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The Informal Sector During Crisis and Transition

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Abstract

One of the most notable phenomena during economic transition is the shrinkage of the public sector and expansion of the not working population, simultaneously with the expansion of both the formal and informal private sectors. We address the related labour dynamics of the pre and post 1996 crisis in Bulgaria with the use of a panel constructed from the 1995 and 1997 Bulgarian Integrated Household Surveys and a Markov chain model of job mobility. Our results support the hypothesis of substantial shrinkage of the public sector and movement out of the labour force. In addition, we find that during the rapid downsizing of the public sector, the informal sector expanded more rapidly than the formal private sector. The links between the formal and informal sectors are complex and differ by gender.

Keywords: employment, mobility, informal sector, transition, dual economy, Bulgaria

JEL classification: J21, J23, J31, J62, P2

1 Introduction

One of the phenomena most noted during economic transition is the shrinkage of the public sector and the expansion of the not working population, simultaneously with the expansion of both the formal and informal private sectors. The formal private sector is usually portrayed as the more 'productive' sector and often policy is oriented to expanding the size of that sector. On the other hand, we do find stylized stories of the transition and development process giving an important role to the informal private sector. This sector is beyond the reach of protective factory and labour legislation and is usually characterized by relatively free entry by labour, competition, low wages and low overhead. These characteristics are viewed as a potential source of great expansion.

In this article we examine the labour market links of the informal private sector to other parts of an East European economy in transition. We examine the 'before and after' of the Bulgarian 1996-97 crisis and market-oriented policy reforms. We adopt a broad definition of informal sector work that goes beyond non-contractual work for an employer and encompasses any entrepreneurial effort in enhancing one's standard of living beyond the boundaries of reported income. Conventional thinking about job mobility during crises in economic transition places its emphasis on the shutting down of the public sector and the expansion of the formal private sector, as well as on large-scale movement into not working. Indeed, the conventional transition literature has proliferated, almost without exception, along two lines of analysis.

Firm level studies have scrutinized the job creation and job destruction aspects of post-communist structural adjustment. They established that while both public and privatized (or *de novo*) firms destroyed a significant number of jobs, the private firms were better at simultaneously creating new job opportunities than their state-owned counterparts (Bilsen and Konings 1998; Faggio and Konings 2003; Acquisti and Lehmann 2000). However, these studies, based on balance sheet and aggregate employment information from manufacturing sector firms, were not able to shed light on human capital reallocation within these economies.

Household level research established that while the labour flow out of employment into not working was significant, the simultaneous non-employment to employment flow was far from being negligible (Bellmann *et al.* 1995; Sorm and Terrell 2000; Hunt 2002). The risk of permanent job loss was lowest among highly skilled and young individuals; and it was most significant among women with low education levels (Jones and Kato 1997; Hunt 2002; Ham *et al.* 1998; Sorm and Terrell 2000). The focus of this literature was the exploration of the determinants of unemployment and labour mobility between working and not working. The literature did not address the fate of people falling between these observable labour market categories.

We use a Markov chain to model labour mobility among both public and private employment, the informal sector and not working. In this way we attempt to explore the subtleties in choices facing a potential employee, including the possibility of a preference for public sector employment and the distinction between public, and formal and informal private sector absorption of labour from the pool of not working people. Next, we use a multinomial logit to study the effect of human characteristics on labour mobility.

We use a panel constructed by merging the 1995 and 1997 Bulgarian Integrated Household Surveys (BIHS). The Bulgarian experience during this period was unique due to the drastic financial crisis, the ensuing rapid structural reform and massive public sector labour shedding. The main advantage of the panel is that it allows us to track the labour market history of people before and after the crisis of 1996 and hence analyze its effect on human capital reallocation.

The rest of the paper is organized as follows. Section 2 discusses some relevant characteristics of the economic transition and the 1996 financial crisis in Bulgaria with its special impact on the labour market. Section 3 describes the data. The results from our transition matrix analysis are presented in Section 4. Section 5 discusses our regression estimates, while Section 6 summarizes and concludes.

2   Economic transition, crisis, labour market and poverty in Bulgaria

During the first half of the 1990s Bulgaria experienced significant output loss and rising inflation, much more than in most other Central and East European (CEE) countries. Whereas the CEE economies that joined the European Union (EU) in 2004 reached the trough of their output loss in 1991-92 and were able to contain inflation by 1993, Bulgaria's GDP continued to fall through 1993, while hyperinflation was witnessed as late as 1997. This lackluster performance relative to most other CEE countries was largely a result of the absence of reform until the financial crisis of 1996-97.

Reforms were initiated in earnest only after the financial crisis, and they included rapid privatization, reform of the pension and social-welfare structure, and the establishment of a currency board. One of the immediate outcomes of this programme 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 per cent of the country's GDP (National Statistical Institute 2003; Bulgarian Privatization Agency 2000). In the process, official employment declined at the rate of about 2 per cent per annum and as late as 2001 the unemployment rate was as high as 17.3 per cent, with 62 per cent of the unemployed people remaining unemployed for more than a year. At the same time the unemployment benefit system in Bulgaria remained among of the least generous in Europe (Garibaldi, Makovec and Stoyanova 2001).

The crisis of 1996-97 contributed to not only rapid restructuring and labour shedding, but also to a significant real wage decline, such that by 1997 the average real wage in Bulgaria was 61.1 per cent lower than its 1990 level (Rutkowski 2003). Besides earnings, hyperinflation also eroded savings; indeed much more than in other transition economies in CEE (Rutkowski 1999; IMF 2002). All of these contributed to a 77 per cent increase in poverty in the 1995-97 period (Sahn *et al.* 2002).

