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May 1996

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Abstract

This paper presents error correction estimates of a simple interdependent model of the labour market using monthly data over 1990-1994 for the industrial sector in Poland and Hungary. The aim is to investigate three issues in the performance of labour markets during transition. First, is there a stable labour market equilibrium or do high unemployment rates across the region indicate hysteresis? Second, has the intensity of employment adjustment increased with progress in institutional reforms that strengthened corporate governance at the enterprise level? Third, what governs the evolution of real wages and to what extent is there evidence for strong insider power in the labour market? The results reveal striking differences between Poland and Hungary. The former exhibits hysteresis and evidence for considerable insider power while the latter has experienced adjustment towards a stable labour market equilibrium. The intensity of adjustment, however, is high in both countries over the sample period and fails to respond to the initiation of institutional reforms.

Keywords: Hysteresis, Adjustment Intensity, Insider Power

JEL: J 20, P 52

LABOUR MARKETS IN POLAND AND HUNGARY FIVE YEARS FROM THE START OF TRANSITION: Evidence from Monthly Data*

1. Introduction

Labour markets play a central role in the process of economic transition in Central and Eastern Europe. First, the labour market has to cope both with the legacy of considerable overemployment in the state-owned enterprise sector (Brada, 1989; Rutkowski, 1990) and the dramatic shift of the relative price vector, implying a reallocation of labour from industry and agriculture to services and within sectors from energy intensive production to those branches more in line with the region's comparative advantages (Hare and Hughes, 1991; Boeri and Keese, 1992). Second, inflation in reforming socialist economies has traditionally been cost driven (Commander and Coricelli, 1991). Wage restraint is thus not only warranted to prevent mass redundancies but also to support stabilisation policies in transition economies (Coricelli and Revenga, 1992).

For most observers, labour markets in Central Eastern Europe are not well equipped to effect such deep adjustments. Thus it is argued that institutional weaknesses pertain at the level of state-owned enterprises (SOEs) where a lack of corporate governance sponsors short-termism. Ailing SOEs have continued access to a deficient capital market (Begg and Portes, 1992) and the legacy of worker control poses the danger of "wage drift". The result is a hypothesised sluggishness of labour demand in reacting to the dramatic output falls in the region and a policy of wage setting decoupled from productivity developments (Agion, Blanchard and Burgess, 1993; Schmieding, 1993). Such pessimism has

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found support in the experience of Western Europe with high and persistent unemployment after the second oil shock in 1979 (Bean, 1994). Thus militant wage bargaining and institutional rigidities are often blamed for the sluggish recovery of investment and the effective segmentation of Western European labour markets into the employed "insiders" and the unemployed "outsiders" (Lindbeck and Snower, 1987). The strength of labour unions, for instance in Poland, has consequently raised the spectre of post-socialist stagflation.

More recently, results from enterprise survey data have led to a more optimistic assessment of enterprise adjustment in transition economies (Pinto et al., 1993; Pinto and v. Wijnbergen, 1994; Estrin, Gelb and Singh, 1994). Thus, the initial output shock was cushioned by a remarkable downward flexibility of real wages (Calvo and Coricelli, 1992). Subsequently, SOEs have shed substantial amounts of labour. Accordingly, the current question is whether wage moderation can be maintained to allow for a recovery of profits and investment and whether labour markets are sufficiently flexible to reintegrate those who lost their jobs in the initial slump.

This paper provides an analysis of labour demand and supply in Poland and Hungary at the level of aggregate industry using monthly data from 1990:1 through 1995:3. The analysis is restricted to industry as it arguably faces the strongest adjustment pressures. First, we examine whether a stable equilibrium exists in the Polish and Hungarian labour markets. We test for the presence of a unit root in an interdependent model of labour demand and supply, specified in the dynamic error correction form. Absence of a labour market equilibrium implies unemployment persistence. Subsequently, we look at the parameters of the functional forms separately to identify periods of accelerated adjustment in labour demand and analyse the specific role of insider forces in wage determination. The results point at a stable labour market equilibrium only in the case of Hungary. In Poland, we find that unemployment fails to exert any

influence on real wages and hence the system of wages and employment has a unit root. Moreover, wage formation in Poland is compatible with enterprise behaviour under labour management, while wages in Hungary seem to be set on a competitive labour market. These differences are finally borne out by substantially lower wage and output elasticities of employment in the Polish case. With respect to the intensity of adjustment we find that labour demand has reacted only little to institutional changes, suggesting that the overall consistency of the reform programmes in both countries was the dominant force in SOE behaviour.

The remainder of the paper is structured as follows. The second section presents some stylised facts of labour market adjustment in Poland and Hungary. These are related to the progress with macroeconomic and institutional reforms which uncovers some notable differences in the two countries. The main part of the paper presents the empirical model and derives the hypotheses to be tested (section three) and proceeds to results (section four). The fifth section concludes.

2. Labour Markets and the Transition in Poland and Hungary: An Overview

Among the four stylised macro-economic facts that have characterised economic transition in Central and Eastern Europe so far, three concern the behaviour of output, employment and wages (Calvo and Coricelli, 1992). First, output has collapsed with the start of economic reforms while recovery has set in after two or three years of transitionary recession. Thereby, the industrial sector has been by far the most important component of the fall in GDP and its share in national income has been progressively reduced. Second, employment has followed output declines with a lag, leading to an initial drop in labour productivity and a gradual rise in unemployment. Third, real wages have fallen in the initial stages of transition, thereby cushioning the effect of the decline of output on profitability

and employment. Fourth, as unit labour costs and unemployment have risen, fiscal balances have turned strongly negative and inflation has subsided only gradually.

Within this general pattern, significant inter-country differences should be noted (see Appendix II, Table A1). Poland has suffered from transitionary recession in two blows, following the introduction of the shock reform programme in 1990 and the disintegration of the CMEA in 1991. Since the beginning of 1992, industrial output and GDP are increasing.[1] In Hungary, the decline in industrial production has proceeded more gradually over 1989-1992 in line with the phased introduction of economic reforms. Nonetheless, the cumulative extent of production losses has been very similar in both countries amounting to 36 per cent of the 1989 level in Poland in 1991 and 34 per cent in Hungary in 1992. A more fundamental difference may be noted in the adjustment of industrial employment. This is plotted in Figures 1 and 2 which show the development of labour productivity, real producer and consumer wages and unemployment in both countries over the 1990-94 period (see Appendix III). Hungarian industry has shed labour far more rapidly and extensively than Polish industry and hence labour productivity declined by only 10 per cent over 1989-91, against almost 30 per cent in Poland. The onset of industrial recovery has led to an increase in labour productivity in Hungarian industry in 1994 to 136 per cent of the 1989 level by 1994, while Poland had only just recovered its 1989 productivity level by that date. The developments of real product wages (nominal wages deflated with the producer price index) mirror the differences in labour productivity. As a result, unit labour costs in industry have increased sharply in both countries until

[1] We should mention that growth has been private sector driven as can be seen from the shifts in ownership structure presented in Table A2 (see Appendix II). The importance of the private sector in total employment at the start of transition was highest in Poland and Hungary among the countries in the region, a fact that very probably impacted positively on enterprise adjustment in both economies.

the second half of 1994 when the steep increase in labour productivity was able to catch up with previous real wage increases.

