A LABOUR MARKET IN TRANSITION – THE CASE OF HUNGARY

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Abstract

The paper documents the major stylized facts of the Hungarian economy after the transition in 1989. A strong decline of output and employment and an increase in unemployment is observed. The recovery of output takes about ten years and is associated with little employment growth. In order to explain the observed pattern of employment and GDP, a simple labour market search model is used with an exogenous and time dependent job destruction rate and a slow technology diffusion process. The initial decline and later recovery of employment and output is explained to be the result of a regime change in the job destruction rate and technology, along with high temporary job destruction rates in the early 90s.

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1 Introduction

Hungary experienced a political transition from state socialism into parliamentary democracy in 1989. While the political transition was over in about a year or two, the transformation of economic institutions has been a much longer process. Economic reforms started in the early 1990s and have been gradually implemented over the decade. Price and trade liberalization, privatization, banking reform and enterprise restructuring were some of the major reform measures put in place in the first half of the 90s. A radical fiscal and monetary 'reform-package' was introduced in 1995, which stabilized the economy and created the necessary conditions for a recovery. Whether the transition process is over is still debated, as no general criterion exists for marking the end of the transformation.

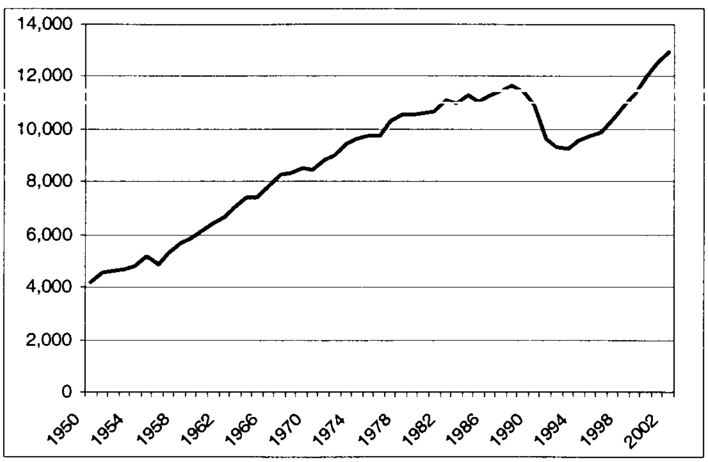
The purpose of the paper is to investigate what mechanisms could lead to the observed pattern of employment and output. First, the paper provides a summary of some major stylized facts of the Hungarian economy after the transition in 1989. Then, it looks at the labour market in more detail and reports some new evidence on labour market flows. Section four presents a simple labour market search model with an exogenous and time dependent job destruction rate and a slow technology diffusion process to explain developments in the labour market and the observed pattern of output.

2 Stylized Facts of the Hungarian Economy

One of the most striking facts of the transition in Central and Eastern Europe is a major decline of output during the early years of the transition. A decline of different magnitude of GDP is identifiable in all transition economies, but there are disagreements on the exact numbers involved. The reason for having competing views on the magnitude of changes is the poor quality of available data. Different sources report different series even for the most basic aggregates, such as population, employment, or real GDP. Even if the reliability of each single data source may be questionable, they all suggest the same overall trend, which cannot be the result of statistical measurement or data problems.

Figure 1 displays the evolution of Hungarian real GDP per capita from 1950 to 2002. The decades of socialism are characterized by sustained economic growth and little fluctuation of output, though the figures before 1989 should be viewed with some caution. The socialist economic regime came to its end in 1989 in Eastern and Central Europe and brought an enormous decline in production. From 1989 to 1993 Hungary's gross domestic product fell to about 80% of its pre-transition level. The year of the biggest output fall was 1991, the year of the breakdown of the Council for Mutual Economic Assistance (CMEA). In 1994, output started to grow again, but it took another five years to reach the level of GDP before the transition. In this sense, the transition lasted for about ten years. Manufacturing output declined more than GDP, to about 65% of the initial level and recovery was weaker than for aggregate output.

Figure 1 GDP per Capita in 1999 US $ (PPP), Hungary, 1950-2002



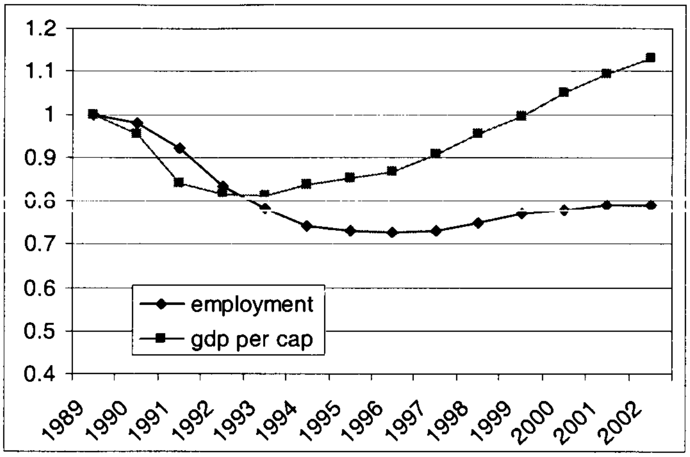
Source: Groningen Growth and Development Centre and The Conference Board, Total Economy Database, July 2003, http://www.ggdc.net

The Hungarian economy's response to liberalization was not unique in the region. All former socialist countries experienced a similar or even stronger initial decline of output. There are, however, marked differences in output performance over time. While the Central European countries can be characterized by a U-shaped evolution of output, GDP in most of the Eastern-European and Baltic countries, as well as Russia displays an L-shaped pattern, with no sign of recovery up to 2000.

State socialism provided full employment, which likely meant, in fact, over-employment. This system was imposed on workers, as there was little or no choice of labour force participation.