It is interesting to note that despite the low level of unemployment benefits, one of the highest unemployment rates in CEE, and high correlation between unemployment and poverty, reservation wages in Bulgaria remained high throughout the transition period (Rutkowski 1999). This observation, together with the extraordinarily high discouragement rate among unemployed males indicates that a high proportion of the Bulgarian population might have found its way towards the informal economy (Garibaldi et al. 2001). The plausibility of this proposition is further augmented by the extraordinary payroll tax burden in transition Bulgaria, accumulating into a 41 per cent

tax wedge between labour costs to employer and take home earnings, as well as by an excessively restrictive business environment leading to a lower number of officially registered Small and Medium Enterprises (SME) than elsewhere in CEE. According to existing macroeconomic estimates, the informal economy in Bulgaria accounts for at least a fourth of the country's GDP (Nenovski and Hristov 2000).

3   Data

Gallup International conducted the Bulgarian Integrated Household Surveys (BIHS) under the auspices of the Bulgarian Ministry of Labour, the Ministry of Social Affairs and the National Institute of Statistics. These surveys provide detailed information about employment, income, education, and demographic characteristics for all members of about 2,500 households in 1995, 1997 and 2001.[1] We create a panel from the 1995 and 1997 BIHS, spanning the crisis and watershed period during which large scale industrial restructuring and privatization occurred. Sample attrition prevented creating a panel data set across all three years; the 2001 sample is a result of a random selection process and is unrelated to that of the earlier two. After accounting for discrepancies in the data, we are left with a total of 2,873 individuals of whom we use the subsample of 1,639 individuals (from 781 households) who are 15-65 years of age and, if working, report positive income.[2]

Our empirical methodology involves the use of a Markov chain in the first step and a multinomial logit in the second step of our analysis. We allocate individuals to one of four labour market sectors based on the sector in which they are employed in their main job (public sector, formal private sector, informal private sector, and not working).[3] We categorize both government employees and employees of state-owned enterprises as belonging to the public sector.[4]

Key to our analysis is how we assign individuals to the informal sector. Our strategy establishing who participates in the informal sector is two-fold. First, we look at the self-employed and their specific jobs. Those who are in jobs that are likely to be in the informal sector, such as taxi drivers, hairdressers and salespeople, we assign to the informal sector. Otherwise, they are placed in the formal private sector. Second, we carefully examine those people claiming to be not working, and determine whether they are truly not working or whether they are in the informal sector. We implement this by first establishing the expenditure to income ratio of households for which we feel comfortable in asserting that no one is in the informal sector. We consider two worker

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[1]   The surveys included information about 2,466 households with a total of 7,199 members in 1995, 2,323 households with 6,947 members in 1997 and 2,633 households with 7,844 members in 2001.

[2]   In restricting the sample to age group 15-65 we use the ILO standards which were applied by the National Statistics Institute in Bulgaria in its labour force surveys and by World Bank reports based on these surveys. We use the sample including 1,639 individuals for our descriptive statistics and transition analysis. However, missing observations, primarily with respect to years of education reduce this sample further and we use 1,470 observations in our regression analysis.

[3]   An average of 30 individuals reported having a second job for each of the survey years, so the categorization of laborers in accordance with their main job should not affect our analysis.

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

households in 1995 where both spouses state they do not have a second job, and find that their median expenditures exceeded median income by 18 per cent. With this information we then assign to the informal sector anyone who is not working and is in a household in which household expenditures exceed household income by 100 per cent. Our rationale is quite obvious; to fund this lifestyle income must be coming from somewhere. Borrowing was fairly primitive in Bulgaria at this time, and our income measure already includes transfers and incomes from real estate and financial assets.

In Table 1 we report the means and standard deviations of age, years of education, marital status, whether there are children less than 6 years of age in the household, location, ethnicity, gender and total family income for all individuals in our sample. We separate individuals by their labour market status in both 1995 and 1997. For example, the average age of individuals who worked in the public sector in 1995 and in 1997 is 41.27 years of age while the average age of people who moved from the public sector in 1995 to the private sector in 1997 is 40.59 years.

These descriptive statistics highlight some interesting patterns. The average number of years of education did not vary significantly for labourers who were employed in either the public or private sectors in both 1995 and 1997. However, the educational attainment of people who were employed in either of these sectors for both years was noticeably higher than that of people who were in the informal sector or not working during at least one of the surveys. This observation is consistent with both the existing literature that finds a significant skill-based gap between employed and unemployed people across the CEE economies, and the presumption that the informal sector in Bulgaria might have developed along the low-skilled outskirts of the economy.

Next, the average number of years of education of people in the informal sector who found employment in the public sector exceeded that of informal sector people who found employment in the private sector. At the same time the difference between years of education of non-working people who found employment in either the public or the private sector is not statistically significant. Taken together, our observations on the skill-based labour reallocation of individuals across sectors does not suggest that the formal private sector in Bulgaria developed as a sector employing low skill labourers who lost their jobs in the public sector. Arguments to the contrary (see e.g., Falaris (2004)) arise when the informal sector is not treated as a separate labour market state distinct from either formal employment or not working.

Third, the average age of individuals who left either public or private sector employment for the informal sector exceeds the average age of individuals who remained in either the public or private formal sector. At the same time, the average age of people who entered the private sector is significantly lower than the age of individuals who faced alternative labour market states. These observations are consistent with the presumption that employers in the formal private sector are more willing to hire labourers whose work habits are not influenced by the socialist era work culture. They also indicate that the informal sector in Bulgaria might have developed as a cushion for older labourers who lost their employment in the formal economy.

