, Earle and Sakova (1999, 2000) using a different sample of 2,705 individuals in 1993, find 9.5% of their Hungarian working sample report self-employment as their main occupation.

Table 2 contains the means of the variables used in the analysis, for all observations, for those who are working, and for those who are not working.[12] Among those who are working, we

[11]Because of financial problems, the panel was stopped in 1997. The data after 1994 was less reliable.

[12]Our sample of workers consists of people who have reported positive earnings and hours of work. Hence, both the unemployed and those not-in-the-labor-force are classified as non-working. Though

distinguish between those who are wage earners and those who are self-employed. For each variable we test the null hypothesis that the mean of those who are self-employed is equal to the mean of those who are wage earners. The earnings variable is monthly earnings from a person's main job (natural log of monthly earnings in forints). Using the sample for both men and women who are working, there is evidence at the 5% significance level that the self-employed earn significantly more than the wage earners.[13] When men and women are separately tested, the significance holds at the 1% level for men, but the difference for women is not statistically significant. The gender variable, female, has the value "one" for women and "zero" for men. A significantly smaller percentage of the self-employed are women. Head of household is equal to one for those who are heads of households. There is evidence that a larger percentage of men who are self-employed are heads of households

None of the other variables – age, experience (measured as age in 1994 minus age of first working),[14] education, marital status, number of children less than six years of age in the family and current residence of the individual – show a significant difference between the self-employed and wage earners. However, among men, age, number of years of education and work experience are bigger for those who are self-employed.[15] The opposite holds for women's age and experience. Wage earners, among women, are somewhat older and have more experience. Both men and

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Earle and Sakova (2000) separately recognize the unemployed, they do not have those not-in-the-labor-force in their sample.

[13]Of course, this difference in "sectoral earnings" needs to be treated with caution. For example, for the self-employed reported earnings may significantly understates their true earnings as they have opportunities to avoid taxes. For both the self-employed and wage/salary workers, it may not include a proper accounting of fringe benefits.

[14]In advanced market oriented economies, imputing experience using age and education is more problematic for women than for men due to the less strong labor market attachment of women. However, it's not clear this is also true for formerly socialist countries. Also, we pooled the sample of men and women due to small number of self-employed.

[15]Unfortunately, the data do not include information on the number of years of self-employed experience. Experience is an aggregate of self-employment and wage earning experience.

women wage earners have more children under age six, though again the difference is not statistically significant. Finally, relatively more women wage earners are living in Budapest and relatively more men who are self-employed are living in Budapest.

The working to population ratio sharply declined in Eastern Europe during the early 1990's. In our Hungarian data, we also observe a very low working to population ratio; only 51 percent of the sample works. Among men the ratio is only 54 percent; while among women, it is 48 percent. This figure is somewhat low in contrast to the figure in Table 1 (at 63.2%), but it is not far from the figure of 54.4% in 1996 (see Boeri, Burda, and Köllö, 1998, p. 13, Table 2.1). Considering this low working to population ratio in the data, it is quite sensible and reasonable to examine the determinants of working choice and the effects of the working choice on the earnings of the self-employed and wage-earners. This is accomplished in our modified switching regression model, in which selection into self-employment or wage-earning jobs is also jointly examined.

IV. Analysis of Results

We estimate the earnings equation (1) using three approaches: OLS, the standard switching regression model, and the modified switching regression model. The latter two alternatives are both estimated using Heckman's two-step method and ML. In the following sub-section, we discuss the determinants of the two types of choice. In Section IV.B, we discuss the return on individual characteristics in the earnings equations of the self-employed and wage earners in each of our three models.

IV.A. Determinants of Work or Non-work and Self-Employment or Wage Earnings

Following previous studies, the determinants of the decision to work or not include age, number of years of formal education, marital status, the number of children below six and the latter's interaction with gender. Age and its square term are included in equation (3) to test the notion that the probability of work increases with age up to a point, and then declines. Investments in formal education are made with the expectation of higher earnings. This implies that the probability of working rises with the number of years of schooling. Married individuals are more likely to work because of their increased economic obligations. The number of children less than age six and its interaction with the respondent's gender are also included in the model; the interaction term in included because the number of young children is expected to affect women's decisions to work or not.