Two further aspects should be noted in Figures 1 and 2. The first is the increasing divergence of real consumer and producer wages, reflecting much higher consumer than producer price inflation in both countries. The reason for this "price wedge" partly lies in the continuing real appreciation of the forint and the zloty, lowering the price of imported industrial inputs and in administrative price increases in rents and public utilities, driving up the cost of living. The extent to which unit labour costs were affected by the attempt of workers to maintain their real incomes will be addressed below as an important aspect of wage behaviour. Suffice to note here that industrial workers in Hungary have by and large maintained their average 1989 incomes while their Polish counterparts have had to cope with a decline of the order of 20-25 per cent with little sign of improvements. The second aspect is the rapid increase in unemployment from virtually zero to well over 10 per cent of the labour force. Interestingly, unemployment in Hungary has been falling since early 1993 whereas it was still increasing in Poland at the end of 1994.[2] Whether the rise in unemployment signals the presence of labour market rigidities and the persistence of disequilibria in Poland and Hungary is a central issue to be investigated below.

Summing up the differences in labour market adjustment emerging from Figures 1 and 2, it would appear that Poland has opted for a combination of employment and wage reductions compatible with a significant role for labour management and insider dominated adjustment strategies (Lane, 1994), while labour market adjustment in Hungary has been primarily effectuated by employment reductions, suggesting substantial inter-sectoral labour mobility and competitive wage

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[2] The higher unemployment rate in Poland may be largely attributed to the dramatic fall in agricultural employment, which in Poland accounted for a much larger share of the labour force than in other countries of the region.

formation. How can we account for such differences? One answer may lie in the general policy framework, including institutional arrangements in both countries.[3]

In Poland, the key to the stabilisation and reform programme introduced in January 1990 was the end of fiscal subsidies to SOEs and a very restrictive monetary policy that was to prevent price liberalisation from ensuing into another hyper-inflationary spiral. This was amended with an incomes policy (popiwek) that taxed the total wage sum of an enterprise in excess of a given norm. In spite of several government changes, the broad direction of reform has been maintained in Poland ever since with an emphasis on macro-economic demand management. Institutional reforms have progressed slowly, particularly in the area of privatisation. Management buy-outs under the provisions for liquidation of state enterprises have often put workers councils and former enterprise directors effectively in control of their firms. An important change in corporate governance occurred in the fourth quarter of 1991, when state-owned commercial banks were brought under the direct supervision of the Ministry of Finance (Pinto and van Wijnbergen, 1994).

The focus on macro-economic stabilisation and the delay in clarifying corporate governance structures may explain the pattern of labour market adjustment sketched above. Forced to undertake immediate adjustments but without a clear long term adjustment plan, Polish SOEs initially "borrowed" from their workers while waiting for a loosening of macro-economic control (Pinto, Belka and Krajewski, 1993). The popiwek supported such an adjustment strategy aimed at minimising redundancies. Moreover, the predominance of insider privatisation may have strengthened the preference for employment security over current

[3] For references see Gomulka (1992) in the case of Poland and Szekhely and Newberry for Hungary (1993); also Buch et al. (1994).

incomes among workers, as would be expected under a system of labour management where property rights are linked to employment.[4]

Economic reforms in Hungary proceeded more gradually than in Poland. Price and trade liberalisation were accelerated during the late 1980s and merely completed during 1989-1991. As price changes were far less accentuated both in relative and absolute terms, monetary policy could afford to be less restrictive. Thus institutional reforms occupied a more important place on the reform agenda in Hungary. Privatisation was initiated early on through direct auction sales. This helped to trigger the largest inflow of foreign direct investment in the region and contained the role of insiders in the process, although a marked slow-down occurred in 1991 (Heinrich, 1993a). In response to increasing evidence for creditor passivity in the banking system (Estrin, Hare and Suranyi, 1992), a new bankruptcy law was put in place in January 1992 together with Western accounting standards for state-owned commercial banks.

The absence of hyperinflation and the legacy of very tight demand management in Hungary during the late 1980s (Brada and Dobozi, 1990) meant that there was less political will but also less scope for a substantial reduction in workers' incomes. Hungarian SOEs started shedding labour as early as 1989, partly induced by the generous system of unemployment benefits (Burda, 1993).[5] The

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[4] For a review of the theoretical literature, see Ireland and Law (1982). Belka et al. (1994) report qualitative evidence on the substantial role of worker councils in both SOEs and privatised enterprises.

[5] According to the EBRD (1993), Hungarian employers have to pay non wage labour costs to the amount of 52.5 percent of gross wages (including 44 percent contributions to social security system, 7 percent for unemployment compensation fund and 1.5 for the employment fund). The employees' portion of payroll taxes amounts to 10 percent of gross wage for social security and to 2 percent for the unemployment compensation fund. This has obvious employment deterring effects. The implicit tax wedge (gross wage minus net wage) rose from 85 percent in 1991 to 100 percent of the net wage in 1993 (KSH, var. issues). Since 1994 the tax wedge shows a downward trend. In March 1995, the new Hungarian government substantially dismantled the current benefit system. The tax wedge in Poland amounts to 80 percent.

additional impact of the bankruptcy law remains debated. While most observers would argue that it provided for a further substantial hardening of budget constraints on Hungarian SOEs, Bonin and Schaffer (1994) claim that banks had changed their lending behaviour as early as 1991. The micro-economic evidence is similarly inconclusive. Brada, Singh and Török (1994) claim that a substantial proportion of Hungarian enterprises even after 1992 were "drifting", i.e. adjusting with a mere view to short term survival. By contrast, Estrin, Gelb and Singh (1994) report results from a different survey indicating that most Hungarian firms had long term adjustment plans in place (see also Heinrich, 1993b). Importantly, the latter source also noted a significantly lesser role of worker councils in management decisions in Hungarian SOEs than in their Polish counterparts.

The general policy environment gives some clues to differences in the pattern of employment and wages since the start of transition. The impact of specific institutional reforms on the intensity and speed of adjustment, however, remains an issue of contention. The following section formalises the above observations in a dynamic model of the labour market that allows to test simultaneously for the existence of an equilibrium adjustment path, changes in adjustment over time and the role of insiders in wage determination.

3. A Dynamic Model of the Labour Market in Transition

In this section we construct a simple model of the labour market.

Labour demand:

Starting from a CES Production function

(1) $$Q_t = A\left[\delta K_t^{-\rho} + (1-\delta)L_t^{-\rho}\right]^{-v/\rho} \text{ with } \rho = \frac{1-\sigma}{\sigma},$$

one obtains the loglinear labour demand function

(2) $$l_t = c + dq_t - \sigma(w - p_p)_t \text{ with } d = \frac{1-\rho+\rho v}{v}$$

where q is the measure of output in industry at constant prices, l is the number of workers in industry and w is the gross monthly wage in industry (including employers' contributions to social insurance, income taxes and pensions).[6] The price of gross output is the producer price index p_p. All variables are measured in logs. Under the restriction of constant returns to scale (v=1) it follows that d=1, and equation (2) may be rewritten as the relationship of labour productivity to the real wage. The coefficient σ is the substitution elasticity between capital and labour. It may vary across countries and/or industries. However, once σ is given by a technological assumption (e.g. $\sigma = 1$ for the Cobb Douglas case), a lower estimate for σ may also indicate allocative inefficiency.[7]

If labour demand is not in long run equilibrium in every period but the adjustment process takes time due to adjustment costs or reaction lags, the appropriate formulation is a generalised lag model, which we transform into the familiar error correction representation.