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Individuals who were in the public sector in 1995; their situation in 1997

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	41.27	40.59	42.50	40.15
	(8.73)	(10.37)	(11.05)	(12.16)
Education (years)	11.68	11.70	10.71	9.92
	(3.02)	(2.73)	(2.70)	(3.25)
Female	0.53	0.35	0.52	0.41
	(0.50)	(0.48)	(0.50)	(0.50)
Married	0.88	0.83	0.87	0.63
	(0.32)	(0.38)	(0.34)	(0.49)
Children under 6 years	0.26	0.41	0.33	0.11
	(0.53)	(0.60)	(0.59)	(0.32)
Ethnic minority	0.08	0.06	0.11	0.19
	(0.28)	(0.23)	(0.32)	(0.40)
Urban	0.83	0.80	0.78	0.44
	(0.38)	(0.41)	(0.42)	(0.51)
Household income (monthly)	14357.83	15486.09	19433.82	13979.08
	(7718.15)	(8504.85)	(45342.11)	(5909.98)
No. of observations	464.00	54.00	141.00	27.00

Table 1b
Individuals who were in the private sector in 1995; their situation in 1997

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	38.80	32.71	39.30	42.67
	(9.48)	(9.40)	(11.79)	(10.50)
Education (years)	11.52	11.57	10.78	7.50
	(3.48)	(2.83)	(2.47)	(2.81)
Female	0.36	0.38	0.44	0.50
	(0.49)	(0.49)	(0.50)	(0.55)
Married	0.88	0.67	0.75	1.00
	(0.33)	(0.48)	(0.44)	(0.00)
Children under 6 years	0.28	0.63	0.42	0.33
	(0.61)	(0.87)	(0.55)	(0.82)
Ethnic minority	0.08	0.21	0.17	0.50
	(0.28)	(0.41)	(0.38)	(0.55)
Urban	0.68	0.79	0.73	0.17
	(0.48)	(0.41)	(0.45)	(0.41)
Household income (monthly)	14016.89	14278.19	17915.15	13173.45
	(6446.50)	(0.8870.463)	(12979.14)	(8204.61)
No. of observations	25.00	48.00	64.00	6.00

Table 1c
Individuals who were in the informal sector in 1995; their situation in 1997

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	49.31	30.89	41.81	40.78
	(8.38)	(11.57)	(15.92)	(14.66)
Education (years)	11.96	11.07	10.08	8.00
	(3.51)	(2.34)	(3.58)	(2.56)
Female	0.48	0.61	0.43	0.44
	(0.51)	(0.50)	(0.50)	(0.51)
Married	0.83	0.67	0.65	0.83
	(0.38)	(0.49)	(0.48)	(0.38)
Children under 6 years	0.31	0.22	0.34	0.06
	(0.67)	(0.55)	(0.62)	(0.24)
Ethnic minority	0.07	0.22	0.22	0.50
	(0.26)	(0.55)	(0.62)	(0.51)
Urban	0.90	0.78	0.76	0.22
	(0.31)	(0.43)	(0.43)	(0.42)
Household income (monthly)	6456.00	7702.17	7138.11	8336.89
	(6738.61)	(8436.35)	(7085.03)	(11252.03)
No. of observations	29.00	18.00	140.00	18.00

Table 1d
Individuals who were in the 'not working' sector in 1995; their situation in 1997

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	34.83	32.14	41.20	41.40
	(12.87)	(12.26)	(18.10)	(18.07)
Education (years)	10.71	10.77	9.15	7.93
	(3.92)	(3.02)	(3.33)	(3.09)
Female	0.50	0.49	0.59	0.56
	(0.51)	(0.51)	(0.49)	(0.50)
Married	0.64	0.62	0.60	0.66
	(0.48)	(0.49)	(0.49)	(0.48)
Children under 6 years	0.38	0.43	0.21	0.22
	(0.62)	(0.69)	(0.52)	(0.52)
Ethnic minority	0.19	0.43	0.20	0.35
	(0.38)	(0.50)	(0.40)	(0.48)
Urban	0.57	0.65	0.62	0.28
	(0.50)	(0.48)	(0.49)	(0.45)
Household income (monthly)	12161.15	14566.51	12586.00	14287.89
	(8978.13)	(13168.72)	(10537.23)	(9271.21)
No. of observations	42.00	37.00	422.00	104.00

Another observation we can make from Table 1 is that in all cases the proportion of people working who come from an urban area is between 60 per cent and 80 per cent while the proportion of people not working who come from an urban area is 17 per cent to 44 per cent. This suggests that jobs, both formal and informal, are hard to come by in rural areas.

Finally, there appears to be easily distinguishable gender differences in the patterns of formal employment, not working and informal sector employment. The proportion of women who retained public sector employment or moved from not working or private sector employment into the public sector exceeds the proportion of women who retained private employment or exited the public sector or not working to embrace private employment. However, the proportion of women who left the informal sector for private employment significantly exceeded that of women who transited from the informal sector into public sector employment, and the proportion of women who exited from not working to enter the informal sector exceeded the proportion of women who remained in the pool of non-working people. The above patterns are difficult to interpret. While there is an apparent preference among women who work in the formal sector to retain public sector employment, perhaps due to child related or other benefits, the preference for private over public employment after exiting the informal sector might be an indication of either bad signals sent to potential public sector employers, or self-selection of more entrepreneurial women into the ranks of either the formal or the informal private sector. These hypotheses will be explored further in our formal analysis in Sections 4 and 5.

Overall, the data do not indicate that the formal private sector in the Bulgarian economy has developed along the low skill outskirts of the economy. Specifically, we find a clear pattern whereby both younger (and perhaps more entrepreneurial) and higher skill individuals tend to reallocate towards the formal private sector. In addition, we find a weak indication that the informal sector might have developed as a cushion to both older and lower skills individuals against the adversities of the crisis period.

4   A Markov chain model of Bulgarian transition

The aim of this section is to characterize the transition in Bulgaria from 1995 to 1997 with particular attention paid to movements into and out of the informal sector. We have data on two periods, 1995 and 1997, and a natural way to think about how the cross-sectional distribution evolves over this time period is via the first order Markov chain (FOMC) model.[5] This approach to modeling the dynamics of the cross-sectional distribution of individuals has a long history in economics. Early work by Champernowne (1953) and Prais (1955) looked at the cross-sectional dynamics of individual incomes and social status, respectively.