High employment levels could not be sustained as market equilibrium. As product markets collapsed and firms faced binding budget constraints, there was a drastic decline in labour demand. Employment fell by almost 30% over a six-year period. The collapse in employment followed the collapse in output with some lag, but it persisted longer, as displayed in Figure 2. From 1996, with an average annual increase of about 1 per cent, employment reached 80% of the pre-transition level in 2002.

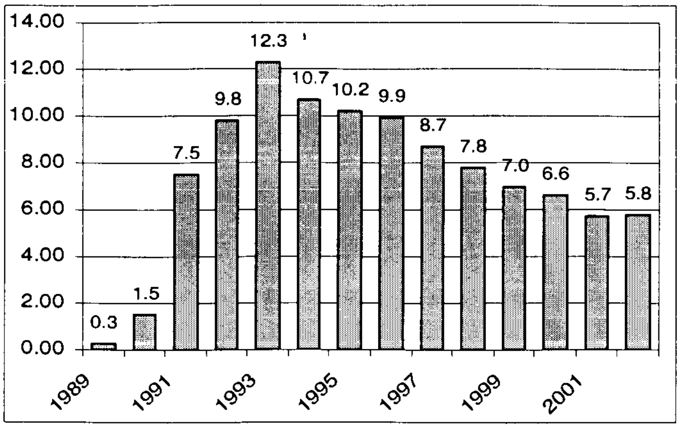
Figure 2 Real GDP per Capita (1999 prices) and Employment, 1989=1



Source: Groningen Growth and Development Centre and The Conference Board, Total Economy Database, July 2003, http://www.ggdc.net

Unemployment was non-existent during the socialist era and it quickly rose to two-digit levels, peaking during 1993 at 13%. The fall of unemployment in the second half of the decade was rather slow and it seems to have stabilized at close to 6 per cent.

Figure 3 Unemployment Rate in Hungary (%)



Source: Groningen Growth and Development Centre and The Conference Board, Total Economy Database, July 2003, http://www.ggdc.net and Hungarian Statistical Office

A decline in employment can be accommodated by either an increase in the unemployment and/or in non-participation. Boeri et al (1998) decompose the decline in the employment rate and find that the increase in the inactive population of working age accounted for more than 50% of the decline in employment. Demographic factors played a marginal role. The significant increase in non-participation supports the view that the old system likely operated with involuntary excess labour.

According to Figure 2, the recovery of output was not associated with much employment growth; after the first few years of transition, employment growth has been lagging behind output recovery, denoting strong gains in labour productivity. In fact, the decline in employment was associated with an increase in productivity, as measured by real GDP per hour. The annual rate of increase in productivity of 6% from 1992 is, however, unlikely to be the result of an overall modernization of the productive capacities. Especially in the first half of the 90s, the improvements could have been a direct consequence of the gradual elimination of the excessive slack of labour and the least productive segments of the economy.

Summarizing the stylized facts above, output and employment displayed a strong initial decline after the transition. The output growth in the recovery period was associated with increases in productivity rather than employment. The aggregate series do not reveal, however, that the economy underwent a massive reallocation process.

Measures of structural change indicate a heavy reallocation of labour across declining and newly emerging sectors of the economy. This process involved changes along at least three dimensions: economic activity, ownership and firm size. Changes occurred in employment shares from agriculture and industry to services, from state owned to private firms, and from large firms to small enterprises and self-employment. Table 1 provides some measures of structural change for Central European Countries.

Table 1 Measures of Structural Change

Country	Year	STD[a]	SR[b]	PR[c]	ΔPS[d]	Small[e] Firms	Private Sector[f]
Czech Rep.	1991-97	11.0	0.72	0.78	0.74	46.9	59.5
Hungary	1991-97	9.1	0.50	0.66	0.68	40.7	80.0
Poland	1990-97	11.5	0.64	0.66	0.46	50.3	50.3
Slovak Rep.	1991-97	13.5	0.66	0.67	0.74	44.8	44.8
Slovenia	1993-97	13.1	0.73	n.a.	0.65	31.4	n.a.
Other OECD	1990-96	1.7	0.33	0.09	0.02		

[a] Standard deviation of employment growth rates across nine sectors (average of yearly standard deviations)
[b] Sectoral Reallocation index, calculated over gross employment variations in nine sectors
[c] Privatization Reallocation index, calculated over gross employment variations in the private and public sectors
[d] Average yearly change in the share of private employment in total employment. OECD displays data for the United States.
[e] Employment share in firms less than 100 employees, 1998.
[f] Private sector employment share (%) in 1997.
Source: OECD and EBRD Transition Report 1999, 2000 in Boeri (2000) and Boeri-Terrell (2001)

The figures for Hungary and other Central European countries clearly indicate strong structural changes compared to other OECD countries. Interestingly, the sectoral reallocation measures are the smallest in Hungary among all countries in the region, but they are still high compared to other OECD countries. The dynamics of this process, however, can be best described with flow measures of labour turnover, a topic I turn next.

3 The Empirical Literature on Labour Market Flows

Section 2 provided some evidence on measures of structural change in Hungary, which indicated an intensive labour reallocation process. Labour reallocation did not occur without frictions, as is evident from the high unemployment rates in the mid 90s. A high unemployment rate is consistent with two very different labour markets: a highly active and turbulent labour market, where large flows of workers go through the state of unemployment on their way to jobs, and a more sclerotic labour market, where unemployment is more of a stagnant pool. Flexibility of the labour market is important, because it indicates a rapid reallocation of labour to the most efficient uses. The North-American labour markets are very much of the first type. The empirical facts on labour market flows investigated below indicate that the Eastern and Central European labour markets have been of the second type during the 90s.

