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ABSTRACT

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Using Bulgarian Integrated Household Surveys for 1995, 1997 and 2001 this paper explores determinants of labor force status – not working, public sector employment, private sector employment and self-employment – and earnings for each of the three employment sectors. We find that while skilled labor's pattern of reallocation into the public sector remains roughly the same over time, the inflow of highly educated laborers into the private sector and self-employment increases. These changes coincide with the erosion of the returns to observed skills in the private sector and self-employment, while the public sector continues to reward all types of education at higher than the elementary level.

JEL Classification: J21, J23, J31

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1. Introduction

One of the most popular stylized facts associated with the labor markets of the Central and East European (CEE) and Commonwealth of Independent States (CIS) during the socialist era was the coexistence of a large supply of skilled labor – a product of virtually universal public education– and compressed compensation for the human capital supplied by way of egalitarian income distribution policies. Subsequent to the end of socialism, returns to high skills increased, producing winners and losers in labor market transition (for a comprehensive review of this literature see Boeri and Terrell, 2002). Rising compensation for skills in these economies typically coincided with the erosion of returns to types of education no longer cherished by the changing environment and with the dropping out of the labor force of low skilled workers, particularly women (for example, see Bird, Schwarze and Wagner, 1994; Chase, 1998; Munich, Svejnar and Terrell, 1999; Gang and Stuart, 1997, 2000).

A high correlation between the characteristics of laborers and the sector in which they work – public sector employment, private sector employment and self-employment – as well as with the characteristics of laborers who become unemployed or drop out of the labor force, indicates that a selection process may have influenced the earnings of people in different types of employment. Falaris (2004) models selection into the public and private sectors while exploring the returns from public and private employment in Bulgaria in 1995, but without accounting for the selection into non-working and self-employment. Co, Gang and Yun (2003) and Earle and Sakova (2000) analyze the choice among self-employment, working for an employer and not working, but disregard the mobility of labor between the public and the private sectors. However, omitting categories may significantly influence the correct interpretation of the labor market reallocation and earnings trends in the former socialist economies (Hunt, 2002). The observed patterns of sectoral choice may be influenced by the characteristics of individuals working in the omitted categories. Crucial aspects of structural reform may be missed, for example the abandonment of the public sector in favor of the presumably more efficient private sector or self-employment (Aghion and Blanchard, 1994).

In this paper we carefully examine laborers' sectoral choice and its consequences for earnings. We first study the reallocation of human capital across sectors – non-

employment, public sector employment, private sector employment, and self-employment – looking at the role of key variables such as education and experience, over time. Next, we estimate the earnings equations of the three types of employed laborers, correcting for possible selection bias. These estimates are based on Bulgarian Integrated Household Survey (BIHS) data for the years 1995, 1997 and 2001, which together capture the entire process of the Bulgarian transition, from the period before the financial crisis of 1996-97 when little structural change had taken place, to the period following the crisis which witnessed the initiation of structural changes, and the near complete privatization of the economy. This latter period coincides with continual economic growth. The uniqueness of the data used allows us to provide the first rigorous analysis of the entire process of labor market transition in Bulgaria.

In the next section we discuss some of the relevant characteristics of the Bulgarian economic transition and the institutional framework of the labor market. Section 3 describes the analytical framework and the data. The empirical specifications and results are presented in Section 4. Section 5 concludes.

2. Transition, Crisis and Institutional Framework of the Bulgarian Labor Market

The recent economic history of Bulgaria is punctuated by the crisis of 1996-97, preceded by economic and political stalemate and followed by one of the most drastic structural reforms among the transition economies of the CEE and CIS. The reform included rapid privatization, changes in the pension and social-welfare structure, and the establishment of a currency board. Its immediate outcome was the transfer of most of Bulgaria's productive resources from public into private hands, such that, by the end of the 1990s, the private sector accounted for nearly 70% of the country's GDP (National Statistical Institute, 2003; Privatization Agency, 2004). While the causal link between the reforms and economic growth is yet to be empirically established, since 1997 the Bulgarian economy has grown approximately 4% per annum, while annual inflation has been contained below 5%.

Economic growth has not been accompanied by commensurate employment growth. Indeed, during the 1997-2000 period employment *declined* at the rate of approximately 2% per annum, and the increase in employment during 2000-01 was

modest. As a consequence, employment continues to be lower than the pre-crisis/pre-reforms level, and 50% of the unemployed people experience long-term unemployment, a proportion that is high even by CEE standards. Although the decline in employment has contributed to an increase in labor productivity and, *on average*, the wages of the employed have increased steadily since the late 1990s, there is as yet no rigorous analysis of whether and how this positive trend may have affected different groups of people in the Bulgarian labor market.

In addressing the latter issue, economists typically compare the skill and experience levels of individuals who remain employed with those who lose their employment, and based on this comparison advance either institutional or market oriented explanations to the divergence of labor market status. Chase (1998) argues that in Slovakia the decline of manufacturing production after the structural reforms led to a decreasing demand for workers with relatively low levels of education and, at the same time, induced an increase in the returns to higher education. Boeri and Terrell (2002) suggest that the generous Polish and Hungarian unemployment benefit systems, together with the flat replacement rates, pushed a large number of low-skilled workers into non-employment, while in the former Soviet republics low social security benefits helped sustain high employment at the expense of falling wage rates.

In Bulgaria, where the social security system experienced one of the most dramatic generosity reducing reforms in Europe,[1] market forces (more than social security benefits) might have dominated the allocation of low skilled labor out of employment. According to available statistics, in Bulgaria workers with only primary education account for over 40% of the unemployed but only 25% of the employed (Rutkowski, 1999). However, there is no evidence to suggest reduced unemployment benefits have had a noticeable impact on the incidence of unemployment. It is even more

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[1] For example, the unemployment benefits coverage rate in Bulgaria decreased from 79% in 1990 and 55% in 1991 to 23% in 1995 and 29% in 1998. The comparable figures for the Czech Republic, Hungary and Poland were 64%, 77% and 79% in 1991 and 44%, 36% and 53% in 1995, respectively. Similarly, the ratio of the minimum wage to the average gross wage in Bulgaria declined from 54.2 in 1991 to 29.3 in 1996. The respective figures for Slovakia, Hungary and Poland were 52.4, 37.4 and 34 in 1991 and 35.9, 32.9 and 43.3 in 1996. Finally, in 1995 the average gross replacement rate of 59.5% in Bulgaria was far below, for example, the Czech average of 73.7%.

difficult to answer the question as to whether the privatization of productive resources has led to a proportionate or greater than proportionate migration of high skill laborers from the public into the private sector. In other words, if the private sector in Bulgaria is seen to pay higher average earnings than the public sector, it will not be obvious whether this difference can be attributed to higher labor productivity or to a premium for scarce skilled labor. This ambiguity is a consequence of the significant degree of job and benefit protection in the public relative to the private sector which might have contributed to retaining a high proportion of the skilled labor pool in the former as opposed to the latter sector (Falaris, 2002; Jones, 1992; Beleva, 1992; Garibaldi, Makovec and Stoyanova, 2003).