We are interested in the labour market outcomes of individuals in Bulgaria where we categorize an individual into one of four labour market categories: public, private, informal, and not working. The first three categories are working categories while the last category is the out-of-labour force category. Individuals in this category include

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[5]   As a practical matter, as we only have data on two years, we are restricted to looking at only the first order Markov model.

those who have retired, those who are studying and those who have left the labour force and have stopped searching for a new job.[6] We characterize the evolution of the cross-section distribution of individuals via the FOMC model introduced in Champernowne (1953).

The FOMC model is defined as follows. In each period we allocate each individual into one of the four categories defined above. Let $s_{it} \in \{1,2,3,4\}$ represent the category that individual i is a member of in period t. Here an individual is in category 1 if they work in the public sector, category 2 if they work in the private sector, category 3 if they are assigned to the informal sector, and category 4 if they report themselves to be out of the labour force. Let

(1) $$\pi_{jt} = P[x = j]$$

be the probability that an individual is in category j in period t. Then

(2) $$\pi_t = (\pi_{1t}, \pi_{2t}, \pi_{3t}, \pi_{4t})'$$

represents the cross-sectional probability distribution of individuals in period t. The FOMC model aims to describe the dynamics of this probability distribution over time. In particular, the FOMC model states that the conditional distribution

$$P[\pi_t \mid \pi_{t-1}, \ldots \pi_{t-k}]$$

is a function of π_{t-1} for all k=1,2,… . That is,

(3) $$\pi_t' = \pi_{t-1}' P,$$

where P is the probability transition matrix.

The probability transition matrix $P = [p_{ij}]$ is a matrix whose individual elements, p_{ij}, represents the probability that an individual moves from category i in period $t-1$ to category j in period t. As the categories that an individual can move to encompasses all possibilities, it follows that the sum of each row of P must be 1.

The FOMC model described in (3) has a unique limiting (ergodic) distribution if there is only one eigenvalue of P that has modulus equal to 1.[7] Given some initial state, π_0 , it follows from (1) that

(4) $$\pi_t' = \pi_0' P^t,$$

so that the limiting (or ergodic) distribution implied by the FOMC is

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[6]   We include retirees and students, as there is a choice element in their decisions to be students or retirees. Indeed, many came out of retirement between 1995 and 1997 and back into the labour force.

[7]   Note that P is a row stochastic matrix, which implies that the rows of P sum to 1. In this case the maximum eigenvalue of P has modulus equal to 1. If there are no repeated eigenvalues with modulus equal to 1 then the limiting distribution is unique.

(5) $\qquad \bar{\pi}' = Lim_{t \to \infty} \pi'_0 \, P^t$.

We are interested in a number of parameters. These include the initial state π_{95}, the final state, π_{97}, the probability transition matrix P and the limiting state, $\bar{\pi}$, of the Markov chain. The first three parameters can easily be estimated using likelihood methods. However, the limiting state is a highly complicated non-linear function of P. It is the left eigenvector of P associated with the eigenvalue 1. In this case, the maximum likelihood estimates of the limiting state are difficult to obtain and require asymptotic approximations. On the other hand, Bayesian methods allow for exact finite distributions of all parameters. We therefore use Bayesian methods to estimate our parameters with the priors chosen to be as diffuse as possible within a specific distributional family.

A very good discussion on Bayesian methods to estimate the FOMC model can be found in Geweke *et al.* (1986) and more recently in Geweke (2003). To summarize, let $S_{MT} = \{s_{it}\}_{i=1}^{M} \, _{t=1}^{T}$ be the observed categories for each individual for each time period in our sample. Define the indicator variable δ_{ijk} to be 1 if individual i, is in category k, in period j and 0 otherwise. That is, $\delta_{ijk} = 1$ only if $s_{ij} = k$. Then the information contained in S_{MT} can be summarized by the following two summary statistics: n_1, the number of individuals each category initially, and N, the data transition matrix. Here,

$$n_{1k} = \sum_{i=1}^{M} \delta_{i1k}$$

is the number of individuals in category k in period 1. The data transition matrix, $N = [n_{kl}]$ where

$$n_{kl} = \sum_{i=1}^{M} \sum_{t=2}^{T} \delta_{it-1k} \delta_{itl}$$

is the number of observed transitions from category k to category l across all individuals and all time periods.[8]

Given these sufficient statistics, the likelihood function for the FOMC model is

(6) $\qquad p(S_{MT} \mid \pi_1, P) = \prod_{k=1}^{4} \pi_{1k}{}^{n_{1k}} \prod_{k=1}^{4} \prod_{l=1}^{4} p_{kl}{}^{n_{kl}}$.

The maximum likelihood estimators for π_1 and P are, therefore,

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[8]   It is implicitly assumed that there is no structural break in the transition probability matrix, *P,* in this formulation.