Empirical studies on the dynamics of labour demand in the transition focus on the rate of job creation and job destruction, by drawing on the work of Davis, Haltiwanger and Schuh (1996) and uses firm-level data. Bilsen and Konings (1998) use firm-level data from Bulgaria, Hungary and Romania and investigate gross job creation and job destruction in newly established and 'traditional' firms over time, within and across sectors. The authors define gross job creation (JC) as the sum of all job gains in expanding firms over all jobs in the economy a year earlier. The gross job destruction rate (JD) is defined as the sum of all job losses in contracting firms relative to the total number of jobs a year earlier. Two other measures of job turnover are the gross job reallocation rate (JR), defined as the sum JC and JD, and the net employment growth rate (NET), defined as the difference of JC and JD. Table 2 displays the job flow measures reported by the authors for the years 1991-94 for Hungary.

Table 2 Job Flow Measures for Hungary

Year	JC	JD	JR=JC+JD	NET=JC-JD
1991	0.4	9.1	9.5	-8.6
1992	0.7	8.1	8.8	-7.3
1993	1.2	8.5	9.7	-7.3
1994	1.3	6.6	8.0	-5.2

Source: Bilsen and Konings (1998)

High job destruction rates and low job creation rates can be observed in the first three years of the sample period. The job destruction rate declines to 1994, but the job creation rate remains very low. A jump in the job destruction rate along with a low job creation led to an increase in unemployment, as observed from the data. According to the sample evidence, job destruction reached 9% at its peak, which is comparable to JD ratios in Western Europe and North America. The same job flow measures for selected developed countries are summarized in Table 3 for comparison.

Table 3 Job Flow Measures for Selected Developed Countries

Country	Year	Coverage	JC	JD	JR	NET
USA	1973-88	Manufacturing	10.2	9.1	19.4	-1.1
Canada	1979-84	Manufacturing	10.0	10.6	20.6	0.6
France	1978-84	Private, Non-farm	12.0	11.4	23.4	-0.6
Germany	1978-88	Private	7.7	8.3	16.0	0.6
Italy	1984-88	Social Security Employees	10.0	9.9	19.9	-0.1

Source: Davis, Haltiwanger and Schuh (1996)

In light of an average 9-10% job destruction rate over the long-run in the developed countries, the 9% JD rate in Hungary does not seem to be extremely high. But as opposed to the developed countries, where job destruction is accompanied by job creation rates of similar magnitude, Hungary exhibited extremely low job creation rates in the early 90s. Job reallocation rates reflect a highly turbulent labour market in the developed countries, but far less so in Hungary, where JR rates are about half of that of the developed countries. The net employment growth rate (NET) is slowly increasing in

Hungary in the sample period, indicating the gradual decline in job destruction and a very slow catch up of job creation. The NET measure for the developed countries is a number close to zero, indicating a steady state equilibrium where JC equals JD.

The sample evidence on job reallocation may seem to be at odds with the measures of structural reallocation presented before. One explanation for this is that the job flow rates reported by Bilsen and Konings (1998) refer to continuing firms only. Thus, the job destruction rates suffer from survival bias, because they miss any firms that have been completely destroyed during the first years of the transition. The JD rates are likely underestimates of the true job destruction rates. Based on firm panel data Boeri, Burda and Köllő (1998) report a 53% job destruction rate over a three-year period (1990-92) for Hungary, which implies an average annual JD rate of 17%. The authors report figures of similar magnitude to other transition countries as well.

A common finding of the empirical studies on the flows during transition is that most job destruction occurred in the state sector, while most new jobs have been created in the private sector (including privatized firms). According to this evidence, labour market restructuring in the transition is a process where job destruction in existing firms and job creation (almost exclusively) by new firms occurs at the same time. Bilsen and Konings (1998) identify de novo (newly established) private firms as the driving force of job creation during the transition, with a slowly increasing employment share. In the de novo firms' sector the authors document a job creation rate of 6.1%, and a job destruction rate of 5.1% in 1994. These figures suggest that the newly established firms' sector is approaching a steady state where JC and JD are equal.

Table 4 Job Flows at Different Firm Types

Hungary, 1994	JC rate	JD rate
State	0.1	5.0
Privatized	1.0	7.0
New	6.1	5.1

Source: Bilsen and Konings (1998)

The findings are in contrast to what is observed in the U.S., where most job creation over the cycle is by existing firms (Davis, Haliwanger and Schuh, 1996). Comparing de novo firms with state enterprises and privatized firms, job creation rates in both latter categories are very low. Privatized firms have higher JD rate than state owned enterprises, which indicates that they restructure more than SOEs. The results are in contrast to popular wisdom and the mechanics of the OST models, assuming that differences in JC and JD result from differences in ownership. While most job creation is concentrated in the new small-business sector, privatized firms do not seem to behave differently from SOEs.

Considering the supply side of the labour market, the empirical literature points to some interesting new evidence on labour market flows. First, contrary to the belief that the reduction of employment was entirely dominated by lay-offs, a large part of the outflows from the state sector was due to voluntary quits. (Boeri, 2000). The relatively high ratio of job leavers might be another explanation for the discrepancy between measures of structural change and job reallocation. More than half of the decline in employment translated into non-participation, which left Hungary at a level comparable with or below labour force participation rates in Western Europe (Boeri et al., 1998).

Second, evidence suggests that the unemployment pool was rather stagnant, with some improvements only in the late 90s. The total exit rate from unemployment was 17.5% in 1994, while the exit rate from unemployment to employment was just 4.9%, compared to the U.S. figures of 36% and 24%, respectively. Among the unemployed, the mean share of the long-term unemployed was 47.6% during 1994-98[1], which indicates that about half of the unemployment pool has poor prospects of finding a job. These facts support the view that while high rates of job destruction in consecutive years were responsible for the increase in unemployment, the persistence of unemployment was due to very slow outflows.