Generally, selection into self-employment versus wage-earning jobs is attributed to people's attitude toward risk (e.g., Kihlstrom and Laffont, 1979); managerial skills across individuals (e.g., Blau, 1986); financial constraints (e.g., Evans and Jovanovic, 1989); and family background (e.g., Evans, 1989), among other reasons.[16] Previous work has found that the self-employed earn more than wage earners in developing countries (see, e.g., Sumner, 1981; Blau, 1985, 1986; Vijverberg, 1986), while the evidence is mixed for developed countries (see, e.g., Hamilton, 2000; Rees and Shah, 1986). Several of these earlier studies on earnings determination in the two sectors correct for selection into self-employment or wage-earning jobs.

We operationalize the decision people make between self-employment and wage-earning jobs by including age, head of household, educational attainment and gender. Age and its square term are included because younger individuals may try riskier occupations (see Johnson, 1978; Miller, 1984). This increases the probability of self-employment. However, as a person ages, risk aversion increases and the probability of self-employment decreases with age. Head of household is included to test the notion that heads of households are perhaps more responsible and have the

[16]Le (1999) reviews empirical studies on self-employment, as well as de Wit (1993) and Fairlie and Meyer (1996).

necessary drive and abilities to run their own businesses. This variable may be indicative of whether an individual is financially constrained to start a business or not. Heads of households are typically assumed to be well informed about the virtue of saving, hence may have accumulated capital to start a business if not overwhelmed by their obligations to their family. Even if financially unconstrained, heads of households may be more risk averse (hence they take up wage-earning jobs) precisely because they are the primary source of the family's income. From this discussion, it is apparent that the effect of this variable is an empirical question. The impact of education on the probability of self-employment is ambiguous. More education implies greater ability, and may thereby increase the probability of self-employment. However, more education also increases one's chance of obtaining a job, lowering the probability of self-employment (see Le, 1999). Finally, the respondent's gender is included to test the notion as some have suggested that men are more likely to be self-employed than women (see, e.g., Blanchflower and Oswald, 1998).

We first consider the results for the two indices, equations (2) and (3), the choice between self-employment and wage-earning jobs and the choice between working and not working.[17]

There is no consensus in the self-employment literature on the appropriate exclusion restrictions. Previous studies have either ignored selection, or relied on functional form for identification and/or have used the number of children or tax rates as exclusion restrictions. Our choice of variables is rather limited in this regard, but none-the-less we have imposed exclusion restrictions as can be seen in Table 3. The first two columns of Table 3 present the estimates from the standard switching regression model. Columns 3-6 of the table contain estimates from the modified switching regression model where both selection into self-employment or wage-earning

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[17]The equations are estimated separately (two-step method: first step, bivariate probit of equations (2) and (3); second step, earnings equation (1) with selection bias correction terms) or jointly (full information ML method). We present them across the three tables (3, 4, and 5) to enable an easier discussion.

jobs and selection into working or non-working are taken into account. Both the standard and modified switching regression models are estimated using both Heckman's two-step and ML methods.

Let us examine the coefficient estimates for the choice between self-employment and wage-earning jobs across our two models (standard and modified switching regression) by comparing column 1 to column 4 and column 2 to column 6 in Table 3. Generally, the coefficient estimates using the modified switching regression model are somewhat different from those using the standard switching regression model; however, the significance of the estimates, except for the constant term, has not changed.

We find that the probability of entering self-employment is not significantly affected by age. Though they are not significant, it is interesting to see that the sign are not as expected in the modified switching regression model. One possible explanation for the insignificance of the age variable is that younger individuals are expected to be more receptive to risk. However, in the context of a transition economy where the financial system is not well developed, these individuals would have fewer resources to start their own businesses. On the other hand, older individuals may have accumulated the necessary resources to start their own businesses but are less willing to take risks. The closer an individual is to retirement, the lower is the probability that he or she would risk his/her savings. While the variable's insignificance is troubling, it is not without precedence; using longitudinal U.S. data, Evans and Leighton (1990) finds that the probability of starting a business is independent of age.