(3)

$$\Delta l_t = \lambda\left[l_{t-1} + \sigma(w - p_p)_{t-1} - dq_{t-1} - c\right] + D_0(L)\Delta l_{t-1} + D_1(L)\Delta(w - p_p)_t + D_2(L)_t \Delta q_t$$

The coefficient λ denotes the impact of the error correction term, which ensures that employment moves into the direction of its long term equilibrium, provided that λ is significantly negative. Further, by tracing the value of λ over time, we may test for the effects of particular reforms on the adjustment speed of labour

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6 In principle, q should be real value added. However, for the whole period value added data are only available on an annual basis. For both countries we take a monthly average of net value added at factor cost in 1993 (1991 in Hungary) and multiply it with the industrial production series (see Appendix I). This is unlikely to be serious if one takes in mind the following considerations. For one, in Poland industrial production data varies only slightly from value added (Kennedy 1994). For another, annual data in Hungary and Poland indicate that the value added deflator is closer to the producer price index than to the consumer price index.

7 An application is provided by Burda and Funke (1993) for the case of West and East German manufacturing.

demand. We should note that the short time span under study imposes a cautious interpretation of the level coefficients. We are interested in equation (3) as a representation of an equilibrium adjustment path rather than as the state of rest in the labour market. Finally, $D_i(L)$ are polynomials in the lag operator L and $D_i(L)\Delta x$ capture the shortrun effects to the system.

Labour supply:

As a specification of labour supply, we use a real wage equation in terms of the real product wage written in error correction form

$$(4) \qquad \Delta(w-p_p) = \alpha_0\left[(w-p_p)_{-1} - \alpha_1(p_c-p_p)_{-1} - \alpha_2(q-l)_{-1} - \alpha_3 + \alpha_4 U_{-1}\right] + B_0(L)\Delta(w-p_p)_{-1} + B_1(L)\Delta(p_c-p_p) + B_2(L)\Delta(q-l)$$

with $B_i(L)\Delta x_t = b_{i0}\Delta x_t + b_{i1}\Delta x_{t-1} + b_{i2}\Delta x_{t-2} + \ldots\ldots\ldots\ldots + b_{ir}\Delta x_{t-r}$.

As with labour demand, a significantly negative estimate of α_0 indicates that wage setting moves towards long run equilibrium as defined by the error correction term. However, this is not sufficient to reject hysteresis in the labour market. Thus, the system of employment and wage equations has a unit root if the coefficient on unemployment (α_4) is insignificantly different from zero (Hansen, 1991). A cointegration relationship between the real wage, productivity and relative prices implies a stable wage equation without any feedback from labour demand.

The error correction term in brackets reflects the hypothesis that a linear combination of real product and real consumer wages is controlled by labour productivity. The higher the coefficient α_2 the stronger the link between the levels of real wages and productivity. Following Franz and Gordon (1993), an α_2 equal to unity is the core of the real wage bargaining model (for a classification see Coe (1990)). This implies that as productivity declines, workers accept wage cuts rather than redundancies, while in a boom wage increases leave little room for recovery of profitability. An estimate of α_2 therefore conveys important

information about the rationale of union behaviour in transition economies and the likelihood that recovery will create new jobs in the industrial sector. The evidence in Section 2 suggests that α_2 should be considerably higher in Poland than in Hungary.

The price wedge variable $(p_c - p_p)$ indicates to what extent consumer prices are relevant for the suppliers of labour.[8] In the case of $\alpha_1 = 1$, the long-run functional relationship is in terms of the real consumer wage, whereas with $\alpha_1 = 0$ wage bargaining is totally oriented at the producers' profitability conditions. This can be conveniently related to wage behaviour under labour management. Thus, if workers are at the same time owners they face a trade-off between the real consumer wage and the residual income on their assets. It has been shown that if these assets are not tradable, real wages will decline as a result of a negative terms of trade shock while employment will increase (Ward, 1957; Ireland and Law, 1982). Hence, a coefficient α_1 considerably below unity may be taken as indication for labour management and be related to the predominance of insider privatisation noted above. Thus, the combination of a high value for α_2 with a relatively low value of α_1 indicates an insider dominated adjustment strategy, while in the opposite case, real wages are determined by intersectoral competition in the labour market so that sectoral productivity and cost developments do not play a particular role. It is likely that a strong role for insiders will also lead to the failure of labour markets to clear.

Finally, in the case of $\alpha_2 = 1$, $\alpha_1 = 0$ and $\alpha_4 = 0$, the error-correction term constitutes the deviation of labour's share from its target level α_3 (see, for example, Franz and Gordon 1993). If α_4 remains significant in labour supply equilibrium, the long term target real wage declines when unemployment rises.

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[8] We do not include the tax wedge (gross wage minus net wage) in equation (4). There are several reasons for doing so. For one, in Poland personal income tax was introduced in January 1992. Second, in Hungary in 1990-1991 the net wage is not available on monthly basis.

Below, we do present estimates of equilibrium labour shares obtained from the restricted version of equation (4). However, as the restriction cannot be accepted statistically, most of our analysis concentrates on interpreting the values of α_1 and α_2 and α_4 in the unrestricted model.

4. Estimation and Results

4.1. The Interdependent Model

As a first step before beginning with estimation, an augmented Dickey-Fuller-test is applied in order to determine the order of integration of all logarithmic transformed variables (Table 1). Only for the price wedge in the case of Poland and for the unemployment rate in Hungary the null of non-stationarity can be rejected which is equivalent to the result that the price wedge and the unemployment rate follow a stationary process, whereas all other variables are I(1) without drift, since they become stationary upon being differenced once.[9]

If there exists a long run equilibrium relationship between the variables, a linear combination of them which reflects this relationship has to be stationary. This is equivalent to saying that the deviation of actual observations from their equilibrium relationship does not grow over time. Following the reasoning of Kremers, Ericsson and Dolado (1992) we do a test of cointegration by means of error correction equations for both labour demand and labour supply (Table 2). The null of no cointegration is rejected if the corresponding adjustment

[9] The asymptotic properties of the OLS estimate depend on whether or not a constant or a time trend is included in the regression (Hamilton, 1994, pp. 529). Panel 1 in Table 1 presents results with a constant, panel 2 with a time trend. Critical t- and F-values are given below the Table. The time trend is significant in two cases, so in Poland output and labour productivity are characterised by a random walk without drift, but with trend.

Table 1 - ADF-Test for I(1) and for I(2): w-p_p, q, q-l, p_c-p_p and U

	Hungary			Poland		
I(1) with constant	t[a]	F-Test[b]	Lags	t[a]	F-Test[b]	Lags
(w-p_p)	-1.19	1.96	4	-0.93	1.53	6
q	-1.71	1.54	4	-1.85	1.79	5
l	-1.68	2.77	5	-2.26	2.57	6
(q-l)	0.12	1.34	4	-1.27	1.13	5
(p_c-p_p)	-0.04	2.03	6	-3.40*	8.26*	5
U	-2.84	4.15	6	-2.31	2.87	3
I(1) with time trend	t[c]	F-Test[d]	Lags	t[c]	F-Test[d]	Lags
(w-p_p)	-2.91	6.02	5	-2.40	3.06	6
q	-0.70	3.10	2	-2.02	11.90*	6
l	-0.68	1.37	4	-1.28	3.04	4
(q-l)	-1.47	3.89	2	-2.64	9.58*	5
(p_c-p_p)	-1.88	1.98	7	-1.94	5.43	4
U	-5.01*	15.58*	4	-0.48	2.15	6
I(2) with constant	t[c]		Lags	t[c]		Lags
Δ(w-p_p)	-5.61*	-	4	-5.20*	-	6
Δq	-5.28*	-	2	-4,04*	-	3
Δl	-11.8*	-	4	-4,54*	-	5
Δ(q-l)	-3.48*	-	3	-4,25*	-	4
Δ(p_c-p_p)	-3.86*	-	4	-4.46*	-	3
ΔU	-2.98*	-	4	-4,08*	-	5

Time range is 1990(1) - 1995(3) for Poland and 1990(1) - 1994(12) for Hungary. The lag-lenth is determined by the FPE criteria. * Significant at the 5 percent level. [a,c] Critical values at the 5 percent level are t=-2.93 and t= -3.49. [b,d] Critical values at the 5 percent level are F= 4.83 and F= 6.73.