$$(7a) \qquad \hat{\pi}_{1j} = \frac{n_{1j}}{\sum\limits_{k=1}^{4} n_{1k}} \quad j = 1,2,3,4\,,$$

and

$$(7b) \qquad \hat{p}_{kl} = \frac{n_{kl}}{\sum\limits_{i=1}^{4} n_{ki}}\,.$$

It is clear that the estimators for each row of P are independent of the other rows of P and independent of the estimator for the initial distribution. This independence of the rows of P allows us to define a simple conjugate prior for π_1 and P. Each row of P and π_1 has the same property, that is, each element is a probability and the sum of all elements is 1. This suggests that the appropriate form of conjugate prior for π_1 and for each row of P is Dirichlet (multivariate Beta).[9] A random vector, $\pi = (\pi_1,\ldots,\pi_m)$, is distributed with a Dirichlet distribution parameterized by vector a if

$$0 \le \pi_j \le 1 \text{ and } \sum\limits_{j=1}^{m} \pi_j = 1.$$

The probability density function for the Dirichlet distribution is

$$p(\pi) \propto \pi_1^{a_1 - 1} \ldots \pi_m^{a_m - 1}\,,$$

with mean for π_j equal to

$$\mu_j = \frac{a_j}{\sum\limits_{k=1}^{n} a_k}\,, \text{ and variance equal to } \operatorname{var}(\pi_j) = \frac{\mu_j(1 - \mu_j)}{1 + \sum\limits_{k=1}^{n} a_k}\,.$$

Therefore, the prior for P will be made up of independent Dirichlet distributions, one for each row, and the prior for π_1 will also be independent Dirichlet. Thus,

$$(8a) \qquad p(\pi_1 \mid a_1) \propto \prod\limits_{j=1}^{4} \pi_{1j}^{a_{1j} - 1}\,,$$

and

$$(8b) \qquad p(P \mid A) \propto \prod\limits_{i=1}^{4} \prod\limits_{j=1}^{4} p_{ij}^{a_{ij} - 1}\,,$$

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[9]   See Bernado and Smith (1994: 134-135) for a complete description of the Dirichlet disitrbution.

where the priors are parameterized by a_1 and $A = [a_{ij}]$ respectively.

The prior densities given in (8) together with the likelihood function given in (6) yields a posterior density of

$$(9) \qquad p(\pi_1, P \mid S_{MT}) \propto \prod_{i=1}^{4} \pi_{1i}^{a_{1i}+n_{1i}-1} \prod_{j=1}^{4}\prod_{k=1}^{4} p_{jk}^{a_{jk}+n_{jk}-1},$$

so that it is clear that the posterior distribution is a product of independent Dirichlet distributions parameterized by vectors of the form $a_{ij} + n_{ij}$ in the case of the rows of P and $a_{1i} + n_{1i}$ in the case of the initial distribution, π_1. The posterior distribution given in (9) is a known distribution and it is simple to make independent and identically distributed pseudo-random draws from this distribution. The results presented below are calculated using these i.i.d. draws from (9).

4.1 Summary of transition results

The following results are for the FOMC model described above. Table 2a reports the posterior means and standard deviations for the full sample (males and females) while Tables 2b and 2c report the posterior means and standard deviations for a FOMC using only males and females, respectively. In all cases the prior distribution for the initial distribution (π_{95}) and each row of P is used.

$$(10) \qquad p(\pi) \sim Dirichlet((0.1, 0.1, 0.1, 0.1)).$$

With $a = (0.1, 0.1, 0.1, 0.1)$ we have a prior mean of 0.25 for each parameter of the distribution π_{95} or row of P, and a prior standard deviation of 0.366. Thus the prior used, while proper, is chosen to be very diffuse. In this way the results presented below reflect information coming from the observed sample and not from our prior. It is clear that the posterior standard deviations are significantly smaller than the prior standard deviations, which implies that the prior is having minimal impact on the results.

The Markov chain model's parameters are the initial distribution and the probability transition matrix. We are also interested in the final distribution and the limiting distribution, which is what the cross-sectional distribution of job categories would look like if the transitions continued on forever without change. Bayesian methods allow us to construct finite sample distributions for all parameters of the model and, most importantly, any well-defined function of these parameters including the limiting distribution of the Markov chain. Given the prior, the results presented are very similar to estimates we would have obtained had we used maximum likelihood as our estimation method.

These results show the effect of the economic crisis that hit Bulgaria in 1996. Before the crisis, the informal sector was relatively small and accounted for about 12.5 per cent of the population. After the crisis, the informal sector grew to about 47 per cent of the population. If this process continued without change the informal sector would grow to about 51 per cent, as we can see from the limiting distribution. This change appears to be facilitated by a reduction in the size of the public sector and movement out of not

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working into the informal sector. The private sector has grown slightly after the crisis but it appears that most people could not find jobs in the formal private sector and so were forced to work in the informal private sector. The fact that the proportion of people not working shrank suggests that households had lost income during the crisis and individuals belonging to these households were forced to exit not working in order to survive.

Tables 2b and 2c report the results for males and females, respectively. While the pattern of movement is similar for males and females, there are some differences. In 1995, males were slightly more likely to work in the public sector than females, with 42.6 per cent of all males working in the public sector compared to 41.2 per cent of all females. After the crisis the percentage of males and females in the public sector are about the same at 34.1 per cent and 34.2 per cent, respectively. Thus the proportion of males working in the public sector fell by more than the proportion of females working in the public sector. Evidence for this is the estimate of the probability of staying in the public sector. Females have approximately 0.05 more probability of staying in the public sector compared to males (0.704 compared to 0.648).

Table 2a
Estimation results for Markov chain: full sample

	Public	Private	Informal	Not working
Initial distribution: 1995				
	0.419	0.087	0.125	0.369
	(0.012)	(0.007)	(0.008)	(0.012)
Final distribution: 1997				
	0.342	0.096	0.468	0.095
	(0.012)	(0.007)	(0.012)	(0.007)
Limiting distribution				
	0.299	0.111	0.516	0.075
	(0.031)	(0.015)	(0.030)	(0.012)
Probability transition matrix				
	Public	Private	Informal	Not working
Public	0.676	0.079	0.206	0.040
	(0.018)	(0.010)	(0.016)	(0.008)
Private	0.174	0.335	0.448	0.043
	(0.032)	(0.039)	(0.041)	(0.017)
Informal	0.141	0.088	0.683	0.088
	(0.025)	(0.020)	(0.033)	(0.020)
Not working	0.070	0.061	0.697	0.172
	(0.010)	(0.010)	(0.019)	(0.015)