Head of household is statistically significant and the coefficient estimates are qualitatively similar across models. The results indicate that the probability of self-employment is greater for individuals who are heads of households. This may be indicative of the lack of financial constraints amongst heads of households and the predominance of this effect compared with the effect of risk aversion.

We do not find evidence that education is a significant determinant of self-employment. In contrast, Earle and Sakova (1999), Gill (1988), and Evans and Leighton (1989), among others, find that schooling has a substantive positive impact on self-employment choice. However, Fairlie and Meyer (1996) found no effect. Le (1999) shows that schooling does not always show up to be a statistically significant determinant of self-employment. Though some earlier papers find that men choose self-employment more often than women, we do not find that gender is significant in Hungary.

Columns 3 and 5 show the results for the working or not choice equation for the modified switching regression model, which is ignored in the standard switching regression model. All the coefficient estimates, except for children less than six years old, are statistically significant at the 1% level of significance. The coefficient estimates for age suggest that the probability of work increases up to a certain age and then starts to decline. Investments are made in formal education with the expectation of increasing one's earnings, and we find the probability of work increases with the level of education. The probability of working is significantly higher for married individuals and the number of children less than six years old significantly decreases a woman's working status (female*children < 6).

The correlation coefficient between the residuals in the working equation and the self-employment equation, ρ_{vu}, is insignificant. This implies that the unobserved characteristics which affect the choice between working and not working do not significantly affect the choice between self-employment and wage-earning jobs. We turn to the determinants of earnings in the next sub-section.

IV. B. Determinants of Earnings

Various personal and human capital characteristics influence earnings of both the self-employed and wage earners. Whether an individual lives in Budapest or not is included to control for the premium of living in the capital. Education and experience (and its square term) are used as proxies for human capital. Education is expected to have a positive effect on earnings; while the effect of experience is assumed to initially rise and then fall. Finally, we also control for gender earnings differentials.

Tables 4 and 5 present the coefficient estimates from the earnings equations for wage-earners and the self-employed, respectively. Column 1 in both tables presents the OLS estimates. Estimates of earnings equations based on the standard switching regression model are reported in columns 2 and 3. Heckman's two-step and ML methods are used, respectively. Columns 4 and 5 contain estimates of the earnings equations for the modified switching regression model when Heckman's two-step and ML methods are used, respectively. For wage earners, the coefficient estimates of the earnings equation are quite robust across the three models (OLS, standard and modified switching regression models) and estimation methods (Heckman's two-step and ML) used. For example, we find that each additional year of education increases earnings by about 8% using OLS (column 1). This is reasonably close to the 7.5% we find using the standard switching regression model estimated using Heckman's two-step method (column 2) and to the 7.8% we find using the modified switching regression model (column 4). Similar comparisons can be made for columns 1, 3 and 5 when the ML method is used. The estimates for the self-employed earnings equation vary across the models when ML estimation is used. In particular when the work or non-work choice is taken into account (i.e., in the modified switching regression model), the estimates of the education and experience parameters are not only larger in magnitude (compared to those in the standard switching regression model) but are now statistically significant at the 5% level.

Before turning to a detailed examination of the influence of observed characteristics on earnings, we first comment on the sign and significance of the two selection bias correction factors (λ_{Aj} and λ_{Bj}) included in Heckman's two-step method to account for the effect of unmeasured characteristics on the earnings equation (see column 4 of Tables 4 and 5). The negative and statistically significant estimate for λ_A in Table 4 indicates that, given the measured characteristics, the earnings of individuals who have larger unobserved characteristics, making them more suitable for wage-earnings jobs, usually earn more in the wage-earnings jobs (i.e., they do better because of their choice into wage-earning jobs). Note that the choice of wage-earnings jobs in equation (2) is coded zero. On the other hand, the selection bias correction factor for the choice of self-employment is not statistically significant in the self-employment earnings equation (see column 4, Table 5).[18] This suggests that unobserved characteristics which lead individuals to choose self-employment do not necessarily increase or decrease earnings. Since our estimate of λ_B is not statistically significant at conventional levels in both earnings equations, there does not appear to be significant selection bias due to the decision to work or not work.