Table 2 - Kremers, Ericsson and Dolado (1992) Test for Co-integration: F-values[a]

	Labour demand	Labour supply
Poland	-4.60**	-6.43**
Hungary	-3.51*	-7.21**

[a] H_0: $\lambda = 0$ against H_1: $\lambda < 0$
H_0: $\partial_0 = 0$ against H_1: $\lambda_0 < 0$.
A single (double) asterisk indicates that the null hypothesis is rejected with 90 (95) percent confidence.

coefficient is significantly negative.[10] For both Poland and Hungary we find stable employment and wage equations.[11]

One problem with independent estimation of the labour demand and supply functions can arise if the explanatory variables in each equation are not weakly exogenous to the cointegration parameters. In this case, arguing for the labour demand equation, not only labour demand but also an explanatory variable in this equation like the real wage reacts to disequilibrium as expressed by the error correction term.[12] Indeed, we find that the Hungarian price wedge in labour supply is the only variable to be weakly exogenous in our model (see Appendix IV, Table A3). The consequence is that independent estimation, although being superconsistent due to the fact that all level variables are integrated of order 1, is no longer efficient.[13] This is particularly serious in the case of a small number of observations and may thus bias the estimates of the single structural equations.

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[10] Critical values were calculated by Banerjee et al. (1992). The Null-hypothesis of no cointegration is rejected at 5 percent if the t-ratio is smaller than the critical values of -3.57 and -3.82 for two and three explanatory variables respectively.

[11] OLS estimates of the single equations are available from the author upon request.

[12] The same reasoning applies to productivity in the labour supply equation.

[13] Furthermore, inference cannot be conducted with standard tables (Banerjee et al., 1993, pp. 163, 244).

We thus formulate and estimate an interdependent model of the labour market to test the hypotheses derived above:[14]

(5)

$$\begin{pmatrix} 1 & -b_{11}^{*} \\ -b_{21}^{*} & 1 \end{pmatrix}\begin{pmatrix} \Delta l \\ \Delta(w-p) \end{pmatrix}=\begin{pmatrix} \bar{b}_{11} & \bar{b}_{12} \\ \bar{b}_{21} & \bar{b}_{22} \end{pmatrix}\begin{pmatrix} l_{t-1} \\ (w-p)_{t-1} \end{pmatrix}+\begin{pmatrix} \bar{c}_{11} & \bar{c}_{12} & 0 & 0 \\ -\bar{b}_{21} & \bar{c}_{21} & \bar{c}_{22} & \bar{c}_{23} \end{pmatrix}\begin{pmatrix} q_{t-1} \\ const_{t-1} \\ (p_c-p_p)_{-1} \\ U_{-1} \end{pmatrix}$$

$$+\begin{pmatrix} c_{11}^{*} & 0 \\ 0 & c_{22}^{*} \end{pmatrix}\begin{pmatrix} \Delta x_1 \\ \Delta x_2 \end{pmatrix}+\begin{pmatrix} u_{1t} \\ u_{2t} \end{pmatrix}$$

with $\begin{pmatrix} \Delta x_1^{'} \\ \Delta x_2^{'} \end{pmatrix}=\begin{pmatrix} B_0(L)\Delta(w-p)_{t-1}, B_1(L)\Delta l_{t-1}, B_2(L)\Delta q \\ B_3(L)\Delta(w-p)_{t-1}, B_4(L)\Delta(q-l)_{t-1}, B_5(L)\Delta(p_c-p_p) \end{pmatrix}$

and $B_i(L)\Delta x_t = b_{i0}\Delta x_t + b_{i1}\Delta x_{t-1} + b_{i2}\Delta x_{t-2}+.....+b_{ir}\Delta x_{t-r}$.

Efficiency is increased since we make use of more restrictions of orthogonality than when estimating the structural form equations (Hansen, 1993, pp. 183). Compared with single estimation of the ECM, the following interdependent estimation produces smaller standard errors (particularly for the adjustment coefficients) and leads to only little changes of the estimated coefficients.

Three stage least square estimation of model (5) yielded equation (6) and (8) for Poland and (7) and (9) for Hungary.[15]

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[14] If we had investigated total national employment, we should have explained unemployment via the relation U=labour force - l, thereby taking account of a another feedback from labour demand. With the industrial sector alone, this restriction does not hold, so we treat U as exogenous. Note that we still assume output to be (weakly) exogenous. This is in line with the supply shock interpretation of output falls in Central and Eastern Europe (van Long and Siebert, 1992; Winiecki, 1993).

[15] For Hungary and Poland following instruments are used:

const. q_{-1}, l_{-1},$(w-p_p)_{-1}$, U_{-1}, $(p_c-p_p)_{-1}$, Δq_{-2}, Δq_{-8}, $\Delta(q-l)_{-3}$, $\Delta(q-l)_{-4}$, $\Delta(q-l)_{-5}$, $\Delta(q-l)_{-9}$, Δl_{-2}, $\Delta(p_c-p_p)$, $\Delta(p_c-p_p)_{-4}$, $\Delta(w-p_p)$, $\Delta(w-p_p)_{-1}$, $\Delta(w-p_p)_{-2}$, $\Delta(w-p_p)_{-3}$, $\Delta(w-p_p)_{-4}$, $\Delta(w-p_p)_{-5}$ and

const. q_{-1}, l_{-1},$(w-p_p)_{-1}$, U_{-1}, $(p_c-p_p)_{-1}$, Δq_{-2}, Δq_{-8}, $\Delta(q-l)_{-1}$, $\Delta(q-l)_{-2}$, $\Delta(q-l)_{-3}$, Δl_{-1}, Δl_{-2}, $\Delta(p_c-p_p)$, $\Delta(w-p_p)_{-1}$, $\Delta(w-p_p)_{-3}$, $\Delta(w-p_p)_{-4}$.

Poland Labour demand 1990.1-1995.3

$$\Delta l = \underset{(-5.04)}{-0.13}\left[l_{-1} + \underset{(7.34)}{0.45}(w-p_p)_{-1} - \underset{(-6.45)}{0.36}\, q_{-1} - \underset{(-8.64)}{5.23}\ \text{const}\right] - \underset{(-2.44)}{0.08}\,\Delta q_{-2} + \underset{(1.26)}{0.04}\,\Delta q_{-8} - \underset{(-3.75)}{0.40}\,\Delta l_{-1} - \underset{(-2.34)}{0.27}\,\Delta l_{-2} + \underset{(3.06)}{0.06}\,\Delta(w-p_p)_{-4} \quad (6)$$

$R^2 = 0.47$, $\alpha(LM(1)) = 0.16, \alpha(LM(12)) = 0.06, ADF(3) = -3.70$.