[1] EBRD Transition Report, 2000.

4 A Simple Model of Labour Market Search

In this section, a simple labour market search model is used to explain the observed pattern of employment. Labour market search models are often used to explain the cyclical behaviour of job and worker flows and their connection to aggregate fluctuations. Here, the purpose is to explain the effect of a one-time event that brought an increase in the job destruction rate and to provide a quantitative explanation on how this led to the observed decline of employment. Obviously, the reallocation process could not happen overnight, but still, the speed of recovery of GDP and employment was surprisingly low. The search framework seems to be appropriate, because it introduces frictions in the reallocation process, which is likely to have been the case in reality.

Here, a simple version of a labour market search model is used, based on the framework developed by Pissarides (2000). The observed pattern of employment and output is explained by an exogenous and time dependent job destruction rate and a slow technology diffusion process. Two regimes are considered; an 'old' regime characterized by low job destruction and low productivity, and a 'new' regime with high long-term job destruction rate and high productivity. A regime change in the job destruction rate is modelled, with initially high temporary job destruction rates. The regime change in terms of productivity is modelled with a technology diffusion process, assumed to follow an S-shaped pattern. The decline of employment is treated as a flow into non-employment; that is, no distinction is made in the model between unemployment and non-participation.

In its simplest version of the model, households maximize expected lifetime utility derived from consumption, which – assuming risk neutral agents – can be written as:

$$E_0 \sum_{t=0}^{\infty} \beta^t c_t$$

Households can either work or engage in job search. The labour force is fixed and normalized to one.

Firms can exist in three states, active, vacant, and dormant. Production takes place at active firms, each providing one job. Without loss of generality, one can assume that each firm requires one worker to produce output. Output at the firm level only depends on the state of technology at time t:

$$y_t = F(z_t)$$

Active jobs pay a wage of w_t to workers, with the wage determined by an exogenous sharing rule. The share parameter $0 < \xi < 1$ is assumed to be constant, so that the wage is $w_t = \xi\ y_t$. Active firms earn a profit of $y_t - w_t$ and with probability $(1-\sigma_{t+1})$ survive into the next period. In order to become an active firm, a vacant firm needs to post vacancies, at a constant cost $\kappa > 0$.

The number of new job matches is governed by a matching technology M. M is a function of the number of vacancies and unemployment at time t: $M(v_t, u_t)$. M is increasing in both of its arguments, and displays constant returns to scale. The ratio v_t / u_t is referred to as the labour market tightness, and is denoted by θ_t. Due to the CRS nature of the matching function, the probability that a vacant firm finds a suitable employee is a decreasing function of the labour market tightness parameter, and is denoted by $q(\theta_t)$. Similarly, the probability that an unemployed worker finds a job is denoted by $p(\theta_t)$, and it is an increasing function of θ_t.

The employment rate at the beginning of period $t+1$ is given by the number of employed workers who survived in a job from the previous period, and employment at the end of period t depends on the stock of employed people and the number of new matches formed in period t:

$$n_{t+1} = (1-\sigma_t)[n_t + p(\theta_t)(1-n_t)] \tag{1}$$

The capital value of an active and a vacant firm in period t are denoted by J_t and V_t, respectively. The value of a dormant job is normalized to zero. The capital value of an active firm at time t can be expressed as the sum of the current profit and the expected, discounted future value of the firm. An active job either survives to the next period with probability $(1-\sigma_{t+1})$ or the firm-worker match separates and the firm becomes a vacant firm, with probability σ_{t+1}. Similarly, a vacant firm becomes active by finding a suitable employee with probability q_t, or it remains vacant with probability $(1-q_t)$. In case the firm finds a suitable employee, the match can still fail if the job is destroyed. The capital value of an active and a vacant firm can be written as:

$$J_t = (1-\xi)y_t + \beta E_t[(1-\sigma_{t+1})J_{t+1} + \sigma_{t+1}V_{t+1}] \qquad (2)$$

$$V_t = -\kappa + \beta E_t\left[q_t\left((1-\sigma_{t+1})J_{t+1} + \sigma_{t+1}V_{t+1}\right) + (1-q_t)V_{t+1}\right] \qquad (3)$$

Free entry into the market of active jobs implies that θ_t will adjust so that the value of a vacant firm is driven to zero for all t. The imposition of the equilibrium condition results in the following equations:

$$J_t = (1-\xi)y_t + \beta E_t[(1-\sigma_{t+1})J_{t+1}] \qquad (4)$$

$$\kappa = q_t\beta E_t[(1-\sigma_{t+1})J_{t+1}] \qquad (5)$$

4.1 A Regime Change in the Job Destruction Rate and the Technology

In order to model the transition from state socialism to the market system in Hungary, I consider an economy that moves from an 'old' regime to a 'new' regime. The old regime is characterized by a low job destruction rate and low productivity. In the new regime, job destruction is, on average, higher than, than in the old regime. The new regime is also associated with higher productivity levels (which presumably rationalizes the change in regime), so that output is higher than in the old regime. The purpose here is to demonstrate that this type of a regime change might lead to a change in employment and output of the type observed in the data.

It is assumed that the job destruction rate in the new regime changes over time, and firms form expectations about the future value of the firm. It is assumed that firms know that the job destruction rate is governed by a random process, specified as an AR(1):

$$\sigma_{t+1} = (1-\rho)\overline{\sigma}_N + \rho\sigma_t + \varepsilon_t \qquad (6)$$

where $0 < \rho < 1$ is the persistence parameter, $\overline{\sigma}_N$ is the long term average rate of job destruction in the new regime, and ε_t is an independently and identically distributed random variable.