Measures similar to the λ's are available in ML. These are the correlation coefficients between the residuals in the earnings equation and the self-employment equation (ρ_{ev}) and the working equation (ρ_{eu}). Column 5 of Tables 4 and 5 suggests the importance of accounting for both types of selection as evidenced by the significant correlation coefficients. For example, in Table 4, ρ_{ev} is negative and statistically significant at the 1% level of significance. This result is consistent

[18]Using U.K. data, Rees and Shah (1986) also find that the selection bias correction factor is statistically significant for the regression pertaining to employees but not for the regression pertaining to the self-employed. As we point out below, this may be because selection into work/non-work is ignored.

with the result for λ_A as discussed above. In Table 5, ρ_{eu} is positive and statistically significant. This is different from the results using Heckman's two-step method since the comparable estimate for λ_B is not significant. This suggests that unobserved characteristics in the earnings and working equations for the self-employed are positively correlated, indicative of a positive selection bias. The observed positive selection bias and the fact that some of the coefficient estimates in columns 3 and 5 in Table 5 are different in magnitude and significance may attest to the importance of accounting for the work or non-work decision.

In comparing the estimates for the wage earners and the self-employed, we focus on the results in columns 4 and 5, in particular, column 5 where we use ML. There is a significant earnings premium for living in Budapest for wage earners but not for the self-employed. Wage earners in Budapest earn a premium of about 17%.[19] Educational attainment is statistically significant in the earnings equations for both the wage earners and the self-employed at the 10% and 5% levels, respectively. Each additional year of education increases earnings by about 8% for the wage earners and 9% for the self-employed. Experience has a positive, and the experience-squared term has a negative effect on earnings. Interestingly, log-earnings for the wage earners peak at 30 years of experience while for the self-employed, it peaks at 19 years of experience. Not only do the self-employed on average have higher earnings (see Table 2), they also reach their highest earnings level earlier. This is because individuals earning wages need to move up the ranks. Finally, gender contributes to earnings differential only for the wage earners. Female wage earners earn about 23% less than male wage earners.

Lastly, we test whether the returns to all the observed attributes are the same for the wage earners and the self-employed using a likelihood ratio (LR) test. That is, we test whether there is a structural difference in the earnings of the wage earners and the self-employed. The null hypothesis is $\beta_0 = \beta_1$, where β_0 and β_1 pertain to the parameters of earnings equation for the wage earners and the self-employed, respectively. We cannot reject the null hypothesis of the LR test at

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[19]This percentage is calculated using exp[ß-.5 V(ß)] - 1, where ß is the estimated coefficient and V(ß) is the variance of ß (see Kennedy, 1981).

5% level of significance. The calculated χ^2 statistics are 5.523 and 6.927 for the standard switching regression and the modified switching regression models, respectively. These values are smaller than the critical $\chi^2(0.05)$ value of 12.592 at 6 degrees of freedom. The results indicate that overall returns to measured characteristics are not significantly different for wage earners and the self-employed.[20] This may imply that, in Hungary, returns to observed attributes of the wage earners and the self-employed do not play a large role in job choice

Our result that overall returns to observed characteristics is not significantly different for wage earners and the self-employed are consistent with earlier studies using U.K. data (e.g., Rees and Shah, 1986) and employment data from transition economies (e.g., Earle and Sakova, 2000). The confidence interval estimates for most of the coefficient parameters for the employee and self-employed regressions in Rees and Shah (1986) and Earle and Sakova (2000) overlap—the coefficient estimates from the employees' regression are not significantly different from the coefficient estimates from the self-employed regression. This suggests those human capital variables (such as education and experience), and time-invariant person characteristics (such as gender and race) do not have significantly different impacts on wage earners and the self-employed in both market and transition economies.[21]

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[20]The same conclusion is also found with OLS estimates when a similar LR test is applied.

[21]If the null hypothesis that coefficients of two equations are the same cannot be rejected in a Chow test, we may estimate the coefficients of "one" earnings equation with pooled sample. However, it should be noted that the finding that the coefficients of earnings equations of self-employed and wage earning jobs are not significantly different does not necessarily imply that earnings in the two sectors can be estimated using the only one earnings equation, since the Chow test assumes that the variance of two earnings equations should be the same (homoskedasticity). We can easily show that earnings in the two sectors have different dispersion of stochastic components (i.e., heteroskedasticity) by implementing another LR test whose null hypothesis is $\sigma_0 = \sigma_1$ in addition to $\beta_0 = \beta_1$. In other words, we are testing whether the return to human capital is the same ($\beta_0 = \beta_1$) *and* whether the dispersion of earnings is the same ($\sigma_0 = \sigma_1$). From the results of the LR test, we reject the null hypothesis, because the test-statistics are 64.658 for the single switching model and 57.337 for the switching and selection model, and are larger than the critical $\chi^2(0.05)$ value of 14.067 with 7 degrees of freedom.