Hungary Labour demand 1990.1-1994.12

$$\Delta l = \underset{(-4.06)}{-0.14}\left[l_{-1} + \underset{(7.47)}{1.06}(w-p_p)_{-1} - \underset{(-8.09)}{0.85}\, q_{-1} - \underset{(-0.21)}{0.31}\ \text{const}\right] - \underset{(-2.14)}{0.13}\,\Delta q_{-2} - \underset{(-3.20)}{0.20}\,\Delta q_{-8} - \underset{(-2.22)}{0.25}\,\Delta l_{-2} - \underset{(-2.54)}{0.11}\,\Delta(w-p_p) + \underset{(1.67)}{0.08}\,\Delta(w-p_p)_{-1} + \underset{(2.12)}{0.09}\,\Delta(w-p_p)_{-2} + \underset{(2.00)}{0.08}\,\Delta(w-p_p)_{-4} + \underset{(2.05)}{0.09}\,\Delta(w-p_p)_{-5} \quad (7)$$

$R^2 = 0.71$, $\alpha(LM(1)) = 0.15$, $\alpha(LM(12)) = 0.83$, $ADF(3) = -5.06$

Poland labour supply 1990.1-1995.3

$$\Delta(w-p_p) = \underset{(-7.15)}{-0.55}\left[(w-p_p)_{-1} - \underset{(-6.73)}{0.30}(q-l)_{-1} - \underset{(-3.04)}{0.53}(p_c-p_p)_{-1} - \underset{(-0.58)}{0.32}\, U_{-1} - \underset{(-11.83)}{0.95}\ \text{const}\right] + \underset{(4.89)}{0.38}\,\Delta(w-p_p)_{-1} + \underset{(3.81)}{0.29}\,\Delta(w-p_p)_{-3} - \underset{(-3.55)}{0.42}\,\Delta(q-l)_{-1} - \underset{(-2.87)}{0.32}\,\Delta(q-l)_{-2} + \underset{(2.42)}{0.27}\,\Delta(q-l)_{-3} + \underset{(3,57)}{0.51}\,\Delta(p_c-p_p)_t \quad (8)$$

$R^2 = 0.43$, $\alpha(LM(1) = 0.061$, $\alpha(LM(12) = 0.18$, $ADF(3) = -4.43$

Hungary labour supply 1990.1-1994.12

(9)

$$\Delta(w-p_p) = \underset{(8.28)}{-0.93}\left[(w-p_p)_{-1} - \underset{(3.64)}{0.17}(q-l)_{-1} - \underset{(8.07)}{1.03}(p_c-p_p)_{-1} + \underset{(3.35)}{0.52}\, U_{-1} + \underset{(10.64)}{2.16}\ \text{const}\right] + \underset{(3.38)}{0.32}\,\Delta(q-l)_{-3} + \underset{(4.11)}{0.48}\,\Delta(q-l)_{-4} + \underset{(3.68)}{0.38}\,\Delta(q-l)_{-5} + \underset{(3.61)}{0.37}\,\Delta(q-l)_{-9} + \underset{(2.44)}{0.23}\,\Delta(w-p_p)_{-1} + \underset{(4.33)}{0.34}\,\Delta(w-p_p)_{-2} + \underset{(3.35)}{0.24}\,\Delta(w-p_p)_{-3} + \underset{(4.08)}{1.15}\,\Delta(p_c-p_p) + \underset{(4.59)}{1.23}\,\Delta(p_c-p_p)_{-4}$$

$R^2 = 0.73$, $\alpha(LM(1)) = 0.15$, $\alpha(LM(12)) = 0.57$, $ADF(4) = -4.69$

The first thing to note, is that α_4 remains insignificant in Poland, inspite of the fact that both the employment and wage equations show a significantly negative

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The long-run coefficients are taken from the instrumental variable estimation of the Bewley-transformation of the ECM. The lag-length of the short-run variables is determined with the procedure 'Stepwise Regression' in RATS. The number in parenthesis is the t-statistic.

adjustment coefficient.[16] Hence, we cannot reject the hypothesis of hysteresis in the Polish labour market and must interpret equations (6) and (8) separately. Equation (8) thereby embodies a wage equation, where real product wages in industry are only controlled by relative prices and sectoral productivity growth. In Hungary, the semi-elasticity of real product wages to the rate of unemployment is statistically significant and its value is roughly 0.5. The size and significance of the adjustment coefficients in Hungary further confirm the existence of a flexible adjustment mechanism along a stable equilibrium path.

This striking difference between the Polish and Hungarian results concurs well with the observations made in Section 2. However, we should not overinterpret our findings. The short time span under study does not allow for the conclusion of deep-seated and long-lasting differences in the two countries labour markets. We now proceed to a detailed discussion of the results for labour demand and labour supply separately. In the first case, we are particularly interested in possible structural parameter shifts corresponding to the major institutional breaking points in Poland and Hungary, namely the financial recentralisation of October 1991 in the former and the enforcement of bankruptcy since April 1992 in the latter country. Our interest in the labour supply equation is to test for insider power along the lines set out in Section 2 above.

4.2. Labour Demand and Institutional Change

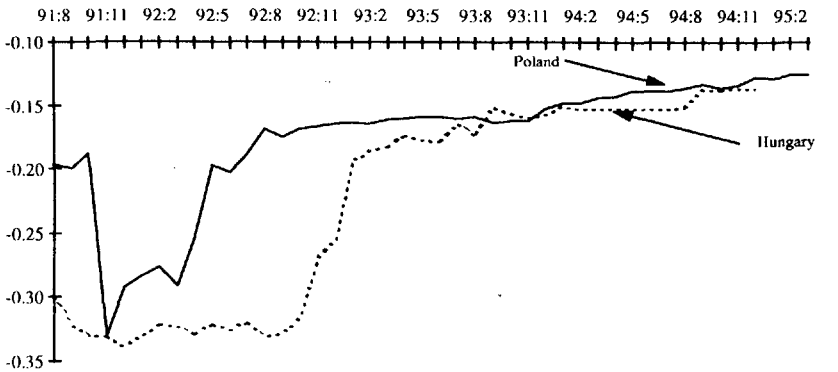
With estimated adjustment coefficients of -0.13 in Poland and -0.14 in Hungary, labour demand reacts to a considerable degree to disequilibrium if one takes into account that the model was estimated on a monthly basis. We therefore have strong evidence that both Polish and Hungarian firms have adjusted labour demand quite rapidly since the start of economic transition. This contradicts the

[16] This result also holds if we replace U with l in equation (8) and include the tax wedge in the error-correction term. The finding of hysteresis in the Polish labour market seems to be robust.

pessimism of some observers and confirms the depth of the systemic changes under way in both countries.

Next, we address the question whether the intensity of adjustment increased after specific institutional reforms. Crucial dates are October 1991 in Poland and April 1992 in Hungary. For empirical investigation we conduct the estimation of labour demand recursively by adding one observation in each step and reiterating computation of λ (Graph 1).

Graph 1 - Recursive Estimation of the Adjustment Coefficient (λ)



For Poland we have a strong confirmation that adjustment intensity rises considerably in November 1991, but falls back again during the year 1992. Whereas the first aspect coincides with what we expect, the decline in adjustment after March 1992 is somewhat of a puzzle. We suggest that banking reform in Poland had the effect of a one-off acceleration of adjustment. It is unclear, however, whether this was sufficient to eliminate all overemployment in Polish industry.

In Hungary, by contrast, λ remained constant at a considerably higher level in 1992 until September, fell sharply until the end of the year and showed no tendency to change afterwards. Therefore,we reach the conclusion that a great deal

of adjustment had been done long before the implementation of the bankruptcy law, which obviously proved to be quite ineffective with regard to the labour market.