As argued at the outset, the analytical framework adopted in this paper allows us to capture as broad a picture of the Bulgarian labor market as possible. In doing so we highlight the relationship between the supply of skills and the earnings obtained from each of the sectors examined. Proxies such as social security benefits and the rate of regional unemployment allow us to evaluate the influence of market versus institutional factors on the allocation of skills and earnings, and we trace these developments from the outset of reforms in 1995, through the crisis in 1996-97, until 2001.

3. Analytical Framework and Data Summary

3.1. Analytical Framework

The basic model is given by:

$$[1] \qquad Y_s = X_s \beta_s + U_s ,$$

and

$$[2] \qquad Y_s^* = Z_s \gamma_s + \eta_s , \qquad s = 1 ... M ,$$

where Y_s refers to the earnings associated with a specific sector, Y_s^* is a discrete choice variable indicating the sector of employment, X_s and Z_s are demographic, institutional and regional explanatory variables and the disturbance U_s satisfies $E(U_s \mid X) = 0$ and

$V(U_s | X, Z) = \sigma_s^2$. When using OLS, the latent (earnings) equations are run separately. However, when the outcome variable Y_s is observed only if category s is chosen, U_s and η_s are not independent, and the least square estimates of β_s are not consistent.

To correct for this inconsistency applied research has traditionally employed the selection bias correction method embedded in Lee's (1983) polichotomous choice selectivity model. Lee (1983) extends the Heckman (1979) model to the multinomial logit case by arguing that $E(U_s | Z_s \gamma_s > \varepsilon_s; \Gamma) = -\sigma_s \rho_s \dfrac{\phi(J_s(Z_s \gamma_s; \Gamma))}{F_s(Z_s \gamma_s; \Gamma)}$, where $\varepsilon_s = \max_{j \neq s}(Y_j^* - \eta_s)$, $J_s = \Phi^{-1}(F_s)$, $F_s = \dfrac{\exp(Z_s \gamma_s)}{\sum_j \exp(Z_j \gamma_j)}$, $\Gamma = \sum_{j \neq s} \exp(Z_s \gamma_s)$, and

ρ_s are the correlation coefficients between U_s and J_s, and σ_s are the standard deviations from the disturbances of the earnings equations.[2] As in Heckman (1979) the estimation proceeds in two steps. In the first step, equation [2] is estimated using multinomial logit. In the second stage, the earnings equations are estimated by least squares techniques, after correcting for selection bias. The resulting selectivity corrected earnings equations are:

$$[3] \qquad Y_s = X_s \beta_s - \sigma_s \rho_s \frac{\phi(J_s(Z_s \gamma_s; \Gamma))}{F(Z_s \gamma_s; \Gamma)} + v_s.$$

The joint distribution of U_s and ε_s involves possible correlation between U_s and all η_s; it therefore depends on all $Z_j \gamma_j$. However, Lee assumes that the correlation between U_s and J_s is independent of Γ. In other words, the transformation of ε_s into J_s does not take into account the fact that the correlation between U_s and J_s should depend on all $Z_j \gamma_j$ and cannot be treated as a simple parameter. The only truly

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[2] In other words, the method involves the transformation of logit standard errors into normally distributed ones such that the bias correction variables of Lee are intuitively the same as those of Heckman.

exogenous correlation coefficients are the structural ones which link the disturbances U_s and η_s from the original model.

Bourguignon, Fourier and Gurgand (2001, hereafter BFG) incorporate this link in their model, by assuming a linear association between U_s and η_s, $U_i = \sigma_i \sum_s \rho_s \eta_s^* + \omega_i$, for each i, i.e., a latent equation. The residual term ω_s is orthogonal to all η_s, that is, a crucial assumption in the above specification is the assumption that the Independence of Irrelevant Alternatives (IIA) hypothesis holds. Hence, the conditional expected value of the disturbances from the latent equation is $E(U_i \mid Y_i^* > \max_{j \neq i}(y_j^*)) = \sigma_i \sum_s \rho_s E(\eta_s^* \mid y_i^s > \max_{j \neq i}(y_j^s))$. After substituting this conditional expected value and a residual term v_i for the disturbance term into the latent equation and performing several algebraic manipulations in the spirit of Lee, we are left with the following bias-corrected earnings equation:

$$[4] \qquad Y_i = X_i \beta_i + \sigma_i [\rho_i m(P_i) + \sum_{j \neq i} \rho_j \frac{P_j}{(P_j - 1)} m(P_j)] + v_i.$$

It is evident that in this revised version of the bias corrected earnings equations the bias correction terms incorporate correlation coefficients between the disturbance terms from both equations, (i.e. ρ) and probabilities of choosing a certain category s (i.e., $m(P)$), which contain all the information underlying the multinomial logit.

In our tables we report the results from our BFG estimations, as well as from OLS. Note that while the second stage estimates from BFG are consistent, they have inefficient standard errors due to the two-step nature of the procedure. We obtain efficient standard errors with the use of bootstraping.