Table 2b
Estimation results for Markov chain: males

	Public	Private	Informal	Not working
Initial distribution: 1995				
	0.426	0.107	0.141	0.326
	(0.018)	(0.011)	(0.012)	(0.017)
Final distribution: 1997				
	0.341	0.115	0.450	0.094
	(0.017)	(0.012)	(0.018)	(0.010)
Limiting distribution				
	0.278	0.106	0.537	0.079
	(0.040)	(0.020)	(0.042)	(0.017)
Probability transition matrix				
	Public	Private	Informal	Not working
Public	0.648	0.104	0.201	0.048
	(0.026)	(0.017)	(0.021)	(0.012)
Private	0.190	0.354	0.420	0.036
	(0.042)	(0.051)	(0.053)	(0.020)
Informal	0.134	0.063	0.713	0.090
	(0.032)	(0.023)	(0.043)	(0.027)
Not working	0.081	0.074	0.668	0.177
	(0.017)	(0.016)	(0.029)	(0.024)

Table 2c
Estimation results for Markov chain: females

	Public	Private	Informal	Not working
Initial distribution: 1995				
	0.412	0.069	0.110	0.409
	(0.017)	(0.009)	(0.011)	(0.017)
Final distribution: 1997				
	0.342	0.078	0.485	0.095
	(0.016)	(0.009)	(0.017)	(0.010)
Limiting distribution				
	0.323	0.116	0.491	0.070
	(0.046)	(0.024)	(0.042)	(0.017)
Probability transition matrix				
	Public	Private	Informal	Not working
Public	0.704	0.055	0.210	0.032
	(0.024)	(0.012)	(0.021)	(0.009)
Private	0.156	0.310	0.482	0.052
	(0.047)	(0.061)	(0.065)	(0.028)
Informal	0.151	0.119	0.643	0.087
	(0.037)	(0.034)	(0.050)	(0.029)
Not working	0.061	0.052	0.719	0.168
	(0.013)	(0.012)	(0.024)	(0.020)

Conditional on moving from the public sector it appears that males are more likely to move to the private sector than females. The probability of a male moving from the public sector in 1995 to the private sector in 1997 is 0.104 while the probability for a female for the same move is 0.055. Conditional on moving these probabilities are 0.29 and 0.185, respectively. The unconditional probability of moving from the public sector to the informal sector are identical for males and females, but, given that females are less likely to move out of the public sector, this yields a conditional probability of moving from the public sector to the informal sector for males and females of 0.564 and 0.707, respectively. Therefore, conditional on moving out of the public sector, females and males are more likely to move to the informal sector than to the private sector. However, males are more likely than females to move to the private sector while females are more likely to move to the informal sector.

When looking at individuals who worked in the private sector in 1995 we again see different patterns between males and females. Females have a 5 per cent lower probability of staying in the private sector compared to males. Of people who do move, males are again less likely to move to the informal sector. Males have a conditional probability of moving to the informal sector of 0.65 compared to 0.695 for females. The conditional probability of a male moving to the public sector is 0.29 compared to 0.22 for females. Again we see that if an individual moves from their 1995 job, females are more likely to move to the informal sector compared to males, although it is always the case that most people move to the informal sector rather than to a formal job. Taken together, the gender-based mobility patterns confirm our observations from the descriptive statistics.

When comparing the initial distribution to the final and/or limiting distributions we see that the increase in the informal sector comes from two main sources: movements out of the public sector and movements out of not working. We saw above that for people who separated from the public sector, females were more likely to move to the informal sector. The same is true for those who moved out of not working. The probability of remaining not working is roughly the same for males and females but the probability of moving from not working to the informal sector is significantly higher for females than for males. Most of the movement out of not working is to the informal sector but it seems that males are more likely to find formal employment while females are more likely to work in the informal sector.

5 Regression results

In the previous section we looked at the overall properties of the transition in Bulgaria from before to after the crisis in 1996. In this section our aim is to further analyze the transition and control for individuals observed characteristics. We use a multinomial logit model to capture the labour choice of individuals.[10] While individuals may not have a great deal of choice over their separation from their employment in 1995, they do

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[10]   We could have used a multinomial probit model instead of a multinomial logit model but we found that because of small sample size in some of the regressions the logit model was more stable than the probit model. In any case, the test of IIA was never rejected so that the use of the logit specification is not rejected on IIA grounds.

have choices as to where they move. Hence we believe that the logit specification is the appropriate specification for looking at the mobility of workers during the transition.

The marginal effects from our multinomial logit regressions are reported in Tables 3-6.[11] Our dependent variable includes the four choices facing a potential labourer, namely public sector employment, private (formal) sector employment, work in the (private) informal sector and not working. The labour force state held by a respondent in 1997 is regressed on a set of 1995 characteristics of that respondent. The multinomial logit is performed over four different samples. We start with those who were in the public sector in 1995 and ask what are the determinants of where they work in 1997. We then proceed to ask the same question of those who were in the formal private sector in 1995, the informal private sector in 1995, and those not working in 1995. We are able to identify the effect of 1995 demographic and other characteristics on the probability a person starting from each of the four original states remains in their origin sector or moves into one of the three remaining labour market categories.

5.1 Public employment as the sector of origin

The marginal effects from the multinomial logit using public employment in 1995 as the origin sector are reported in Table 3. These results confirm our prior of a skill gap between public sector employees and individuals who exited public sector employment for non-employment. Education has a significant and positive marginal effect on the probability of staying in the public sector, while education has a significant and negative marginal effect on moving from the public sector to either the informal sector or not working.