A test for a structural break in the value of the adjustment coefficient reveals no significant differences in the time period following the reforms from the period before. The relevant break points and F-statistics are given in Table 3.[17]

Table 3 - F-Test for a structural change of the adjustment coefficient

Hungary		Poland	
d1=92.6-94.12,d1*l_{t-1}	F(1.46)=0.01 (0.91)	d1= 91.10-92.6,d1*l_{t-1}	F(1.48)=0.13 (0.71)

[a] Number in parenthesis is the marginal significance level.

The result of no structural break holds for both Hungary and Poland. We therefore conclude that even for Poland the temporarily higher adjustment coefficient induced no permanent change in the intensity of adjustment.

Concerning the functional form of labour demand, in Hungary we observe quite a good approximation of a Cobb-Douglas technology, although the restrictions d=1 and σ=1 are jointly rejected by a Likelihood ratio test at the 5 percent level of significance (see Appendix V, Table A4). Nevertheless, the early beginning of gradual reforms in Hungary and the dual structure of its labour market during the 1980s might have moved the country closer to long-run equilibrium prior to the reforms than was the case for other countries of the region (Sokil, 1990).

In Poland, the response of labour demand to both output and real wage changes is quite low (d=0.36, σ=-0.45) although the coefficients are significant and show the right sign. A recent study by Franz (1995) finds nearly the same elasticities

[17] Following Graph 1, we chose October 1991 - June 1992 and June 1992 - December 1992 as our relevant break points for Poland and Hungary respectively. In the latter country we thus allow for a two month lag since the enforcement of bankruptcy in April 1992.

(d=0.38, σ=-0.46).[18] A plausible explanation might be that the strong role of insiders in Polish enterprises has limited the downward flexibility of employment in industries dominated by insiders (see Burda and Funke, 1993). In this sense, assuming similar technologies in Poland and Hungary, the lower estimates of real wage and output elasticities could indicate higher allocative inefficiency in Polish industry. This contention leads us to wage determination and the question whether the results of the wage equation confirm the larger role for insiders in the Polish labour market.

4.3. Labour Supply and the Role of Insiders

Both in Poland and Hungary the clear significance of the adjustment coefficient indicates that the real product wage tends to equilibrium defined by the explanatory variables in the labour supply equation. The coefficient on the error correction term in the Hungarian labour supply equation does only slightly differ from one, so current real wages are fully corrected for past errors. Further, a test of the hypothesis of equal coefficients on employment (l) and output (q) is accepted and labour productivity enters the wage equation with a single coefficient (Appendix V, Table A4, A5). The most interesting results, however, concern the differences in the size of the estimated parameters of the structural form in Hungary and Poland.

With α_2 equal to 0.30 in Poland and 0.17 in Hungary, wage setting in the first country is more oriented at sectoral productivity than in the latter. Moreover, the coefficient on the price wedge is near unity in Hungary, but only 0.53 in Poland. The hypothesis $\alpha_1 = 1$ is rejected for Poland, but not for Hungary.[19] Both results are supportive of the hypothesis of insider dominated adjustment in Polish

[18] Using a partial adjustment model, fixed effects panel estimates for all four Visegrad countries indicate relatively low long-run elasticities, with coefficients of 0.21 and -0.26 respectively (Franz, 1995). This contrasts with our results for Hungary. Our long-run elasticites for this country are much higher (d=0.85, σ=-1.06).

[19] See Appendix V, Table A4 column 4, Table A5 column 5.

enterprises following our reasoning in Section 3. The higher elasticity of real producer wages to labour productivity and the partial cushioning of terms of trade shocks in Poland, has reduced the pressure for lay-offs but thereby has lowered the speed at which structural change occurs. Moreover, together with the absence of wage moderating effects of unemployment, the insider dominated adjustment pattern is likely to limit employment creation during recovery, a result that does not contain much hope for Poland's currently 15 per cent unemployed. In Hungary, the wage in industry is more determined outside the sector itself. In this context it is interesting to note that the expansion of the service sector has been considerable in Hungary. Hence employment opportunities in services and corresponding prospects of remuneration may have contributed to this sort of outsider influence on wages.

Finally, note that the restriction of $\alpha_2 = 1$ is rejected for both countries, so that the error correction mechanism cannot be expressed in terms of the labour share (see Appendix V, Table A4, A5). If one still follows this path of interpretation one obtains equilibrium labour shares in net value added of 74 and 78 per cent in Poland and Hungary respectively. Both figures are comparable to Western industrialised economies but considerably higher than in developing countries.[20]

5. Concluding Remarks

In this paper we offer an estimation of labour demand and supply equations on monthly data for the industrial sector in Poland and Hungary. We find a striking contrast between Poland and Hungary. In the former country, we cannot reject the hypothesis of hysteresis in the industrial labour market. In the latter country, at least for the industrial sector, a labour market equilibrium exists.

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[20] See Appendix V, Table A4, A5 column 2. Pinto et al's (1993) study reveals a labour share in value added in Polish SOEs ranging from 40 to 80 percent.

The results for labour demand alone, point towards significantly higher employment adjustment in both countries than predicted by most observers after the initial transition crisis. Institutional reforms like the Hungarian bankruptcy law did not have a significant additional impact. The major challenge would seem to lie in the creation of new jobs. With respect to labour supply, we find interesting differences between the two countries, pointing at strong insider forces in Poland in contrast to Hungary. The former country thereby might have limited labour shedding in industry with wage moderation, which in view of its high unemployment rate may not have been undesirable. However, the effective exclusion of the unemployed from the labour market poses the danger in the future of creating a pool of long-term unemployment. The finding of large insider power thus complements the result of hysteresis in the industrial labour market. In Hungary, a substantial reallocation of labour away from industry seems to have occurred. The resulting transitionary unemployment has provided strong wage moderating effects, although real wages have responded less to productivity developments.

Finally, the level of aggregation chosen in this paper may cloud the interesting interaction of institutional legacies, such as insider power, with sub-sectoral difference such as the extent of the relative price shocks or the degree of labour market competition (Kennedy 1994). Future research will have to take into account such structural differences among industrial sectors as important determinants for the pattern of labour market adjustment in transition economies.

The policy conclusions to be derived from this analysis have to remain speculative in account of the short time span. Nonetheless, developments in Poland mirror some of the experience with labour market rigidities in Western Europe. Strengthening corporate governance structures would seem a high priority for Poland's insider dominated industrial sector. Hungary's challenge seems to lie with macroeconomic revival in order to fully absorb those made redundant by the deep structural change evident in the industrial labour market.

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Appendix I - Variable description:

All variables except for U are log transformed. The real product wage ($w-p_p$) is seasonally adjusted. For the series real product wage and ip seasonal adjustment is performed in RATS 4.10 using the option exponential smoothing.

Variable description: Poland

w Nominal wages are measured as the sum of monthly total wage bill and of non-wage labour costs divided by l. Monthly total wage bill is the product of average gross monthly nominal wage in total industry in thousand (old) zlotys and l. In 1990-1991 GUS-data refer to net wage (that is after deductions on account of income tax of natural persons).

p_p (p_c) Producer (consumer/retail) price index, 1993=100. Since 1994 price indices are calculated on net prices, that is without VAT.

q Industrial production, 1993=100, seasonally adjusted. Sold production of industry covers industrial enterprises with more than 5 persons employed.[21] q is computed by: $(\text{industrial value added}_{1993,I-XII} / 12) * (ip_{t,1993=100} / 100)$. Net value added at factor cost in industry in 1993: 323600 bn (old) zlotys.[22]

l Log of industrial employment in numbers (end month). Monthly data on employment (and wages) cover economic entities with more than 5 persons employed.