3.2. Data Summary

For our analysis we use the Bulgarian Integrated Household Surveys (BIHS), which were conducted by Gallup International under the auspices of the Bulgarian Ministry of Labor, the Ministry of Social Affairs and the National Institute of Statistics. The surveys provide detailed information about employment, income, education, and demographic

characteristics of all household members for about 2500 households.[3] The sampling procedures ensured that the samples for each of the surveys are highly representative.[4] After accounting for missing observations, the working force sample of 15-65 years of age consists of 3855 observations for 1995, 3738 observations for 1997, and 4141 observations for 2001.[5]

The data allows us to distinguish among people holding different types of employment. Our categorization is based on the sector of employment for the individual's main job. Given that an average of only 30 individuals reported having a second job for each of the survey years, the categorization of laborers in accordance with their main job should not affect our analysis in a significant way. We categorize both government employees (e.g., civil servants) and employees of state-owned enterprises as being employed in the public sector.[6] Further, an individual is categorized as being self-employed if (s)he reports earnings only from self-employment.[7]

Following Mincer (1974), Chase (1998) and Munich *et. al*. (2000), we use average monthly earnings as our measure of income. In keeping with the literature, the earnings of those employed in the public and private sectors are proxied by their gross monthly salaries, while net monthly revenues are used to proxy the earnings of self-employed individuals earnings are expressed in constant 1995 levs which were generated using the

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[3] The surveys included information on 2466 households with a total of 7199 members in 1995, 2323 households with 6947 members in 1997, and 2633 households with 7844 members in 2001.

[4] The sampling was done in two stages. In the first stage the survey sample is selected. The listing is organized in the following order: (i) the list of 28 regions, (ii) cities and villages in these regions, (iii) each city and village listed by size. In the second stage the households interviewed are selected with equal probability, provided that they have also been listed by size. One of the objectives of the interviewers was to reduce the number of refusals to fewer than 5%. Each refusal had to be verified by a team supervisor and each substitution had to be authorized by the field supervisor as well.

[5] In restricting the labor force sample to age groups 15-65 we use the ILO standards which were applied by the National Statistics in Bulgaria in its labor force surveys and by World Bank reports based on these surveys.

[6] Since only 60 individuals in 1995, 59 individuals in 1997 and 36 individuals in 2001worked for the government, it is impractical to analyze them as a separate category.

[7] In eleven cases respondents reported earnings both from self-employment and from regular employment. We included them in regular employment, not in self-employed.

CPI available in the International Financial Statistics publication of the IMF. The descriptive statistics from these data are reported in Table 1.

We have two ways of capturing education: (1) years of schooling, and (2) dummy variables capturing educational attainment – university, general secondary education, vocational training, and primary education[8]. For all three years of the survey the average number of years of education does not vary significantly for employed laborers across the three sectors of employment. However, the educational attainment of an average employed laborer is noticeably higher than that of an average non-employed individual and people with university education are more likely to be employed than non-employed. In addition, the average age of private sector employees is lower than that of workers in other sectors and the same is true for the average private sector tenure, defined as the individual's age less the years of education less the basic school enrollment age of six.[9]

The data provide support for the existence of an educational gap between unemployed and employed people in Bulgaria noted in the previous section, as well as for the fact that younger and less experienced laborers find it easier to sustain private sector employment. Our statistics also highlight qualitative changes in human capital reallocation over time. For example, we observe that the proportion of university graduates in the public sector increases from 0.16 in 1995 to 0.18 in 1997 and 0.26 in 2001, while the proportion of university graduates in self-employment declines from 0.22 in 1995 to 0.21 in 1997 and 0.20 in 2001. Meanwhile the proportion of university graduates in the private sector changes from 0.09 in 1995 to 0.19 in 1997 and 0.11 in 2001, and the average age of private sector workers goes up from 35.14 in 1995 to 36.78 in 1997 and 37.92 in 2001.

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[8] While we use the former in our selection equation in order to evaluate the impact of skills in general on labor reallocation, we use the latter measure in our earnings equation to avoid correlation with our measure of potential experience and to evaluate the market demand of different *types* of skills in the changing environment.

[9] See Falaris (2004) and Munich (2000). Potential experience is not an ideal measure of actual work experience for women. However, in the Bulgarian context it is probably closer to both women's and men's actual experience than in many middle- and high-income market economies.

The proportion of employed urban residents is noticeably higher than the proportion of non-working urban residents. This observation is consistent with both the hypothesis that formal job opportunities are more abundant in the urban as opposed to the rural areas and the evidence that numerous (unemployed) rural residents in Bulgaria drop out of the labor force and become involved in subsistence agriculture (Pauna and Pauna, 1999). The proportion of self-employed individuals residing in urban areas increases from 72 % in 1995 to 84 % in 1997 and then falls slightly to 80 % in 2001. The peak of urban residents' involvement in self-employment around the crisis period of 1996-97 is perhaps indicative of the ability of self-employment to absorb city dwellers losing their jobs in the process of industrial restructuring. We also observe that self-employed individuals tend to be concentrated in geographical regions that have relatively high rates of regional unemployment.[10]

The variable capturing the impact of social security benefits takes a value of one if any member of the family has received social security aid during the past 12 months. The average of this variable across all labor market categories in 1997 exceeds the respective values for 1995 and 2001, indicating that even in its depleted state, the social security system provided some protection against poverty during economic crises. Not surprisingly the average number of households receiving aid is higher for the nonworking than for the working categories of people. Interestingly, while the proportion of benefits received by the families of nonworking respondents increases from 0.7735 to 0.7909, the average proportion of benefits received by the families of self-employed respondents decreases from 0.5169 in 1995 to 0.4480 in 2001, even though the respective proportion for private sector employees remains relatively constant at 0.47 and that of public sector employees increases from 0.42 in 1995 to 0.48 in 2001. This might be a result of changes in the social security system which forces people who have exhausted their benefits into

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[10] We use a variable to capture the extent of regional unemployment in each of Bulgaria's nine regional entities: Sofia City, Bourgas (Bourgas, Jambol, Sliven), Varna (Varna, Dobrich, Shumen), Lovech (Veliko Tarnovo, Gabrovo, Lovech, Pleven), Montana (Vratza, Montana, Vidin), Plovdiv (Plovdiv, Pazardjik, Smoljan), Russe (Ruse, Razgrad, Silistra, Targovishte), Sofia Region (Sofia, Pernik, Kjustendil, Blagoevgrad), and Haskovo (Stara Zagora, Haskovo, Kardjali). In these regions live roughly 14%, 10%, 11%, 12%, 7%, 14%, 9%, 12% and 11% of the population, respectively (data on unemployment and population come from Statistical Yearbook, Bulgarian Statistical Institute, 2001).

entrepreneurship, even when the public sector continues to provide a haven for members of socially weak families.