V. Conclusion

This paper estimates earnings functions for the self-employed and for wage-earners in Hungary in the year 1994. As in other Eastern European countries, Hungary experienced a large decrease in the employment rate, which cannot be ignored when studying earnings in wage/salary jobs and self-employment in Hungary in the mid-1990's. The main innovation of the paper is the introduction of an econometric method for studying a three-state model, including nonemployment as well as self-employed and wage-earning as separate states. We contrast this “modified switching” approach with the “standard switching” approach used in most of the literature.

This paper studies earnings determination of self-employment and wage-earning jobs in Hungary during transition. It is well recognized that the self-employed may have preferences that differ from those holding wage-earning jobs. The choice of self-employment has been attributed to people’s attitude toward risk, managerial skills across individuals, financial constraints, and family background, among other reasons. The role of self-employment in transition has been very important as documented in various papers. During the transition, many jobs have disappeared due to, for example, closure of formerly state-owned firms. Self-employment generates jobs when economies undergo transition from socialist to more market orientation. Hence, examining the determinants of earnings in both self-employment and wage-earning jobs in economies of transition is important for understanding the labor market in the transition economies.

Earlier papers have corrected for the bias caused by the choice between self-employment and wage-earning jobs using the standard switching regression model. This standard switching regression model has also been applied to studies of earnings determination in labor markets in transition economies. The novelty of this paper lies in the econometric methodology for estimating earnings equations accounting for two choice problems: first, the potential bias due to the choice between working and not working and, second, the choice between self-employed and wage-earning jobs conditional on the choice of working. We have developed the econometrics of the modified switching regression model which corrects for bias due to both choices. The modified switching regression model has been estimated using both Heckman's two-step and maximum likelihood methods.

Our approach helps improve understanding of the determinants of self-employment/wage earnings in Hungary. Accounting for the choice between working or not in addition to the choice between self-employment and wage earning affects the estimates of the earnings equations, especially for the self-employed. Moreover, according to our hypothesis tests, the earnings determinants of the two sectors are not significantly different from one another. This may imply that it is not an earnings premium, but rather non-pecuniary benefits/different preferences toward the two sectors which determines the choice between self-employment and wage-earning jobs. Finally, we find evidence of positive selection-bias in the observed earnings for wage earners but find no selection bias for the self-employed. Workers who chose wage-earning jobs have especially benefitted from their choice since the unobserved characteristics which led them to choose wage-earning jobs significantly increase their earnings. However, this is not true for the self-employed; unobserved characteristics have no impact on earnings.

References

Blanchflower, David and Andrew Oswald, "What Makes an Entrepreneur?," *Journal of Labor Economics* 16 (1998): 26-60.

Blank, Rebecca M., "Are Part-Time Jobs Bad Jobs?," in Gary Burtless, (ed.), *A Future of Lousy Jobs?*, (Washington, D.C.: Brookings Institution, 1990).

Blau, David M., "Self-Employment and Self-Selection in Developing Country Labor Markets," *Southern Economic Journal* 53 (1985): 351-363.

Blau, David M., "Self-Employment, Earnings and Mobility in Peninsular Malaysia," *World Development* 14 (1986): 839-52.

Boeri, Tito, Michael C. Burda, and János Köllö, *Mediating the Transition: Labour Markets in Central and Eastern Europe*, (London: Institute for EastWest Studies, 1998).

Co, Catherine Y., Ira N. Gang, and Myeong-Su Yun, "Returns to Returning," *Journal of Population Economics* 13 (2000): 57-80.

de Wit, Gerrit, "Models of Self-Employment in a Competitive Market," *Journal of Economic Surveys* 7 (1993): 367-397.