U Unemployment rate (adjusted series). U is expressed as percentage rates. Due to correction of number of employment in individual agriculture and in the national economy the registered unemployment rate in 1994 is 0.7 percent above the old series (in 1994.1 16.7 compared to 16.0).

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[21] Industrial production data in GUS are presented under the Polish Classification of the national economy (KGN) and since 1992 under European Classification of Activities (EKD). Starting from 1.1.92 we replace industrial production under KGN by EKD.

[22] gross value added

- depreciation

- taxes on production

+ subsidies on production

= net value added (GUS 1995a, pp. 64, own calculations).

Depreciation is assumed to be 20 per cent of gross value added.

Variable description: Hungary

w Nominal wages are measured as the sum of monthly total wage bill and of non-wage labour costs divided by l. Monthly total wage bill is the product of average gross monthly nominal wage in total industry in forint (HUF) and l. Gross average wage includes personal income tax, employees' contribution to the social security system and the pension fund, as well as the contribution to the solidarity fund (for unemployment compensation).

p_p (p_c) Industrial producer price (consumer/retail price) index. 1991=100.

q Industrial production, 1991=100, seasonally adjusted. q is computed by: $(\text{industrial value added}_{1991,I-XII}/12) * (ip_{t,1991=100}/100)$. Net value added at factor cost in industry in 1991: 532390 millions HUF (619502-19312-67808) (KSH 1993, pp. 45).

l Industrial employment in numbers (average staff numbers). Adjusted series due to new classification. Note that starting from 1.1.93 (1.1.94) industrial employees refer to enterprises with more than 20 (10) employees.

U Unemployment rate. U is expressed as percentage rates.

Source: GUSa,b, Planecon var. issues, GUS (1995b), OECD (1994), KSH, Planecon var. iss., KSH (1993).

Appendix II

Table A1 — Macro-economic Indicators for Poland and Hungary, 1990-1994, percentage change

		1990	1991	1992	1993	1994
GDP[a]	Hu	-3.5	-11.9	-4.3	-2.3	+2.0
	Po	-11.6	-7.0	+2.7	+3.8	+4.5
Industrial[a]	Hu	-9.6	-17.9	-11.0	+3.9	+8.3
production	Po	-23.8	-16.2	+1.7	+5.3	+11.0
CPI[b]	Hu	33.4	32.2	21.6	21.1	20
(end year)	Po	24.9	60.4	44.3	37.6	27
Fiscal[b] balance	Hu	0.5	-2.5	-5.5	-5.9	-8.0
(per cent GDP)	Po	3.1	-6.5	-6.7	-2.9	n.a.
Broad[b] money	Hu	29.2	29.4	27.4	20.0	n.a.
(end year)	Po	160	36.9	57.5	36	n.a.
Exports[b]	Hu	-5.3	-15.3	5.4	-11.9	n.a.
	Po	13.7	-2.4	-3.5	n.a.	n.a.

[a]GUSa, GUSb, SHK, PlanEcon, var. issues. — [b]EBRD (1994).

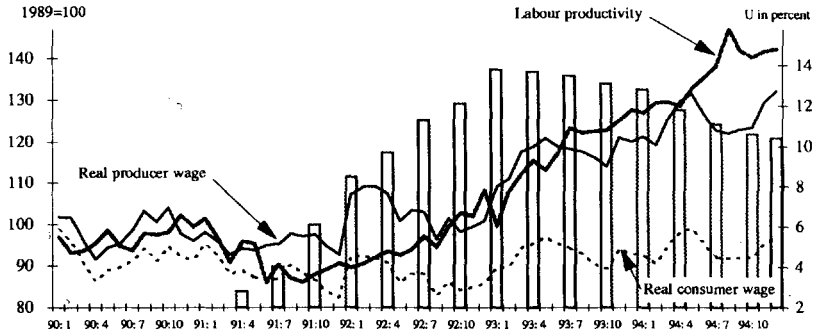
Table A2 - Structural Change Indicators, 1989-94, Hungary and Poland

		1989	1990	1991	1992	1993	1994
Share of Industry in GDP	HU	28.9	27.7	26.7	26.4	25.2	25.4
(1990 constant prices)[a]	PO	49.5	44.9	40.2	38.0	37.1	38.7
Share of Industry in total[c]	HU	30.2	29.7	29.5	28.8	29.1	30.7
employment (incl. agric.)	PO	28.8	28.3	27.7	26.5	25.4	25.3
Share of private sector	HU	-	-	-	-	42.0	-
in total employment [d]	PO	46.6	48.9	54.1	56.0	58.9	60.4
Share of private sector	HU	-	-	-	-	-	-
in industrial employment[e]	PO	29.1	31.2	35.8	40.5	42.7	-
Share of private sector	HU	17.2	25.0	29.0	34.0	50.0[h]	55.0[h]
in GDP[g]	PO	28.6	30.9	42.1	47.2	50.0[h]	50.0[h]

[a] PlanEcon, var. issues. PQS, var. issues. 1993-1994 Data: GUS (1995a, pp. 28). EBRD (1994). KSH (1993, pp. 123). —[b] KSH, var. issues. KSH (1993 pp. 123). PQS (1995, pp. 16). Statistical bulletin (1994).—[c]Employment including private agriculture. PQS (1994, June, pp. 19). KSH (1993a, pp. 123). —[d] Employment including private agriculture. PQS (1994, June, pp. 19; 1994, December, pp. 10). —[e] PQS (1994, June, pp. 19). EBRD (1994)—[f] PQS (1994, December, pp. 35). —[g] EBRD (1993, 1994). GUS (1994, pp. 317), KSH (1993, pp.31) —[h]EBRD estimate (1994).

Appendix III

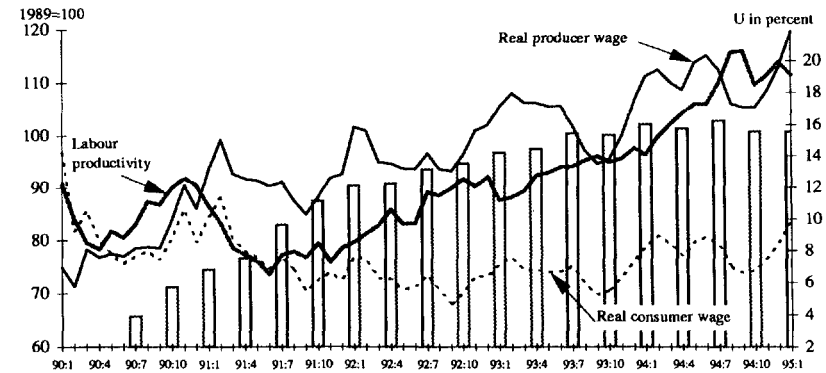
Graph A1 Labour Productivity, Real wage and Unemployment in Hungary



Real producer wage index: Average gross monthly nominal wage in industry deflated by producer price index, 1989=100. — Real consumer wage index: Average gross monthly nominal wage in industry deflated by consumer price index, 1989=100. Both series are seasonally adjusted. ··· Labour productivity: Seasonally adjusted industrial production per industrial worker (old classification, adjusted series), 1989 =100. Note that starting from 1.1.93 (1.1.94) industrial employees refer to enterprises with more than 20 (10) employees. -·- U: Unemployment rate in percent.

Source: KSH, var. issues, OECD (1994) and Planecon (1994).