The proportion of female laborers employed in the public sector is much higher than the proportion of female laborers employed in the private sector. This is possibly on account of the benefits such as maternity and other leaves that are associated more with public sector employment than with any other form of employment. The data allowed us to identify whether the respondent belongs to non-Bulgarian ethnic group, the main such groups being the Roma and the Turks. The descriptive statistics indicate that ethnic minorities are less likely to be employed in the public sector than ethnic Bulgarians, reinforcing anecdotal evidence about discriminatory treatment of ethnic minorities (Rutkowski, 1999; Falaris, 2004).

Overall, our descriptive statistics in Table 1 indicate that while the public sector continues to attract both better educated and experienced laborers (as well as members of families which receive social security benefits), the patterns of human capital reallocation change over time, with better educated and/or more experienced laborers reallocated towards the private sector and self-employment. Both market forces and institutional factors seem to influence the development of self-employment, and it experiences an observable peak during the (post)-crisis year of 1997. These patterns differ by ethnicity and gender with females finding it harder to sustain private employment and ethnic minorities finding it more difficult to secure public sector employment.

4. Empirical Specifications and Results

Our specifications are fairly stylized (see, e.g. Mincer, 1974; Chase, 1998; Munich et. al., 2000; Earle and Sakova, 2000; Co, Gang and Yun, 2003). Our identified system of equations is as follows:

$$[5] \quad Sector = \beta_0 + \beta_1\,Age + \beta_2\,Years\ of\ education + \beta_3\,Benefits + \beta_4\,Married$$
$$+ \beta_5\,Disability + \beta_6\,Children\ under\ 6\ years\ of\ age$$
$$+ \beta_7\,Regional\ unemployment + v,$$

and

$$[6] \quad ln\ Earnings = \alpha_0 + \sum \alpha_{1i}\ Education + \alpha_2\ Experience + \alpha_3\ Experience^2$$
$$+\alpha_4 Urban + \alpha_5\ Female + \alpha_6\ Ethnic + \alpha_7 Hours + u,$$

where [5] is the selection equation and [6] is the earnings equation.

As mentioned earlier, we report both OLS and BFG earnings estimates. In the first step of our BFG analysis we use multinomial logit to model the choices facing a potential laborer: non-employment, public sector employment, private sector employment and self-employment. This step not only provides with insights about the determinants of the choice of an average laborer, but also generates bias correction terms that are used to correct for selection bias in the second step. In the second step, we estimate the earnings equations of the three different types of employed laborers, after correcting for the selection bias.

The regression results are reported in Tables 2-4. Table 2 reports the marginal effects from our first-step multinomial logit, Table 3 reports the OLS earnings estimates and Table 4 reports the BFG earnings estimates. As indicated in Table 2, the Hausman test does not reject the hypothesis of Independence of Irrelevant Alternatives (IIA) in any of the three years, lending support to the appropriateness of the present econometric method.

4.1. Multinomial Logit Results

By and large, our cross-sectional logit estimates confirm the priors derived from our descriptive statistics. We find that that in each year the probability of being in some sort of employment increases with the level of educational attainment. Moreover, in all three years, the marginal effect of years of education for the public sector (approximately 0.03) exceeds the respective private sector and self-employment values which are less than 0.01. Our estimates also indicate that younger people are more likely to work in the private sector, which may indicate that either older people are more risk averse, or that the private sector prefers laborers whose work habits are not influenced by the work culture in the socialist era. Further, we observe that while the coefficient of education in the public sector equation remains roughly the same at 0.03, the education coefficient in the private sector category increases from 0.0042 to 0.0081 between 1995 and 1997, and

reaches 0.0182 in 2001. Similarly, the education coefficient in the self-employment category changes from 0.0022 in 1995 to 0.0030 in 1997 and 0.0052 in 2001. A test of coefficient equality confirms the statistical significance of these changes over time.

Estimates of the impact of regional unemployment on sectoral choice provide additional interesting insights. Although in 1995 this impact is not significant for either of the sectors, in 1997 and 2001 the probability of entering self-employment increases with the rate of regional unemployment. This observation is consistent with the countercyclical nature of self-employment highlighted by Rissman (2003) in an analysis of US entrepreneurship and hence poses questions about the quality of self-employment in Bulgaria along the two popular lines discussed in the literature, namely *hidden unemployment*, or a state inferior to working for an employer, usually associated with a degradation of human capital, and *dynamic entrepreneurship,* or a driver of Schumpeterian creative destruction in an economy.

We argue that if the coefficient vector from the self-employment equation in our multinomial logit is equivalent to the coefficient vector from the non-working equation, we have evidence in favor of the hypothesis that self-employment is equivalent to hidden unemployment; otherwise, we reject this hypothesis (Earle and Sakova, 2000). For this purpose we use a Wald test and report in Table 2 the results from the test over each of the 6 twin comparisons among the 4 multinomial logit choices. For each of the three years the test of coefficient equality between the determinants of self-employment and non-working, namely categories 3 and 4 of our multinomial logit is rejected. Hence, we do not have sufficient evidence in favor of the proposition that self-employment in Bulgaria is equivalent to hidden unemployment. Indeed, while in 1995 and 1997 the test results indicate that self-employment in Bulgaria was not qualitatively different from working for the public sector, the rejection of the coefficient equality hypothesis in the 2001 estimation indicates that by the end of the period analyzed self-employment developed as a sector of its own, distinct not only from non-employment, but also from working for an employer.

Finally, Table 2 highlights the fact that in each of the individual years, the probability of being employed decreases with the extent of social security benefits and the probability of falling into the non-working pool increases with the extent of social

security benefits, i.e. even in its depleted state, the social security system in Bulgaria was effective in reallocating people out of employment into not working.

4.2. Earnings Estimations

How did sector-specific earnings in Bulgaria respond (or fail to respond) to the reallocation patterns observed? As mentioned earlier we first take a look at the OLS earnings estimations for each individual sector in each of the three years and refer to these estimates in discussing our selectivity corrected estimates. The OLS estimates reported in Table 3 indicate that in all three years the public sector provided significantly higher rewards to university education, vocational training and general secondary training than to the omitted elementary education category, and an F-test of coefficient equality indicates that the observed differences in the respective coefficients are not statistically significant across the three years. Further, our results indicate that, contrary to the evidence from other transition economies, the public sector in Bulgaria provides higher rewards to vocational training than to general secondary training. This is not necessarily inconsistent with the finding that during the first half of the 1990s vocational school enrolment in Bulgaria dropped nearly 40% while general secondary school enrolment rose almost 80% (Boeri, 2000).