In order to account for the fact that output in the data initially declines and reaches the pre-transition level in about 10 years, productivity in the model does not immediately equal to its long-run new regime value. Instead, it is assumed that diffusion of the new technology follows an S-shaped pattern, after Griliches (1957).

To reflect the slow diffusion of technology, it is assumed that productivity grows according to the following equation:

$$y_t = f_t y_N + (1 - f_t) y_o \tag{7}$$

where y_N is the potential long-run productivity in the new regime, y_O is productivity in the old regime, and f_t is given by

$$f_{t+1} = f_t + \delta\ (1 - f_t) f_t \tag{8}$$

where f_t equals the fraction of potential productivity available or absorbed by firms at time t, and $0<\delta<1$ is a parameter that governs the speed of transition. It is assumed that firms know that the evolution of productivity over time is characterized by Equation (7) and (8).

Allowing for the technology diffusion process and a stochastic job destruction rate, the value of an active firm depends on the two state variables, σ_t and y_t. The value function of an active and vacant firm in Equations (4) and (5) can therefore be written as:

$$J(\sigma_t, y_t) = (1 - \xi) y_t + \beta E_t[(1 - \sigma_{t+1}) J(\sigma_{t+1}, y_{t+1})] \tag{9}$$

$$\kappa = q_t \beta E_t[(1 - \sigma_{t+1}) J(\sigma_{t+1}, y_{t+1})] \tag{10}$$

4.2 Calibrating the Model

In what follows, parameter values of the new regime are chosen to be consistent with the restrictions imposed by theory on secular observations and with the available empirical evidence. Steady state values of variables in the old regime are assumed to correspond to the long run averages of their counterparts in the data. Since only about twelve years of data is available about the new regime (that is, after the transition), the assumptions about long run average values are based on evidence from other countries.

Let "starred" variables denote the steady state values of the variables. The steady state value of an active job can be expressed as:

$$J^*(\overline{\sigma}, y) = \frac{(1-\xi)y}{1-\beta(1-\overline{\sigma})} \tag{11}$$

and be calculated for both the old and new regimes. The steady state value of employment can be written as:

$$n^* = \frac{(1-\sigma)p(\theta^*)}{\sigma + (1-\sigma)p(\theta^*)} \tag{12}$$

Let $\overline{\sigma}_O$ and $\overline{\sigma}_N$ denote the long-run average job destruction rates in the old and new regimes, respectively. It has been documented, that job destruction was low but not zero before the transition in Hungary (Boeri et al., 1998). The JD rate in the old regime, $\overline{\sigma}_O$, is set to 2%. Evidence on job destruction rates (Bilsen and Konings, 1998) suggest that JD has increased in the early 90s to almost 10%, and it has declined to 6.6% to 1994. Other than this sample evidence, there are not much data available about job flows in the second half of the 90s. The long run average value of the job destruction rate will be assumed here to be close to what is observed in developed countries. Scattered evidence from the 90s, however, indicates that the Central and Eastern European labour markets are less turbulent. Among the selected developed countries in Table 3, Germany has the lowest JD rate of 8.3%. The long run JD rate, $\overline{\sigma}_N$ is, therefore, set to 8%.

Productivity of firms in the new regime, y_N is assumed to be higher, than productivity in the old regime, y_O. Output in the old regime is normalized to 1, and output in the new regime is assumed to be 50% higher on the long run.

The steady state employment level (the ratio of employed workers and working age population) is set according to employment rates available from before and after the transition. Employment ratios were high in the post-soviet economies, as most state enterprises were over-manned. Boeri et al (1998) report an 83% average employment rate for Hungary in the 80s. The employment rate declined markedly after the transition to a level of about 60%, and since then it has increased to about 65%. Employment rates of similar magnitude can be observed for developed countries. Accordingly, n_o^* is set to 83% and n_N^* is set to 65%. With the given long-run values of the variables, the job finding probability in the old and new steady states, p_O^* and p_N^* can be calculated from Equation (12).

In order to model changes in the job destruction rate and a slow diffusion process of technology in the new regime, it is necessary to calibrate the other variables and parameter values as well. Since all values refer to values in the new regime, the index for 'new' will be dropped from now. First, a functional form needs to be determined for the matching function. The following specification is used:

$$M = \chi v_t^{\alpha}(1-n_t)^{1-\alpha} \tag{13}$$

The matching function is Cobb-Douglas, and is assumed to display constant returns to scale, with $0<\alpha<1$ denoting the elasticity of job findings with respect to vacancies, and χ denoting the technology parameter of matching.

In order to compute the equilibrium value function of an active firm in the new regime, values must be assigned to the following parameters: $\alpha, \beta, \xi, \kappa, \chi, \overline{\sigma}, \rho, \delta$, as well an initial value for the fraction of potential output available for firms, f_1, needs to be set.

The discount factor β is set to 0.96, the generally used yearly value for β. The parameter α, the elasticity of outflows to jobs with respect to vacancies is documented to be rather low for transition economies. A value of 0.4 is used here, as suggested by Boeri (1999). This value is lower than 0.6, which is estimated by Blanchard and Diamond (1989) for the U.S. economy. A lower alpha value for the transition economies is consistent with a rather stagnant unemployment pool documented by empirical studies on the labour market.

Wage is assumed to be a constant fraction of output. The share parameter, ξ, is determined through bilateral bargaining, which is not modelled here. Boeri (2000) takes the value of the share parameter from the labour cost share in total value added, which, he argues, was of the order of 40% throughout the Central and East European Countries in the 1990s. Though this value is lower than the labour share of income estimates from U.S. or Canadian data, the value of ξ is set to 0.4.