Earle, John S. and Zuzana Sakova, "Business Start-Ups or Disguised Unemployment? Evidence on the Character of Self-Employment from Transition Economics," *Labour Economics* 7 (2000): 575-601.

Earle, John S. and Zuzana Sakova, "Entrepreurship from Scratch: Lessons on the Entry Decision into Self-Employment from Transition Economies," SITE, Stockholm School of Economics, 1999, http://www.hhs.se/site.

Evans, David and Linda Leighton, "Some Empirical Aspects of Entrepreneurship," in Zoltan Acs and David Audretsch (eds.), *The Economics of Small Firms: A European Challenge* (Dordrecht: Kluwer, 1990).

Evans, David and Boyan, Jovanovic, "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints," *Journal of Political Economy* 97 (1989): 808-827.

Evans, David, " The Determinants of Changes in U.S. Employment," *Small Business Economics* 1 (1989): 111-120.

Fairlie, Robert W. and Bruce D. Meyer, "Ethnic and Racial Self-Employment Differences and Possible Explanations," *Journal of Human Resources* 31 (1996): 757-793.

Fishe, Raymond P.H., Robert P. Trost, and Philip M. Lurie, "Labor Force Earnings and College Choice of Young Women: An Examination of Selectivity Bias and Comparative Advantage," *Economics of Education Review* 1 (1981): 169-191.

Gill, Andrew M., "Choice of Employment Status and the Wages of Employees and the Self-Employed: Some Further Evidence," *Journal of Applied Econometrics* 3 (1988): 229-34.

Ham, John C., "Estimation of a Labour Supply Model with Censoring Due to Unemployment and Underemployment," *Review of Economic Studies* 49 (1982): 335-354.

Hamilton, Barton H., "Does Entrepreneurship Pay? An Empirical Analysis of the Returns to Self-Employment," *Journal of Political Economy* 108 (2000): 604-631.

Heckman, James, "Sample Selection Bias as a Specification Error," *Econometrica* 47 (1979): 153-161.

Johnson, William R., "A Theory of Job Shopping," *Quarterly Journal of Economics* 92 (1978): 261-278.

Kennedy, Peter E., "Estimation with Correctly Interpreted Dummy Variables in Semilogarithmic Equations," *American Economic Review* 71 (1981): 802.

Kihlstrom, Richard and Jean-Jacques Laffont, "A General Equilibrium Entrepreneurial Theory of Firm Foundation Based on Risk Aversion," *Journal of Political Economy* 87 (1979): 719-748.

Le, Anh T. "Empirical Studies of Self-Employment," *Journal of Economic Surveys* 13 (1999): 381-416.

Miller, Robert A., "Job Matching and Occupational Choice," *Journal of Political Economy* 92 (1984): 1086-1120.

O'Leary, Christopher J., "Promoting Self Employment Among the Unemployed in Hungary and Poland," UpJohn Institute Staff Working Paper 99-055, 1999, http://www.upjohninst.org/publications/wp/9955wp.html

Rees, Hedley and Anup Shah, "An Empirical Analysis of Self-Employment in the U.K.," *Journal of Applied Econometrics* 1 (1986): 95-108.

Sik, Endre, "Measuring the Unregistered Economy in Post Communist Transition," *Eurosocial Report* 52 (1995), Vienna, Austria.

Sumner, Daniel A., "Wage Functions and Occupational Selection in a Rural Less Developed Country Setting," *Review of Economics and Statistics* 63 (1981): 513-19.

Tunali, Insan, "A General Structure for Models of Double-Selection and an Application to a Joint Migration/Earnings Process with Remigration," *Research in Labor Economics* 8(B) (1986): 235-283.

Vijverberg, Wim P. M., "Consistent Estimates of the Wage Equation when Individuals Choose among Income-Earning Activities," *Southern Economic Journal* 52 (1986): 1028-1042.

Yuengert, Andrew M., "Testing Hypotheses of Immigrant Self-Employment," *Journal of Human Resources* 30 (1995): 194-204.