Our estimates also indicate that, by and large, the private sector and self-employment reward university education alone, with only 10% significance of the vocational and general secondary education coefficients in the 1997 private sector earnings estimations, and no coefficient significance of the 1995 and 2001 private sector or any of the self-employment secondary education coefficients. As in the public sector case, the private sector returns to education experience no statistically significant change over time, and we observe no statistically significant difference between the returns to education in the public and the private sectors. Finally, while the coefficient on university education is significant in the 1995 self-employment equation, none of the three types of higher than elementary education is rewarded by this sector in the remaining two years. In addition, the fact that the R^2 value in the self-employment earnings estimation drops from 0.44 in 1995 to 0.18 in 1997 possibly indicates that, over time, self-employment

earnings were determined to a higher extent by unobserved characteristics than by formal education.

The results for the public sector and self-employment, derived from our OLS estimates are supported (and indeed strengthened in the case of self-employment!) by the BFG estimations reported in Table 4. Specifically, while the BFG university education coefficient in the public sector estimation remains roughly the same over time, the selectivity corrected returns to any type of formal education for the self-employed are insignificant. At the same time, the private sector university education coefficient not only drops from 0.85 in 1997 to 0.25 in 2001, but also loses its significance. This difference between the selectivity corrected and the OLS university education estimates is not inconsistent with the increasing inflow of high skilled labor into the private sector, captured by the self-selection equations. None of the secondary education coefficients is significant in either the private sector or self-employment equations, and as in the OLS estimation, the BFG university education coefficient in the self-employment estimation loses its significance after 1995.

It is perhaps not surprising that the selectivity correction coefficients from the BFG estimations are significant only in the 1997 estimations, given that 1996-97 saw a large amount of economic restructuring, undoubtedly associated with a certain degree of short run job mismatch. Interestingly, the selectivity bias coefficients related to the correlation between the residuals from the self-employment selection and both the public sector and the private sector earnings equations are positive and significant, indicating that in 1997 public and private sector laborers obtained on average higher earnings than comparable randomly selected self-employed individuals. This is perhaps on account of the high concentration of self-employed individuals in activities such as sales, which saw a slowdown during the crisis on account of depleted household budgets. In addition, the positive selectivity correction coefficient capturing the correlation between the residuals from the public sector earnings and the selection into non-employment indicates that earnings in this sector might have been increased due to people dropping out who have lower than expected average earnings.

Although our primary focus is on the returns to education, several additional interesting relationships emerge from both our OLS and BFG estimations. First, the

concave experience-earnings profiles and average returns to experience between 0.02-0.03 are comparable to similar estimates from the Czech Republic and Hungary (Munich, Svejnar and Terrell, 1999; Campos and Jolliffe, 2004). Secondly, while in 1995 women's earnings in the public sector are on average about 30% lower than men's, the private sector differential is about 40% and the self-employed differential is about 50%. A plausible explanation of this phenomenon is the higher unemployment rate for women and the resulting willingness of women to accept (higher risk) private sector jobs at a penalty rather than face the alternative of unemployment (Falaris, 2004).[11] However, the gender wage differential in the public sector increases to 36% in 1997 and then decreases slightly to 33% in 2001. Meanwhile the private sector differential decreases to roughly 23%-24% during these two years and disappears for individuals involved in self-employment. Taken together these results are consistent with the hypothesis that changes in the returns to human capital patterns across sectors in Bulgaria might have been influenced by the reallocation of highly educated women out of the public sector into the private sector and self-employment. Finally, while self-employment earnings of ethnic Bulgarians are on average close to 100% higher than the earnings of ethnic minorities, by 2001 this differential disappears. During none of the years one observes similar ethnicity related earnings differential in either the public or the private sector.

5. Conclusion

In this paper, we explored the impact of labor force choices – not working, public sector employment, private sector employment and self-employment – on earnings from the three sectors of employment. We tracked this impact from the beginning of transition in Bulgaria, through the crisis of 1996-97 till the time when structural reform approached its completion. Our results are not inconsistent with the existence of an efficiently functioning labor market, which allocates low skilled laborers out of employment and

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[11] In order to test this hypothesis, we re-estimated our multinomial logit and BFG equations adding female and female*married variables in the first stage estimations. The positive and significant coefficient of the female variable and the negative and significant coefficient of the female*married variable in the private sector selection, combined with the lower gender wage gap implied by the BFG estimate lend support to the proposition that risk aversion might have affected the reallocation and earnings of women in the private sector. The results, not reported in the tables presented, are available upon request from the authors.

rewards the skills of those retaining employment on the basis of demand and supply conditions. However, these results to a large extent contradict the general finding of significant increase in the rewards to high education in the CEE economies with the progress of economic reform, particularly in areas such as services, trade and de novo private enterprises (Bird, Schwarze and Wagner, 1994; Ozarem and Vodopivec, 1997; Chase, 1998; Munich, Svejnar and Terrell, 2000; Campos and Joliffe, 2004).

We do find that the public sector continues to reward all types of education at higher than the elementary level. Our estimates of returns to higher than elementary education in the public sector – around 50% for university education, around 25% for vocational training and approximately 20% for general secondary education – are only slightly lower than similar estimates from the Czech Republic and Hungary, though remarkable by the finding that contrary to the experience of other former socialist economies, vocational training in Bulgaria receives higher rewards than general secondary education (Chase, 1998; Munich, Svejnar and Terrell, 2000; Campos and Jolliffe, 2004). However, once the impact of reallocation on earnings is taken into account, returns to formal education in the private sector and self-employment lose their significance. This process coincides with increased reallocation of high skilled labor towards these sectors in the process of high degree of economic restructuring.