Graph A2 Labour Productivity, Real Wage and Unemployment in Poland



Real producer wage index: Average gross monthly nominal wage in industry deflated by producer price index, 1989=100. — Real consumer wage index: Average gross monthly nominal wage in industry deflated by consumer price index, 1989=100. Both series are seasonally adjusted. In 1990-1991 data refer to net wage. ··· Labour productivity: Measured as sold production index per one industrial worker, 1989=100. Sold production of industry cover industrial enterprises with more than 5 persons employed. -·- U: Unemployment rate in percent. Note that the classification system of unemployment is verified starting from January 1994. Unemployment rate in the graph above is 0,7 points lower than reported in GUS (1994.1-1994.1).

Source: GUS, var. issues, Planecon (1994), OECD (1994).

Appendix IV

The test for weak exogenity is based on the following regressions (H_0: $v_{i,t-1} = 0$ against H_1: $v_{i,t-1} \neq 0$):

$$(A8)\ \Delta q_t = -c_0 \left[\underbrace{q_{t-1} - c_1 (w - p_p)_{t-1} - c_2 l_{t-1} - c_3 \text{const}}_{v_{1,t-1}} \right] + \text{diff. variables}$$

$$(A9)\ \Delta (w - p_p)_t = -e_0 \left[\underbrace{(w - p_p)_{t-1} - e_1 q_{t-1} - e_2 l_{t-1} - e_3 \text{const}}_{v_{2,t-1}} \right] + \text{diff. variables}$$

(A10)

$$\Delta (q - l)_t = -\gamma_0 \left[\underbrace{(q - l)_{t-1} - \gamma_1 (w - p_p)_{t-1} - \gamma_2 (p_c - p_p)_{t-1} - \gamma_3 \text{const} - \gamma_4 U_{t-1}}_{v_{3,t-1}} \right] + \text{diff. variables}$$

(A11)

$$\Delta (p_c - p_p)_t = -\theta_0 \left[\underbrace{(p_c - p_p)_{t-1} - \theta_1 (w - p_p)_{t-1} - \theta_2 (q - l)_{t-1} - \theta_3 \text{const} - \theta_4 U_{t-1}}_{v_{4,t-1}} \right] + \text{diff. variables}$$

Table A3 - Test for Weak Exogenity

Labour demand		Poland		Hungary	
Variable	H_0	F-Statistic	marginal S'level	F-Statistic	marginal S'level
Δq	$v_{1,t-1} = 0$	F(1,52) =7.13**	0.010	F(1,42) =11.04**	0.002
$\Delta(w\text{-}p_p)$	$v_{2,t-1} = 0$	F(1,51) =5.61*	0.021	F(1,48) =9.64**	0.003
Labour supply		Poland		Hungary	
Variable	H_0	F-Statistic	marginal S'level	F-Statistic	marginal S'level
Δ(q-l)	$v_{3,t-1} = 0$	F(1,51) =7.73**	0.008	F(1,44) =6.00*	0.018
$\Delta(p_c - p_p)$	$v_{4,t-1} = 0$	F(1,52)=12.87 **	0.001	F(1,40) =0.45	0.505

A single * (double**) asterisk indicates that the F-test rejecting weak exogeneity is significant at the 5 (1) percent level.

Appendix V

Test for unit productivity: H_0: $\alpha_2 = 1$ H_1: $\alpha_2 \neq 1$.

Test for equal coefficient on labour input and output: H_0: $\alpha_5 = -\alpha_6$ H_1: $\alpha_5 \neq -\alpha_6$

Test for constant returns of scale: H_0: $d = 1$ H_1: $d \neq 1$.

Test for unit elasticity of substitution: H_0: $\sigma = 1$ H_1: $\sigma \neq 1$

Test for unit price wedge: H_0: $\alpha_1 = 1$ H_1: $\alpha_1 \neq 1$

Table A4 - Different Hypothesis: Hungary

Restriction/ coefficients	*unre-stric-ted*	$\alpha_2 = 1$	$\alpha_5 = -\alpha_6$	$\alpha_5 = -\alpha_6$ $\alpha_1 = 1$	$\alpha_5 = -\alpha_6$ d=1, $\sigma = 1$	$\alpha_5 = -\alpha_6$ d=1 $\alpha_1 = 1$	$\alpha_5 = -\alpha_6$ $\sigma = 1$ $\alpha_1 = 1$	$\alpha_5 = -\alpha_6$, d=1,σ=1 $\alpha_1 = 1$
LR- Test, λ^2 (r)[c]		115.4	2.83	2.76	12.65	20.08	8.61	15.51
$\alpha(\lambda^2$ (r))[b]		**0.00**	**0.09**	**0.25**	**0.00**	**0.00**	**0.04**	**0.00**
Lab. demand								
elast. of subst. σ	-1.05**	-1.01**	-1.06**	-1.05**	-1.00**	-0.94**	-1.00**	-1.00**
output d	0.84**	0.82**	0.84**	0.84**	1.00**	1.00**	0.87**	1.00**
Lab. supply								
constant α_3		**-0.242**[a]						
price wedge α_1	0.90**	-0.93**	1.02**	1.00**	0.90**	1.00**	1.00**	1.00**
output α_5	0.15**	**1.00****	0.17**	0.18**	0.14**	0.17**	0.18**	0.17**
labour α_6	-0.25**	**-1.00****	-0.17**	-0.18**	-0.14**	-0.17**	-0.18**	-0.17**
U[d] α_4	-0.73**	1.29**	-0.52**	-0.50**	-0.73**	-0.48**	-0.49**	-0.48**

A single * (double**) asterisk indicates that the F-test is significant at the 5 (1) percent level.

[a] exp(-0.242) = 0.785. [b] marginal significance level.

[c] critical values: $\lambda^2(1)_{\alpha=0.05}$ =3.84, $\lambda^2(2)_{\alpha=0.05}$ = 5.99, $\lambda^2(3)_{\alpha=0.05}$= 7.81, $\lambda^2(4)_{\alpha=0.05}$= 9.49.

[d] U is taken from the Bewley transformation of the SEM.

Table A5 - Different Hypothesis: Poland

Restriction/ coefficients	*unre-stricted*	$\alpha_2 = 1$	$\alpha_5 = -\alpha_6$	$\alpha_5 = -\alpha_6$ d=1	$\alpha_5 = -\alpha_6$ $\alpha_1 = 1$	$\alpha_5 = -\alpha_6$ d=1, $\alpha_1 = 1$
LR-Test, λ^2 (r)[c]		239.9	0.09	134.8	9.24	141.3
$\alpha(\lambda^2$ (r))[b]		**0.00**	**0.75**	**0.00**	**0.01**	**0.00**
Labour demand						
elast. of subst. σ	-0.45**	-0.45**	-0.45**	-0.28**	-0.45**	-0.28**
output d	0.36**	0.36**	0.36**	1.00**	0.36**	1.00**
Labour supply						
constant α_3		**-0.305**[a]**				
price wedge α_1	0.39*	1.54**	0.53**	0.53**	1.00**	1.00**
output α_5	0.27**	1.00**	0.31**	0.31**	0.35**	0.35**
labour α_6	-1.11*	-1.00**	-0.31**	-0.31**	-0.35**	-0.35**
U α_4	-0.72	-3.49**	0.30	0.32	-1.11**	-1.10**

A single * (double**) asterisk indicates that the F-test is significant at the 5 (1) percent level.

[a] exp(-0.305) = 0.737. [b] marginal significance level.

[c] critical values: $\lambda^2(1)_{\alpha=0.05}$ =3.84, $\lambda^2(2)_{\alpha=0.05}$ = 5.99, $\lambda^2(3)_{\alpha=0.05}$= 7.81, $\lambda^2(4)_{\alpha=0.05}$= 9.49.