Table 1: Labor Market Characteristics for Selected Transition and G7 Counties

	Labor Force Participation Rate (%)[1, 2]	Unemployment Rate (%)[3]	Non-Working Population (%)[4]	Self-Employment Rate (%) [5]	Self-Employment Rate (%) [6]
	1995	1995	1995	1993	1997/1998
Bulgaria	66.7	11.1	40.7	7.6	13.2
Czech Republic	85.7	3.5	17.3	10.4	10.7
Hungary	71.4	10.2	34.8	9.5	13.9
Poland	73.1	15.2	38	20	30.2
Russia	77.8	8.3	28.7	3.5	8.5
Slovak Republic	75	13.2	34.9	7.4	na
France	68.4	11.6	39.5	12	9.1
Germany	71.4	10.4	36	8.5	10.1, 6.1 [7]
Italy	64.1	12	43.6	na	30.4
U.K.	76.3	8.3	30	12.7	15.6
U.S.	77.3	5.6	27	8.2	14

Sources of data: [1] Total labor force divided by population aged 15-64. [2] From the World Bank's 1997 World Development Report. [3] From the IMF's International Financial Statistics Database. [4] Includes those not in the labor force and the unemployed. [5] Statistics of Bulgaria, Czech Republic, Hungary, Poland, Russia and Slovak Republic are from Le (1999), Table 1, and the rest are from Earle and Sakova (2000), Table 1. [6] From Blanchflower et al (2001), see their Table 1. [7] West and East Germany, respectively.

Table 2. Mean Characteristics of the Sample 18-65 years old

			Working	
Both Sexes	Everyone	Not Working	Wage Earners	Self-Employed
Sample Size	3145	1544	1480	121
Age (Years)	40.292	42.91	37.72	38.339
Experience (Years)			19.376	19.992
Head of household (Head = 1)	0.435	0.352	0.501	0.686***
Education (Years)	10.159	9.244	11.034	11.14
Female (Women = 1)	0.524	0.552	0.509	0.339***
Marital Status (Married = 1)	0.65	0.597	0.7	0.702
Number of Children under age 6	0.248	0.262	0.239	0.198
Budapest (Living in Budapest = 1)	0.158	0.134	0.18	0.19
Monthly Earnings in Forints			17089.318	22441.694**
Working	0.509			
			Working	
Men	Everyone	Not Working	Wage Earners	Self-Employed
Sample Size	1498	692	726	80
Age (Years)	39.505	41.449	37.66	39.438
Experience (Years)			19.609	21
Head of household (Head = 1)	0.696	0.571	0.795	0.888**
Education (Years)	10.201	9.331	10.935	11.063
Marital Status (Married = 1)	0.654	0.564	0.731	0.738
Number of Children under age 6	0.254	0.189	0.32	0.225
Budapest (Living in Budapest = 1)	0.156	0.142	0.164	0.2
Monthly Earnings in Forints			19442.249	25223.038*
Working	0.538			
			Working	
Women	Everyone	Not Working	Wage Earners	Self-Employed
Sample Size	1647	852	754	41
Age (Years)	41.007	44.096	37.777	36.195
Experience (Years)			19.153	18.024
Head of household (Head = 1)	0.198	0.175	0.219	0.293
Education (Years)	10.121	9.174	11.129	11.293
Marital Status (Married = 1)	0.645	0.624	0.67	0.634
Number of Children under age 6	0.243	0.32	0.16	0.146
Budapest (Living in Budapest = 1)	0.16	0.128	0.196	0.171
Monthly Earnings in Forints			14823.763	17014.683
Working	0.483			

The null hypothesis tested is that the mean of wage earners is equal to that of self-employed. ***, ** and * mean statistically significant at 1%, 5%, and 10%, respectively.