While one might attribute the deviation of our estimates from those in the cited literature to self-selection reasons ignored by earlier studies, the fact still remains that, contrary to findings on more advanced transition economies, even our OLS estimates indicate an absence of increase in the returns to skills in Bulgaria across the years. There are at least two possible explanations of the observed anomaly in the Bulgarian context. On the one hand, it is highly probable that the skills adopted in the socialist era are not in demand by the newly emerging private sector and self-employment, and hence the increasing inflow of highly educated people in these sectors results in erosion of the returns to their skills. It is also possible that the anomalies arise from distortions in the reallocation and wage setting mechanisms, facilitated by the highly protected public sector. Taken together, these phenomena call for further reforms in the education and labor marked institutions to accommodate the needs of the new environment

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Table 1
Descriptive Statistics

Table	1995				1997				2001			
	Public	Private	Self	NW	Public	Private	Self	NW	Public	Private	Self	NW
Age (years)	40.88	35.14	40.07	44.29	41.90	36.78	42.00	42.89	42.51	37.92	40.82	41.54
	(9.48)	(11.23)	(10.17)	(16.05)	(9.47)	(11.12)	(9.936)	(15.37)	(9.664)	(10.78)	(10.28)	(15.29)
Years of Education	11.54	11.28	11.55	9.306	11.88	11.58	12.07	9.604	12.48	11.39	12.34	9.252
	(3.10)	(2.85)	(3.98)	(3.599)	(2.989)	(2.768)	(3.004)	(3.473)	(3.150)	(2.509)	(2.825)	(3.574)
Primary Education	0.1912	0.1585	0.2135	0.4808	0.1608	0.1415	0.1447	0.4463	0.1392	0.1447	0.0800	0.4863
	(0.3933)	(0.3658)	(0.4121)	(0.4998)	(0.3675)	(0.3491)	(0.3542)	(0.4972)	(0.3463)	(0.3519)	(0.2724)	(0.4999)
General Secondary	0.2086	0.2429	0.2135	0.1823	0.1893	0.2389	0.2105	0.1824	0.1146	0.2352	0.2080	0.1612
	(0.4064)	(0.4296)	(0.4121)	(0.3862)	(0.3919)	(0.4271)	(0.4104)	(0.3863)	(0.3188)	(0.4244)	(0.4075)	(0.3678)
Vocational	0.4328	0.5000	0.3483	0.2713	0.4624	0.4717	0.4342	0.2954	0.4775	0.5031	0.5040	0.2930
	(0.4956)	(0.5009)	(0.4791)	(0.4448)	(0.4988)	(0.4999)	(0.4989)	(0.4563)	(0.4998)	(0.5003)	(0.5019)	(0.4552)
University	0.1675	0.0986	0.2247	0.0656	0.1876	0.1991	0.2105	0.0759	0.2688	0.1169	0.2080	0.0595
	(0.3735)	(0.2986)	(0.4198)	(0.2476)	(0.3905)	(0.0594)	(0.4104)	(0.2649)	(0.4436)	(0.3216)	(0.4075)	(0.2366)
Experience (Yrs-Yrs Educ-6)	23.34	17.87	22.52	28.99	24.02	19.20	23.93	27.29	24.03	20.53	22.49	26.29
	(10.24)	(11.81)	(11.05)	(17.06)	(10.14)	(11.54)	(10.30)	(16.19)	(10.32)	(11.11)	(10.72)	(15.39)
Gender (Female=1)	0.5025	0.4718	0.3146	0.5528	0.5272	0.4371	0.2763	0.5414	0.5252	0.4377	0.3520	0.5442
	(0.5001)	(0.5001)	(0.4669)	(0.4972)	(0.4995)	(0.4968)	(0.4501)	(0.4984)	(0.4997)	(0.4964)	(0.4795)	(0.4981)
Ethnicity (Minority=1)	0.0841	0.1338	0.1236	0.2122	0.0873	0.1195	0.1053	0.2305	0.0750	0.1157	0.0480	0.3131
	(0.2776)	(0.3410)	(0.3309)	(0.4089)	(0.2824)	(0.3249)	(0.3012)	(0.4212)	(0.2636)	(0.3201)	(0.2146)	(0.4638)
Marital Status (Married=1)	0.8375	0.7183	0.8315	0.6972	0.8219	0.7044	0.7763	0.6923	0.7899	0.6931	0.8240	0.6704
	(0.3690)	(0.4506)	(0.3765)	(0.4596)	(0.3827)	(0.4570)	(0.4195)	(0.4617)	(0.4077)	(0.4615)	(0.3824)	(0.4702)
Benefits (HH Received=1)	0.4203	0.4718	0.5169	0.7735	0.7009	0.6761	0.6974	0.8605	0.4843	0.4717	0.4480	0.7909
	(0.4938)	(0.5001)	(0.5025)	(0.4187)	(0.4580)	(0.4687)	(0.4624)	(0.3465)	(0.5001)	(0.4995)	(0.4993)	(0.4067)
Disability (Disabled=1)	0.2136	0.1796	0.1910	0.3326	0.2385	0.1792	0.2237	0.3265	0.2224	0.1572	0.1840	0.2886
	(0.4099)	(0.3845)	(0.3953)	(0.4713)	(0.4264)	(0.3842)	(0.4195)	(0.4690)	(0.4161)	(0.3642)	(0.3890)	(0.4532)
Children lt 6	0.2715	0.4437	0.2584	0.2868	0.2290	0.2893	0.2763	0.2817	0.1869	0.2352	0.3600	0.3521
	(0.5613)	(0.7036)	(0.5119)	(0.6039)	(0.5114)	(0.5874)	(0.6022)	(0.5945)	(0.4607)	(0.4853)	(0.6401)	(0.6673)
Regional Unemployment, Proportion of total	0.1825	0.1787	0.1810	0.1851	0.1970	0.1991	0.2063	0.1988	0.1707	0.1664	0.1858	0.1787
	(0.0569)	(0.0556)	(0.0561)	(0.0523)	(0.0605)	(0.0594)	(0.0579)	(0.0623)	(0.0631)	(0.0626)	(0.0604)	(0.0633)
Location (Urban=1)	0.7839	0.7606	0.7191	0.5634	0.7969	0.7421	0.8421	0.6136	0.7722	0.7698	0.8000	0.5627
	(0.4117)	(0.4274)	(0.4519)	(0.4961)	(0.4025)	(0.4381)	(0.3671)	(0.4870)	(0.4197)	(0.4212)	(0.4016)	(0.4962)
Monthly Salary (Real 1995 terms)	8.5694	8.5112	9.0221	N/A	7.7529	7.5423	7.9848	N/A	8.6004	8.4853	8.8347	N/A
	(0.4832)	(0.6298)	(1.1374)		(0.8192)	(0.8759)	(1.0754)		(0.5218)	(0.5218)	(1.0177)	
Hours Worked (month)	149.01	172.12	181.22	N/A	148.13	158.28	181.79	N/A	154.86	167.69	186.19	N/A
	(47.73)	(62.58)	(97.07)		(39.77)	(47.94)	(72.29)		(36.01)	(44.59)	(89.75)	
Number of Observations	1606	284	89	1876	1157	318	76	2187	733	795	125	2488

Note: 1. NW = not working; Public = public sector employment; Private = private sector employment; Self = self-employment
2. The values within parentheses are standard errors.
3. *, ** and *** indicate significance at the 1%, 5% and 10% levels respectively.

