A Computational Political Economy Model of Transition[.]

John E. Jackson[#]
University of Michigan
Haven Hall
Ann Arbor, MI 48104
email: jjacksn@umich.edu

The political and economic transitions in East-Central Europe are a unique laboratory for studying the dynamics of social change, prompting a number of studies offering theoretical and empirical insights into transition processes. The best theoretical papers develop propositions about the speed of transition and explore the political and economic aspects of this process. (See Aghion and Blanchard, 1994; Castanheira and Roland, 2000; Dewatripont and Roland, 1994; Fidrmuc, 1998, 2000a and 2000b; Rodrik, 1995; and Roland 1992 and 2000.) Often these papers treat the economic or the political variables exogenously. Yet common sense as well as empirical evidence suggest they are jointly determined. This paper presents a computational model of transitions that captures this endogeneity, relating vote outcomes to economic change, and vice-versa. The economic model relies on the proposition developed by Castanheira and Roland (2000) that the rate of job destruction affects income growth, which in turn affects saving and capital accumulation, which influences the rate of job creation in the new private sector.

[.]Forthcoming, *The Political Economy of Transition*, Jan Fidrmuc, Nauro Campos and Juergen von Hagen (eds.). Klewer.

[#] Professor of Political Science and Area Director, William Davidson Institute, University of Michigan, Ann Arbor, MI, USA.

I want to thank Scott Page, Gerard Roland and the participants at the Bonn Conference for their helpful comments. All errors are my own.

The extension developed here is that the speed of transition is defined by the level of subsidies for the state sector, which are funded by taxes on wages and on profits in the emerging private sector. The subsidies and associated taxes are, in turn, a function of the political support for reform governments, which is related to the distribution of employment between the new private sector, the remaining state sector and unemployment. The model is based on recent empirical evidence about job destruction and creation and their political implications. The first section of the paper presents the economic model, including the subsidy and tax variables. The next section adds the propositions relating the level of subsidy to political support and then to the employment distribution. The third section explores the model.s predictions about the speed and success of the transition under different scenarios. The paper then concludes with a suggestion on directions in which the political model needs to be expanded to better

integrate the economic and political processes. The model.s most significant implication is that for appropriate parameter values it is possible to have simultaneous economic and political reforms.

A Formal Model of Economic Transition

The representation of the economic transition is developed in two parts. This section develops a model of the state and private sectors and the transition from a state dominated to a private market economy. These equations capture the major features and propositions about the economy and how it develops. The next section presents a computational version of the model that can be used to examine its dynamic properties.

The model features two different sectors, the older state sector denoted by *s* and an emerging de novo private sector subscripted by *p*. Each sector has its own Cobb-Douglas production function, with total output being the sum of the output from each sector. For period *t*,

$$Y_{st} = A_{st} L_{st}^{\alpha_s} K_{st}^{\beta_s}, \qquad (1)$$

and

$$Y_{pt} = A_{pt} L_{pt}^{\alpha_p} K_{pt}^{\beta_p}, \qquad (2)$$

$$Y_t = Y_{st} + Y_{pt}.$$

L and *K*, with subscripts, refer to the labor and capital inputs in the state and private sectors.

The objective function for enterprises in each sector is quite different. State enterprises are assumed to want to maintain their labor force at as high a wage as possible, do not make any profits, and do not pay for capital depreciation, which depreciates at a rate *ä.* State firms may receive a subsidy set by the government. The subsidy is proportional to their labor force in the previous period so the total subsidy is $G_t = \sigma L_{s,t-1}$. The subsidy is divided between capital and labor, with γG_t going to capital and $(1-\gamma)G_t$ going to labor. With the subsidy, state capital at time *t* is,

$$K_{st} = (1-\delta)K_{s,t-1} + \gamma G_t. \qquad (3)$$

The subsidy is financed by a wage tax on workers in both sectors and a profits tax on the private sector, which are discussed subsequently.

If the state sector labor force is constant its projected revenues at time *t*, including the subsidy, are The wage bill from the previous year is . If the projected revenues equal or exceed the prior year.s wage bill, the state enterprises keep the same labor force and raise wages so the current year.s wage bill equals total revenues, i.e. if then,

$$A_{st} L_{s,t-1}^{\alpha_s} K_{st}^{\beta_s} + (1-\gamma)\sigma L_{s,t-1} \geq w_{s,t-1} L_{s,t-1}, \quad w_{st} = [Y_{st} + (1-\gamma)G_t]/L_{st}$$

and $L_{st} = L_{s,t-1}$,

$$w_{st} = [Y_{st} + (1-\gamma)G_t]/L_{st}. \qquad (4)$$

If the projected revenues are less than the previous year.s wage bill, wages are constant and the labor force is decreased so the wage bill equals total revenues, i.e. if [then,
$_{1t1ttssts}LwG1Y_{..<.+}])(.\gamma$
w and $,_{1.=tt}SSw$