Table 3. Estimates of the Standard and Modified Switching Equations

	Standard Switching		Modified Switching			
	Two-Step	ML	Two-Step		ML	
	Self-Emp.	Self-Emp.	Working	Self-Emp.	Working	Self-Emp.
Constant	-1.628*** (0.551)	-1.767*** (0.585)	-4.819*** (0.249)	-0.923 (1.570)	-4.841*** (0.249)	-1.402 (1.216)
Age	0.002 (0.029)	0.009 (0.030)	0.219*** (0.013)	-0.024 (0.062)	0.220*** (0.013)	-0.003 (0.050)
$Age^2/100$	-0.004 (0.036)	-0.015 (0.037)	-0.298*** (0.016)	0.031 (0.082)	-0.299*** (0.016)	0.002 (0.066)
Head of Household	0.269** (0.124)	0.357*** (0.115)		0.271** (0.123)		0.352*** (0.116)
Education	0.009 (0.017)	0.006 (0.018)	0.131*** (0.010)	-0.004 (0.031)	0.131*** (0.011)	-0.002 (0.027)
Female	-0.192 (0.117)	-0.134 (0.111)		-0.173 (0.124)		-0.128 (0.113)
Marital Status			0.240*** (0.062)		0.226*** (0.064)	
Children < 6			0.017 (0.068)		0.005 (0.071)	
Female* Children < 6			-0.707*** (0.093)		-0.686*** (0.096)	
ρ_{vu}			-0.177 (0.354)		-0.107 (0.286)	

1. Standard errors are in parentheses.
2. ***, ** and * mean statistically significant at 1%, 5%, and 10%, respectively.

Table 4. Log-Earnings for Wage Earners Using the Standard and Modified Switching Regression Models

		Standard Switching		Modified Switching	
	OLS	Two-Step	ML	Two-Step	ML
Constant	8.608*** (0.055)	8.402*** (0.145)	8.579*** (0.063)	8.341*** (0.216)	8.549*** (0.132)
Budapest	0.161*** (0.027)	0.161*** (0.027)	0.159*** (0.028)	0.161*** (0.027)	0.159*** (0.028)
Education	0.080*** (0.004)	0.075*** (0.008)	0.079*** (0.005)	0.078*** (0.010)	0.080*** (0.007)
Experience	0.021*** (0.003)	0.018*** (0.006)	0.020*** (0.004)	0.020*** (0.007)	0.021*** (0.005)
$Experience^2/100$	-0.033*** (0.008)	-0.027* (0.014)	-0.032*** (0.009)	-0.033** (0.017)	-0.035*** (0.013)
Female	-0.275*** (0.020)	-0.152** (0.073)	-0.257*** (0.021)	-0.160** (0.070)	-0.258*** (0.022)
λ_A		-1.488* (0.772)		-1.423* (0.737)	
λ_B				0.039 (0.085)	
σ_e			0.401*** (0.017)		0.401*** (0.017)
ρ_{ev}			-0.527*** (0.116)		-0.529*** (0.115)
ρ_{eu}					0.043 (0.161)
Adjusted R^2	0.32	0.325		0.324	

1. Standard errors are in parentheses.
2.***, ** and * mean statistically significant at 1%, 5%, and 10%, respectively.

Table 5. Log-Earnings for the Self-Employed Using the Standard and Modified Switching Regression Models

		Standard Switching		Modified Switching	
	OLS	Two-Step	ML	Two-Step	ML
Constant	9.019*** (0.376)	10.176*** (1.422)	9.518*** (0.594)	10.065*** (1.476)	8.481*** (0.889)
Budapest	0.190 (0.153)	0.191 (0.141)	0.190 (0.142)	0.191 (0.141)	0.192 (0.137)
Education	0.053* (0.029)	0.046 (0.036)	0.050 (0.034)	0.058 (0.047)	0.093** (0.043)
Experience	0.032 (0.020)	0.029 (0.019)	0.030* (0.018)	0.038 (0.030)	0.062** (0.026)
$Experience^2/100$	-0.083* (0.046)	-0.076 (0.046)	-0.078* (0.045)	-0.100 (0.074)	-0.163** (0.068)
Female	-0.278* (0.124)	-0.100 (0.250)	-0.203 (0.137)	-0.090 (0.251)	-0.240 (0.154)
λ_A		-0.602 (0.703)		-0.700 (0.715)	
λ_B				0.155 (0.372)	
σ_e			0.665*** (0.089)		0.763*** (0.161)
ρ_{ev}			-0.392 (0.265)		-0.331 (0.433)
ρ_{eu}					0.711*** (0.234)
Adjusted R^2	0.072	0.069		0.064	
LR test for $\beta_0 = \beta_1$	6.684		5.523		6.929

1. Standard errors are in parentheses.
2.***, ** and * mean statistically significant at 1%, 5%, and 10%, respectively.

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