In order to calibrate the fixed cost of issuing a vacancy, κ, and the matching technology parameter, χ, as well as tp determine the steady state market tightness parameter, θ^*, the following restrictions are used:

$$\kappa = q^* \beta(1-\sigma) J^* \tag{14}$$

$$q^* = \chi\, \theta^{\alpha-1} = p^* / \theta^* = 0.9 \tag{15}$$

Equation (14) is the steady state equivalent of equation (5). Equation (15) exploits the CRS nature of the matching technology and describes the relationship between q^*, p^* and θ^*[2]. The job finding probability, p^*, is calculated from Equation (12). The probability that a job is filled, q^*, is set to 0.9, following Andolfatto (1996). Because the average duration for vacancies is under one month in the U.S., q^* is, in fact, a number close to one. The same is assumed to hold for Hungary. Given p^* and q^*, the market tightness parameter can be calculated from Equation (15), as well as the matching technology parameter can be determined. The value of κ is then determined from Equation (14).

The initial value for the fraction of potential productivity available for firms is assumed to be low; f_1 is set to 0.5%. The technology diffusion parameter, δ, is set to 0.6, a value that generates a 25 year long diffusion process, after which period firms produce at the long-run productivity level. 25 years for a full adaptation of the new production technology seems to be realistic time frame for Hungary.

Finally, the parameters of the AR(1) process need to be set. The persistence parameter of job destruction, ρ , is set - in the lack of other evidence - to 0.8, the value of one year persistence of JD reported by David, Haltiwanger and Schuh (1996) for the U.S. economy. The average long run value of the job destruction rate, $\overline{\sigma}$, is set to the new regime's job destruction rate, 8%. The disturbance term of the AR(1) process, ε_t, is assumed to be normally distributed with zero mean and standard deviation of 1%.

With the parameter values, the distribution of next period's job destruction rate, and the technology diffusion process defined as described above, the equilibrium value of an

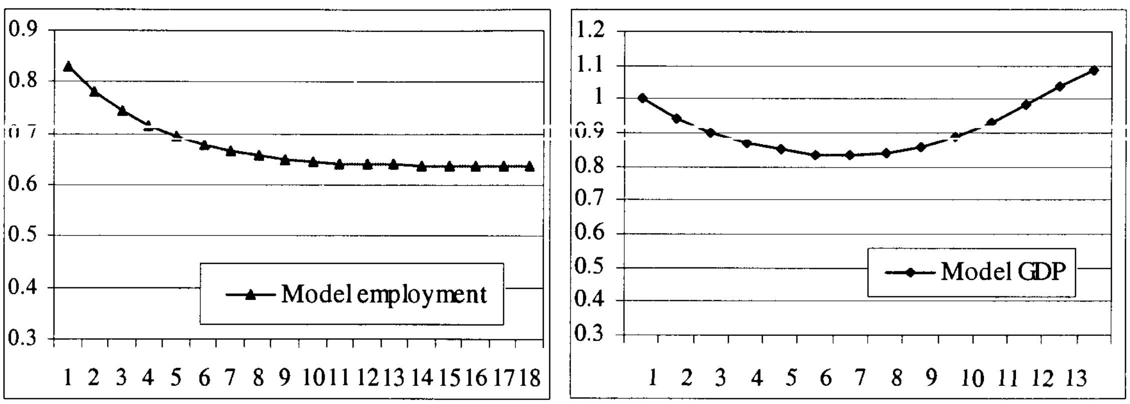
[2] $q^* = M^* / v^* = \chi\, (1/\theta^*)^{1-\alpha} = p^* / \theta^*$

active firm can be computed numerically by using the Coleman algorithm[3] according to Equation (9) for each pair of job destruction rate and output level. With $J(\sigma_t, y_t)$ determined this way, the equilibrium value of labour market tightness for each period can be calculated from Equation (15), where q_t is determined from Equation (10). The number of new matches is then governed through the matching function, which determines the employment rate in the next period.

4.3 Model Evaluation and Implications

The model implies a path of employment from the 'old' to the 'new' steady state level, due to the regime change in terms of the job destruction rate and the diffusion of technology. Figure 4 displays the decline in employment and the evolution of GDP implied by the model.

Figure 4 Response of Model Employment and Model GDP to a Regime Change



Output implied by the model displays a U-shaped pattern, similarly to the data. The initial decline of output is due to low initial levels of technology and declining employment. Output growth in later periods is only due to increasing productivity.

Considering the pattern of employment in Hungary, a permanent increase in the JD rate does not fully explain what happened. It seems likely, that after the outset of the

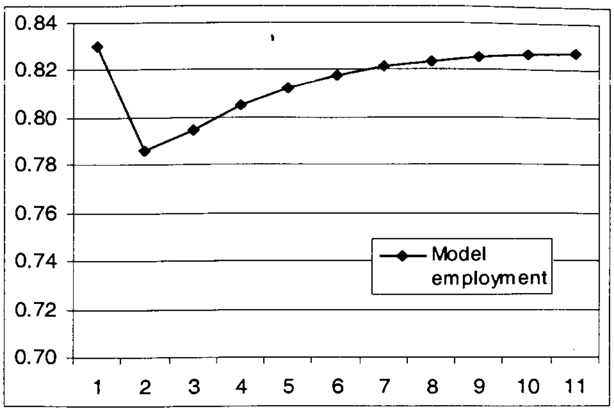
[3] In order to facilitate the numerical calculation, the possible job destruction rates were restricted to 16 different discrete values from 0 to 15%. The AR process was modified by rounding the evolving JD rates to the closest percentage. A transition matrix was constructed according to this "discretized" process, containing the probabilities of moving from one job destruction rate to another. Using the transition matrix the expectation in equation (9) can be calculated in each step of the Coleman algorithm.

transition the job destruction rate did not settle to its new value, but rather it was changing over time. In the new regime, temporary changes in the job destruction rate are likely to have occurred, that enhanced the decline of employment.