Table 2
Marginal Effects from Multinomial Logit: Cross Section Analysis

	1995				1997				2001			
	Public	**Private**	**Self**	**NW**	**Public**	**Private**	**Self**	**NW**	**Public**	**Private**	**Self**	**NW**
Age in Years	-0.0011	-0.0023*	-0.0003	0.0037*	-0.0005	-0.0021*	0.0001	0.0025*	0.0012**	-0.0029*	0.0001	0.0016**
	(0.0008)	(0.0004)	(0.0002)	(0.0008)	(0.0007)	(0.0004)	(0.0002)	(0.0008)	(0.0005)	(0.0006)	(0.0002)	(0.0008)
Years of Education	0.0386*	0.0042*	0.0022*	-0.0449*	0.0390*	0.0081*	0.0030*	-0.0502*	0.0312*	0.0182*	0.0052*	-0.0546*
	(0.0028)	(0.0013)	(0.0008)	(0.0029)	(0.0026)	(0.0014)	(0.0006)	(0.0029)	(0.0018)	(0.0021)	(0.0007)	(0.0028)
Benefits	-0.2721*	-0.0239*	-0.0038	0.2997*	-0.1669*	-0.0500*	-0.0117***	0.2287*	-0.1134*	-0.1409*	-0.0229*	0.2774*
	(0.0176)	(0.0085)	(0.0050)	(0.0175)	(0.0207)	(0.0125)	(0.0064)	(0.0215)	(0.0136)	(0.0149)	(0.0060)	(0.0178)
Disability	-0.0572*	-0.0039	-0.0063	0.0674*	-0.0581*	-0.0224**	-0.0056	0.0859*	-0.0242***	-0.0670*	-0.0062	0.0944*
	(0.0209)	(0.0101)	(0.0057)	(0.0218)	(0.0178)	(0.0101)	(0.0047)	(0.0197)	(0.0128)	(0.0149)	(0.0051)	(0.0194)
Child less than 6 years	-0.0418*	0.0156**	-0.0058	0.0319***	-0.0236	0.0017	0.0032	0.0187	-0.0307**	-0.0393*	0.0082**	0.0618*
	(0.0162)	(0.0065)	(0.0049)	(0.0165)	(0.0158)	(0.0082)	(0.0041)	(0.0169)	(0.0123)	(0.0129)	(0.0038)	(0.0165)
Married	0.2074*	0.0067	0.0138*	-0.2278*	0.1651*	0.0189***	0.0040	-0.1881*	0.0585*	0.0293**	0.0124**	-0.1002*
	(0.0201)	(0.0098)	(0.0050)	(0.0219)	(0.0169)	(0.0098)	(0.0049)	(0.0194)	(0.0123)	(0.0147)	(0.0050)	(0.0189)
Regional Unemploym.	0.2367	-0.0724	0.0002	-0.1645	0.1636	0.0792	0.0611***	0.3039**	0.0014	-0.2899*	0.0877*	0.2008
	(0.1622)	(0.0731)	(0.0448)	(0.1699)	(0.1271)	(0.0701)	(0.0360)	(0.1410)	(0.0878)	(0.1019)	(0.0341)	(0.1326)
LR Chi2	971.06				686.99				1126.37			
Pseudo Rsq	0.1267				0.0952				0.1314			
N Obs	3855				3738				4141			
Hausman test of IIA	Passed				Passed				Passed			
Wald: 1-2	78.25*				50.56*				99.09*			
Wald: 1-3	5.088				4.75				19.86*			
Wald: 1-4	642.67*				437.29*				563.31*			
Wald: 2-3	16.94*				13.19***				40.56*			
Wald: 2-4	198.28*				174.00*				450.39*			
Wald: 3-4	66.69*				58.95*				167.12*			

Note: 1. NW = not working; Public = public sector employment; Private = private sector employment; Self = self-employment
2. The values within parentheses are standard errors.
3. *, ** and *** indicate significance at the 1%, 5% and 10% levels respectively.

Table 3
Income Estimations: OLS Estimates

	Public			Private			Self Employed		
	1995	**1997**	**2001**	**1995**	**1997**	**2001**	**1995**	**1997**	**2001**
Constant	7.9242*	6.9418*	7.7228*	8.1910*	6.4792*	7.6823*	7.4543*	7.4385*	7.3988*
	(0.0656)	(0.1502	(0.1226)	(0.1929)	(0.2673)	(0.1306)	(0.5283)	(0.7497)	(0.5239)
General Education	0.1431*	0.2194*	0.2389*	-0.0052	0.2987***	0.0967	0.0867	0.3519	0.3559
	(0.0364)	(0.0847)	(0.0700)	(0.1201)	(0.1714)	(0.0775)	(0.3928)	(0.4632)	(0.4412)
Vocational Education	0.2523*	0.2934*	0.3071*	0.1214	0.2578***	0.0993	0.2928	0.5977	0.3421
	(0.0338)	(0.0773)	(0.0576)	(0.1201)	(0.1560)	(0.0775)	(0.3860)	(0.4145)	(0.4199)
University Education	0.5117*	0.5044*	0.6405*	0.5965*	0.7202*	0.4479*	0.8251**	0.6983	0.3521
	(0.0415)	(0.0909)	(0.0664)	(0.1577)	(0.1922)	(0.0943)	(0.4031)	(0.4685)	(0.4504)
Experience	0.0243*	0.0198**	0.0298*	0.0269*	0.0473*	0.0308*	0.0434	-0.0598	0.0245
	(0.0043)	(0.0093)	(0.0067)	(0.0101)	(0.0151)	(0.0073)	(0.0328)	(0.0449)	(0.0324)
Experience^2	-0.0005*	-0.0004***	-0.0006*	-0.0005**	-0.0010*	-0.0007*	-0.0006	0.0013	-0.0005
	(0.00001)	(0.0002)	(0.0001)	(0.0002)	(0.0003)	(0.0002)	(0.0007)	(0.0009)	(0.0007)
Urban	0.0983*	0.3706*	0.0796***	0.1964**	0.3684*	0.1688*	-0.0228	-0.0259	0.7018*
	(0.0262)	(0.0584)	(0.0421)	(0.0885)	(0.1100)	(0.0544)	(0.2269)	(0.3190)	(0.2239)
Female	-0.3029*	-0.3649*	-0.3274*	-0.4059*	-0.2348**	-0.2407*	-0.5042**	0.1744	-0.1698
	(0.0214)	(0.0459)	(0.0340)	(0.0693)	(0.0938)	(0.0439)	(0.2005)	(0.2701)	(0.1741)
Ethnic Minority	-0.0519	-0.0602	-0.0943	-0.0227	-0.2133	-0.2336*	-0.9542**	-1.3306*	-0.9162***
	(0.0413)	(0.0882)	(0.0696)	(0.1109)	(0.1528)	(0.0722)	(0.3678)	(0.4151)	(0.4871)
Hours Month	0.0015*	0.0015*	0.0021*	0.0001	0.0015	0.0025*	0.0053*	0.0040**	0.0024**
	(0.0002)	(0.0006)	(0.0005)	(0.0006)	(0.0009)	(0.0005)	(0.0010)	(0.0016)	(0.0009)
Adj Rsq	0.2623	0.1421	0.2761	0.2125	0.1540	0.1564	0.4402	0.1800	0.2186
N Obs	1606	1157	733	284	318	795	89	76	125