The urban variable has a significant and positive effect on the probability of staying in the public sector, suggesting that a disproportionate number of lost public jobs occurred in the rural area. If an individual leaves public employment then those in the urban areas are significantly less likely to move to the not working category. This suggests that it is easier to find an informal sector job in urban areas than in rural areas.

We see that age has a non-linear, inverted U shape, effect on the probability of staying in the public sector. Thus it appears that both the young and the old are more likely to move from the public sector. The inverse of this relationship is found in the marginal effects of age on movements from the public sector into either the informal sector or not working. Age does not have any significant marginal effect on the probability of moving into the private sector. The only characteristics that had a significant marginal effect of moving into the private sector from the public sector were gender and whether you had a child under the age of 6. We found that there was a significantly negative marginal effect for a female of moving into the private sector from the public sector. This accords with our earlier finding that females are less likely to move to private sector from the public sector. We also find that individuals who have children have a higher marginal probability of working in the private sector. This could be because these people are willing to take any job that is offered. We cannot test this hypothesis, as we do not know the type of jobs at which these people work. However, we do see

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11   The numbers of observations in the regressions differ from the transition matrices above, as we have lost cases because of missing observations.

that individuals with children under the age of 6 are less likely to move into not working, which is consistent with the story above.

Table 3
Those in public sector employment in 1995; their situation in 1997
(marginal effects from multinomial logit)

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	0.050*	-0.004e-01	-0.045*	-0.005***
	(0.013)	(0.007)	(0.012)	(0.003)
Age-squared	-0.001*	1.31e-06	0.001*	0.006e-02***
	(0.001e-01)	(0.009e-02)	(0.001e-01)	(0.003e-02)
Education (years)	0.017*	0.001	-0.016*	-0.003***
	(0.006)	(0.004)	(0.006)	(0.001)
Female	0.022	-0.054**	0.037	-0.005
	(0.037)	(0.022)	(0.032)	(0.008)
Married	0.102***	-0.037	-0.022	-0.044
	(0.064)	(0.040)	(0.055)	(0.028)
Children under 6 years	-0.041	0.032***	0.030	-0.021***
	(0.034)	(0.017)	(0.029)	(0.011)
Ethnic minority	0.037	-0.033	-0.019	0.015
	(0.063)	(0.031)	(0.055)	(0.018)
Urban	0.081***	-0.005	-0.015	-0.062*
	(0.049)	(0.027)	(0.041)	(0.023)
Household income	-1.57e-06	3.04e-07	1.50e-06	-2.29e-07
	(0.049)	(0.000)	(0.000)	(0.000)
Pseudo R_square	0.076			
No. of observations	676			
LR chi2	94.68			

Note: *, **, *** significant at 1, 5 and 10 per cent respectively.

5.2 Private employment as the sector of origin

The marginal effects of the individual characteristics for those individuals who were working in the private (formal) sector in 1995 are reported in Table 4. As we saw in Section 4 the size of this sector is very small (around 10 per cent) and does not change much after the transition (around 11 per cent). We do see some characteristics having significant marginal effect on the probability of moving from the private sector to the public sector. In particular, married people are more likely to move to the public sector, while ethnic minorities, people who live in urban areas, and people with children under the age of 6 are less likely to move. Given the small number of individuals in this category it is difficult to draw any strong conclusions from these results, though there appears movement to the public sector in the rural areas.

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Table 4
Those in private sector employment in 1995; their situation in 1997
(marginal effects from multinomial logit)

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	0.026 (0.023)	-0.013 (0.029)	-0.013 (0.031)	0.003e-02 (0.007e-02)
Age-squared	-0.003e-01 (0.003e-01)	0.005e-02 (0.004e-01)	0.003e-01 (0.004e-01)	-3.11e-07 (0.000)
Education (years)	0.114 (0.119)	0.013 (0.018)	-0.025 (0.019)	-0.001e-02 (0.003e-02)
Female	-0.015 (0.064)	-0.078 (0.089)	0.093 (0.096)	-4.11e-06 (0.004e-02)
Married	0.146** (0.061)	-0.065 (0.123)	-0.087 (0.128)	0.006 (0.008)
Children under 6 years	-0.101*** (0.059)	0.092 (0.069)	0.009 (0.077)	-0.005e-02 (0.001e-01)
Ethnic minority	-0.144** (0.059)	0.134 (0.146)	0.010 (0.148)	0.001e-02 (0.007e-02)
Urban	-0.245** (0.119)	0.139 (0.105)	0.105 (0.124)	-0.003e-02 (0.006e-01)
Household income	-4.50e-06 (0.000)	-5.34e-06 (0.000)	9.85e-06** (0.000)	-1.37e-09 (0.000)
Pseudo R_square	0.169			
No. of observations	140			
LR chi2	55.25			

Note: *, **, *** significant at 1, 5 and 10 per cent respectively.

5.3 Informal sector as the sector of origin

The marginal effects from the multinomial logit regressions using the (private) informal sector as sector of origin are reported in Table 5. We see from these results that being married has a significant and positive marginal impact on the probability of moving from the informal sector to not working. However, children under the age of 6 have a significant and negative marginal impact on the probability of moving from informal work to not working.[12] Therefore, individuals are more likely to move out of the informal sector to not working if they are married but not so if they have children under the age of six. Finally, living in an urban region has a significant and negative marginal effect on the probability of moving from the informal sector to not working. This again suggests that there are more informal job opportunities in urban areas as compared to rural areas.

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[12]   As a check we added an interaction between the married dummy and the children dummy but this term was insignificant in all regressions and did not change the results. Hence, we do not report the results with the interaction term included. We did the same with the interaction of female and having children under 6, which was also insignificant in all regressions and did not change the results.