An important implication of the search model is that a temporary increase in the rate of job destruction leads to persistent unemployment. First, an increase in the job destruction rate has a direct impact on the stock of employment in the future, since only the fraction $(1-\sigma_t)$ of the currently employed survive in a job to the next period, as evident from equation (1). Secondly, an increase in the job destruction rate decreases the expected value of an active job, and decreases the number of vacancies relative to unemployment. The labour market becomes tighter for the unemployed, so the probability that an unemployed worker finds a job, p_t, decreases. The magnitude of this effect depends on the parameters of the matching function. The effect of a decrease in the job finding probability is balanced by the effect of a larger unemployment pool, which, eventually, increases the number of new matches. Since the formation of new matches takes time and effort, the increase in the job destruction rate leads to persistent unemployment.

This mechanism is demonstrated in Figure 5. It is assumed that an economy with low job destruction is hit by a temporary increase in JD, after which it falls back to its original level. In order to demonstrate the pure effect of a temporary change in the job destruction rate, technology is assumed to be constant in this experiment. When the JD rate jumps up, employment suddenly decreases, and then it gradually recovers to its initial level.

Figure 5 Employment Response to a Temporary Increase in JD



Considering the case of Hungarian employment, it can be argued that the observed pattern has been the result of some combination of the two mechanisms described above. In order to demonstrate this combined effect of a regime change in terms of the job destruction rate and technology along with some temporary increases in the job destruction rate, a hypothetical time path of JD is considered. Job destruction rates reported by Bilsen and Konings (1998) most likely underestimate the true JD rates. Therefore, instead of using this sample evidence, a time path with several years of high JD rates (10%) is imputed, after which JD is assumed to fall back to its long run value in the new regime.

The procedure is different from the usual RBC approach, which would simulate a time path for the state variable of interest (here the JD rate) and compare the time series properties of the simulated model with that of the data. Here, instead of a simulated time path for job destruction, a series of specific job destruction rates are used, which can be regarded as actualizations of the AR(1) process, upon which the expectations of the agents are based. Exogenously determining a time series of job destruction may be viewed as *ad hoc*, but – in this simple model - it is the only way to match the observed pattern of the data. Employment data and the model employment are displayed in Figure 6. Figure 7 compares data on GDP with total output generated by the model.

Figure 6 Employment Rates in Hungary from 1989 to 2002 and Model Employment

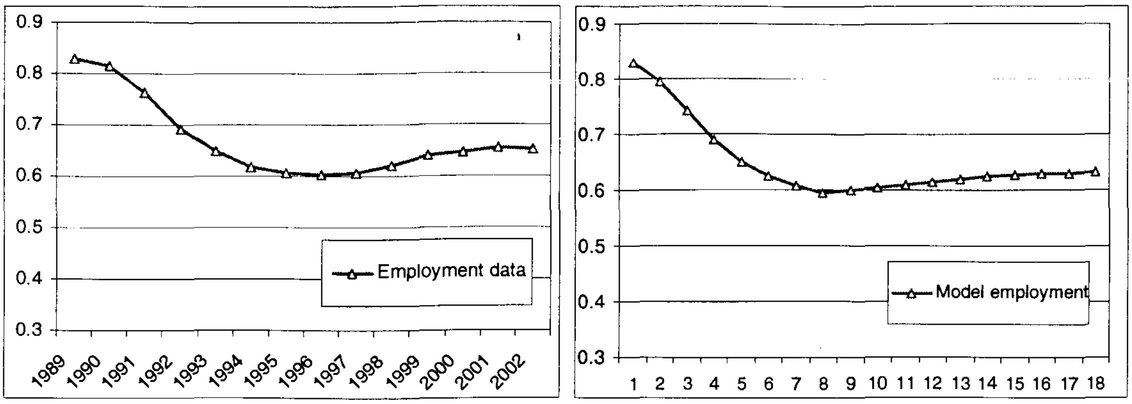
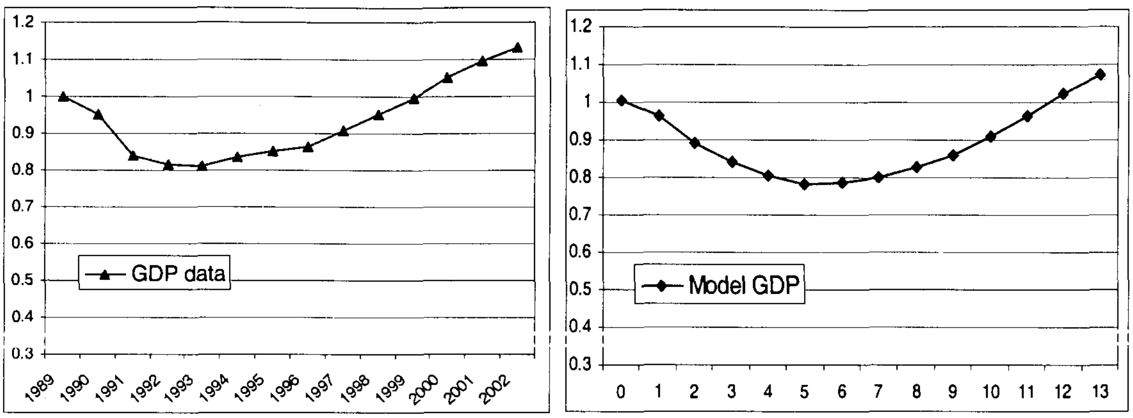


Figure 7 Real GDP per Capita in Hungary from 1989 to 2002 and Model GDP



The initial decline and the slow recovery of the employment rate are matched fairly well by the model. As a result of the permanent increase in the job destruction rate, employment gradually declines from its pre-transition level to a new steady state value. High temporary job destruction rates in the early years of the new regime exacerbate the decline of employment and divert the employment from its 'original' convergence path to the new steady state. The new employment level is then reached from 'below'. This mechanism seems to be a reasonable explanation for the observed pattern of employment in the data.