Note: 1. Public = public sector employment; Private= private sector employment; Self = self-employment
          2. The values within parentheses are standard errors.
          3. *, ** and *** indicate significance at the 1%, 5% and 10% levels respectively.

Table 4
Earnings Equations: BFG Estimations

	Public			Private			Self Employed		
	1995	**1997**	**2001**	**1995**	**1997**	**2001**	**1995**	**1997**	**2001**
Constant	7.508705*	7.8130*	7.7086*	8.1062*	6.5396*	7.6491*	3.1456	8.0708	8.8689*
	(0.5342)	(0.9863)	(0.4421)	(1.4832)	(1.9169)	(0.4627)	(8.1864)	(8.1482)	(2.7560)
General Education	0.1177*	0.2828*	0.1754**	-0.0218	0.1904	0.0135	0.1701	0.5410	0.3936
	(0.0433)	(0.0889)	(0.0807)	(0.1251)	(0.1670)	(0.0890)	(0.4874)	(0.6305)	(0.4854)
Vocational Education	0.2175*	0.3813*	0.2299*	0.1034	0.2114	-0.0014	0.3730	0.7994	0.3887
	(0.0439)	(0.0985)	(0.0717)	(0.1312)	(0.1812)	(0.0909)	(0.4594)	(0.6542)	(0.4790)
University Education	0.4476*	0.6008*	0.5297*	0.5573*	0.8453**	0.2493	0.8423	0.9674	0.6876
	(0.0716)	(0.1462)	(0.1001)	(0.1879)	(0.3685)	(0.1799)	(0.6637)	(0.7936)	(0.6302)
Experience	0.0316*	0.0249	0.0274*	0.0209	0.0479***	0.0242*	0.1009	-0.0353	0.0535
	(0.0105)	(0.0167)	(0.0072)	(0.0163)	(0.0249)	(0.0088)	(0.0643)	(0.0694)	(0.0475)
Experience^2	-0.0005*	-0.0004***	-0.0005*	-0.0004***	-0.0009**	-0.0005*	-0.0013	0.0008	-0.0007
	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0004)	(0.0002)	(0.0008)	(0.0013)	(0.0008)
Urban	0.0883*	0.3351*	0.0688	0.1645***	0.2861*	0.1518*	-0.0497	0.0470	0.7131*
	(0.0271)	(0.0614)	(0.0454)	(0.0934)	(0.1038)	(0.0528)	(0.2083)	(0.3514)	(0.2422)
Female	-0.3039*	-0.3699*	-0.3248*	-0.4043*	-0.2575*	-0.2607*	-0.5214**	0.1585	-0.1859
	(0.0238)	(0.0445)	(0.0310)	(0.0764)	(0.0809)	(0.0400)	(0.2109)	(0.2998)	(0.1573)
Ethnic Minority	-0.0529	-0.0753	-0.0676	-0.0531	-0.2815***	-0.2049**	-0.8802***	-1.3831*	-1.0488*
	(0.0394)	(0.1024)	(0.0681)	(0.1114)	(0.1630)	(0.0939)	(0.2109)	(0.4913)	(0.6534)
Hours Month	0.0016*	0.0015**	0.0021*	0.0002	0.0016***	0.0026*	0.0048*	0.0041*	0.0021*
	(0.0003)	(0.0007)	(0.0005)	(0.0006)	(0.0009)	(0.0007)	(0.0015)	(0.0015)	(0.4854)
BFG_1	0.1675	0.2486	-0.1645	-0.5230	-2.5276	-0.7129	-0.0816	2.7979	3.9304
	(0.2250)	(0.3367)	(0.1762)	(1.5784)	(1.7496)	(0.8748)	(5.9063)	(5.5318)	(3.3995)
BFG_2	-1.1783	-0.4945	-0.2199	0.0599	-0.7929	-0.1819	-7.4081	0.1384	-3.2485
	(1.2314)	(2.4972)	(0.4806)	(0.4846)	(0.8343)	(0.2251)	(6.8584)	(9.2170)	(2.3751)
BFG_3	-2.7977	8.3351**	-0.7415	2.6077	13.4193***	-0.4382	1.2153	0.7368	-0.7122
	(2.8713)	(3.3755)	(0.6687)	(6.8069)	(7.9483)	(1.1501)	(1.9928)	(1.6405)	(0.5458)
BFG_4	0.2863	1.5864**	-0.3301	0.0774	-1.3887	-0.2513	0.3831	2.8133	0.8481
	(0.2808)	(0.7500)	(0.3851)	(1.0825)	(1.3569)	(0.6312)	(4.5717)	(4.851)	(2.9176)
Adj Rsq	0.2665	0.2072	0.4386	0.2072	0.1512	0.1641	0.4386	0.1510	0.2401
N Obs	1606	1157	733	284	318	795	89	76	125

Note: 1. NW = not working; Public = public sector employment; Private = private sector employment; Self = self-employment
2. The values within parentheses are standard errors.   3. *, ** and *** indicate significance at the 1%, 5% and 10% levels respectively.