Table 5
Those in informal sector employment in 1995; their situation in 1997
(marginal effects from multinomial logit)

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	0.049*	-0.005E-02	-0.050*	0.007E-01
	(0.013)	(0.009)	(0.017)	(0.006)
Age-squared	-0.006e-01*	-0.005E-02	0.007*	-0.002E-02
	(0.002e-01)	(0.001E-01)	(0.002E-01)	(0.007E-02)
Education (years)	0.006	0.001	-0.003	-0.003
	(0.007)	(0.007)	(0.010)	(0.004)
Female	0.040	0.038	-0.078	-0.009E-01
	(0.039)	(0.033)	(0.055)	(0.021)
Married	-0.004	0.027	-0.067	0.044***
	(0.049)	(0.036)	(0.066)	(0.025)
Children under 6 years	0.009	-0.058	0.108**	-0.060***
	(0.029)	(0.036)	(0.053)	(0.033)
Ethnic minority	-0.059	-0.007	0.044	0.021
	(0.052)	(0.041)	(0.078)	(0.036)
Urban	0.029	-0.005	0.107	-0.131***
	(0.053)	(0.042)	(0.099)	(0.075)
Household income	-3.73E-06	2.81E-07	2.39E-06	1.06E-06
	(0.000)	(0.000)	(0.000)	(0.000)
Pseudo R_square	0.252			
No. of observations	180			
LR chi2	87.55			

Note: *, **, *** significant at 1, 5 and 10 per cent respectively.

5.4 Not working as the sector of origin

The results from the multinomial logit regression using not working as the sector of origin are reported in Table 6. As we found in Section 4, there was a lot of movement out of not working during this transition. We see that education has a significant and negative marginal effect on the probability of staying in not working and a significant and positive marginal effect on the probability of moving from not working to either the public sector or the private (formal) sector. We also see that individuals who live in an urban area also have a lower probability of remaining not working. This along with the result that individuals in the urban regions are also more likely to get private jobs (either formal or informal) suggests that jobs are easier to come by in the urban areas. We also see that females are more likely than males to get an informal sector job and less likely to get a public sector job. Thus, controlling for other individual characteristics, there do appear to be gender differences in where individuals go when they leave not working.

Table 6
Those not working in 1995; their situation in 1997
(marginal effects from multinomial logit)

	Public 1997	Private 1997	Informal 1997	Not working 1997
Age (years)	0.009** (0.005)	0.005*** (0.003)	-0.004E-01 (0.010)	-0.014 (0.009)
Age-squared	-0.001E-01* (0.005E-02)	-0.009E-02** (0.004E-02)	0.007E-02 (0.001E-01)	0.001E-01 (0.001E-01)
Education (years)	0.006** (0.003)	0.006** (0.002)	-0.002 (0.007)	-0.010*** (0.007)
Female	-0.042** (0.021)	-0.012 (0.013)	0.086** (0.041)	-0.031 (0.036)
Married	0.009 (0.023)	0.005 (0.014)	-0.051 (0.051)	0.037 (0.045)
Children under 6 years	0.016 (0.014)	0.015 (0.009)	0.014 (0.036)	-0.045 (0.034)
Ethnic minority	-0.021 (0.019)	0.075** (0.014)	-0.076 (0.056)	0.022 (0.044)
Urban	-0.005 (0.018)	0.026*** (0.014)	0.153* (0.044)	-0.174* (0.039)
Household income	-8.46E-07 (0.000)	2.65E-07 (0.000)	-1.74E-06 (0.000)	2.32E-06 (0.000)
Pseudo R_square	0.145			
No. of observations	474			
LR chi2	129.18			

Note: *, **, *** significant at 1, 5 and 10 per cent respectively.

6   Conclusion

As transition to a market based economy proceeds, the private sector grows. The private sector we have spoken about above is composed of two very different groups of labourers: those who obtain formal private sector jobs and those who obtain informal private sector jobs. The cause of the co-existence of the formal and informal sectors appears to be the side effects of deliberate government policy. Government policy *vis-a-vis* extra taxes, protective labour legislation, support for unions, payoffs, and a variety of other measures, ensure, 'artificially', that the formal private sector will be a high cost sector.

The informal sector is largely unobserved, and it is of interest to consider its relationship to other sectors of the economy. Even our simple presentation, however, points out how complicated this relationship is, and how intertwined the informal sector is with the rest of the economy. In Bulgaria, the political economy of transition led to policy inertia during the first half of the 1990s. A banking crisis struck in December 1996-January 1997. Rapid privatization of state-owned enterprises followed. Between

1995 and 1997, the informal sector grew both absolutely and relative to the private sector, while the public sector shrunk in absolute and relative terms.

Overall, the pattern of the transition is one of movement out of formal employment into informal employment. The crisis caused a large reduction in the size of the public sector, and displaced workers could not find jobs in the formal private sector. Hence they were forced to find work in the informal private sector. Also, the economic crisis forced people who were initially out of the labour force to rejoin the labour force, mostly the informal sector. In our sample, we did observe some retired individuals who left retirement and found a job in the public or formal private sectors between 1995 and 1997. While most of the movement was into the informal sector for both males and females, there were some gender differences. Females were more likely to join the informal sector than males but also less likely to leave the public sector.

When we studied the movement of workers controlling for a number of individual characteristics we saw a number of interesting results. First, more education meant increased likelihood of obtaining a job in the formal sector (either public or private). We also saw that it was more likely for someone to move into the informal sector if they lived in an urban area suggesting that the informal sector was mainly an urban phenomenon. The regression results also reinforced the aggregate results that females were less likely to move to formal private jobs and more likely to move to the informal sector. We also saw that individuals who had children under the age of 6 were also more likely to have a job, either formal or informal.

The results reported in Sections 4 and 5 indicate that there was a significant increase in the size of the informal sector after the crisis in 1996. The increase in the informal sector came from two sources: a downsizing of the public sector and a movement out of not working. The crisis in Bulgaria caused a great amount of hardship and many people found informal work to get by.

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