Total GDP implied by the model matches the data fairly well as well. As before, the model employment together with the S-shaped technology diffusion process generates a U-shaped pattern of GDP. In the model, GDP growth is associated with little increase in employment, just like in the data. GDP growth in later periods is rather due to higher levels of productivity absorbed by firms. The recovery period is of an order of ten years, similar to what is observed in the data.

The model generates higher job creation rates than what is documented by empirical studies for Hungary in the early 90s. This is due to the fact that parameters are calibrated to their long-run values, which were not yet realized during the transition. Little job creation in the early and mid 90s, as observed from the sample evidence, must have been the consequence of the poor effectiveness in how matches were found. For example, the matching technology parameter χ must have started from a low initial value and increased over time, as workers and firms adapted to a new market environment. A χ value that is lower than its long run value during the transition, however, does not change the results; it only contributes to an even larger decline in employment.

While some parameters of the model can be expected to be unchanged over time, the job creation implied by the model suggests that the parameters of the matching process (χ and α) cannot be assumed to be constant during the period of the transition. Matching is likely to be a learning process, which, initially does not function very effectively. One can expect, however, improvements to occur in the matching technology parameter, as well as in the responsiveness of outflows to jobs with respect to vacancies over time. This latter can be thought of not only as a result of an increase in the number of available jobs, but as an increase in the number of 'good' quality jobs.

Other factors that could have resulted in a change in the efficiency of the matching process do not appear in the simple Cobb-Douglas specification of the matching function. A more flexible functional form may allow, for example, to include the ratio of the long-term unemployed. Evidence from Hungarian Labour Force Survey (Boeri et al, 1998) indicates that the long-term unemployed have a negative effect on the efficiency of matching. In 1994-95, the outflow rate from short-term unemployment increased, while the outflow from long-term unemployment decreased (Boeri at al, 1998). As the ratio of the long-term unemployed decreases over time (e.g. as a result of some active labour market policies), one would expect an increase in the outflows and the number of new matches, so that job creation moves toward its long run value.

5 Conclusion

The paper provided an overview of the major stylized facts of the Hungarian economy after 1989. It documented a strong decline of output and employment and a rapid increase in unemployment. The recovery of output lasted for about ten years, and was associated with little growth in employment. The transition involved a massive reallocation of labour. Jobs at 'old' firms were destroyed and most jobs were created by newly established firms.

Developments in the labour market and the pattern of output observed in the data were explained by using a simple labour market search model with an exogenous and time dependent job destruction rate. A regime change in the job destruction rate and a slow technology diffusion process were shown to lead to a new steady state employment level after the transition. A regime change by itself could not explain the initial decline and later recovery of the employment rate. It has been argued that the pattern of employment can be explained as the result of a regime change along with temporary increases in the job destruction rate in the early years of the transition.

Reference List

Aghion, Philippe and Blanchard, Olivier J. "On the Speed of Transition in Central Europe". NBER Macroeconomics Annual. The MIT Press. 1994. pp. 283-320.

Andolfatto, David. "Business Cycles and Labour-Market Search". *The American Economic Review*, March 1996, 86 (1), pp. 112-132.

Bilsen, Valentin and Konings, Jozef. "Job Creation, Job Destruction and the Growth of Newly Established, Privatized and State-owned Enterprises in Transition Economies: Survey evidence From Romania, Bulgaria, and Hungary." *Journal of Comparative Economics*, 26 (3), September, 1998. pp. 429-445.

Blanchard, Olivier J. *The Economics of Post-Communist Transition.* Clarendon Press. 1997.

Boeri, Tito and Terrell, Katherine. "Institutional Determinants of labour Reallocation in Transition" William Davidson Working Paper No. 34. June 2001.

Boeri, Tito. *Structural Change, Welfare systems, and Labour Reallocation. Lessons from the Transition of formerly Planned Economies.* Oxford University Press, 2000.

Boeri, Tito; Burda, Michael C. and Köllő, János. *Mediating the Transition: Labour Markets in Central and Eastern Europe.* Institute for East West Studies. 1998.

Davis, Steven J.; Haltiwanger, John C. and Schuh, Scott. *Job Creation and Destruction.* The MIT Press. 1996.

Faggio, Giulia and Konings, Jozef. " *Job Creation, Job Destruction, and Employment Growth in Transition Countries in the 90s.*" IZA Discussion Paper No. 242. 2001.

Griliches, Zvi. "Hybrid Corn: An exploration in the Economics of technological Change." *Econometrica,* October 1957, 25 (4), pp. 501-522.

Jurajda, Stepán and Terrell, Katherine. "*What Drives the Speed of Job Reallocation During Episodes of Massive Adjustment?*" William Davidson Working Paper, No. 432. January 2002.

Konings, Jozef; Hartmut, Lehmann and Schaffer, Mark. "*Job Creation and Job Destruction in a Transition Economy: Ownership, Firm Size and Gross Job Flows in a Polish Manufacturing, 1988-1991.*" Labour Economics. 3. pp. 299-317/

Pissarides, Christopher A. *Equilibrium Unemployment Theory.* The MIT Press. 2000. 2nd edition.

Roland, Gérard. *Transition and Economics. Politics, Markets, and Firms.* The MIT Press. 2000.