(5) $.])([0LwG1KLA_{ttststsstsss=..+\gamma\beta\alpha}$
Eq. 5 is then solved for the value of . $_{t}SL$
Private enterprises maximize profits, given by,
$,_{ttptptpptKLwY\delta..=\pi}$
(6)
whereδ and rate esector wag private theis
$_{pw,t}pL_{,tpw.ttt}pstuLLLL_{..=}$is the capital depreciation rate. The private sector labor force, and wage rate, are set simultaneously to clear the labor market. Labor demand is determined by the marginal productivity of labor and the supply is a function of the unemployment level, (The level of state employment is determined by equations 4 or 5.)
Demand: $w\alpha=$
(7) $_{pp}ppppKLA\beta\alpha1.$
Supply: $).LL1/(L/)L(fwupuup_{2121..}===++\omega\omega\omega\omega$
(8)
The form for eq. 8 is arbitrary but has the desired property that the wage associated with zero unemployment is infinite. Equating these two functions gives an expression that can be solved forwhich is then used in eq. 7 to compute the private sector wage rate. $,Lp$
The government may both subsidize state sector enterprises and offer benefits to the unemployed. The unemployment benefit is denoted by $ó_u$, so the total unemployment cost is $).(_{ttpsuuutLL1LB..==}\sigma\sigma$ The unemployment rate and the total cost of unemployment insurance is determined after the state and private sectors have set their labor force.[1] State $_{p}\tau$enterprise subsidies and unemployment benefits are financed by a tax on private sector profits, , and a tax on workers. earnings, $_{e}\tau_{tp}\pi$. The total cost of these two state programs, assuming no deficit financing, is $G).(_{ttttppssetttLwLwB}++=+\tau\tau$ In the model, the
[1] In a more complete model, higher unemployment benefits would change the supply of labor equation as they reduce the differential between wages and benefits. This will not be the case here.

state sets the subsidy and benefit rates, $ó_s$ and $ó_u$, and the taxes are then determined by the costs of the total subsidy and unemployment benefit programs.
The profits and earnings taxes have an important consequence. They reduce the total savings the private sector might use for investment in the next period to establish new enterprises or to expand existing ones. Corporate savings is one minus the profits tax times profits. Individual savings are a proportion of after tax

earnings, with the proportion denoted by ê. Combing these two sources gives savings in year *t* as,

.)())((*tpssppetttttt1LwLw1Sπιτκ.++.=epττ/*

(9) It is apparent in eq. 9 that higher the tax rates financing state subsidies and unemployment benefit programs the lower the savings that can be reinvested. The proportion of tax money raised by the profits tax, , is set exogenously but can be varied in the model.

The last piece in the economic model is capital accumulation in the private sector. Current empirical evidence suggests that most growth and job creation in the new private sector is the result of de novo firms. (Jackson, Klich and Poznańska, 1999 and 2002; Jurajda and Terrell, 2001.) This has a number of implications for how to model the capital accumulation process. One is that there may be more and less efficient institutions making capital available for entrepreneurs starting and/or trying to expand their enterprises. The less efficient these institutions, the more leakage from savings to the actual use of capital in the private sector. There may also be direct leakage if entrepreneurs who realize a profit do not reinvest but remove their funds from the economy, such as into foreign bank accounts. Foreign owned firms may repatriate profits, removing them from local investment. Thirdly, it is quite clear that de novo firms fail at a regular and at times a high rate, particularly early in the transition. (See Jackson, Klich and Poznańska, 1999.) This also entails a non-trivial degree of inefficiency as funds are used to start new firms and deal with bankruptcies. The implication of these propositions is that the private capital available in period *t* is a function

of capital the previous period minus depreciation plus some proportion of the savings in the previous period,

1₁)1(.+.=.*tssSKK*ττ.δ.

(10)

The value of *ö* is important as it has a strong influence on the success and speed of the transition.

A Computational Model of Transition

A computational model is an efficient way to examine and sumarize the dynamic properties of the formal model. This paper.s focus is on explicit government policies controlling the speed of transition and how those policies are in turn affected by the speed of transition. To that end, we focus the discussion on the two subsidies, *ós* and *óu*. These are controlled directly by the government and exert a large influence on the transition in two ways. The larger the subsidy for the state sector, the longer resources stay in that sector rather than moving to the more productive private sector. Secondly and less directly, the higher the subsidies for the state sector and the unemployed, the higher tax rates must be to finance the subsidies, which slows the growth of the de novo sector.

This section explores the properties of the model for different values of the two subsidy parameters through the computational model. The computational model assumes values for the other parameters, such as those in the production functions; the savings rate, *ê*; the capital accumulation term, *ö*; the share of the state subsidy going to capital, *ã*; and the size of the profits tax relative to the earnings tax, *eptt/*; etc. and runs simulations for different values of the policy parameters. The time paths for key variables such as the unemployment rate and total output in each sector reveal how transitions differ for different values of $ós$ and $óu$.

Parameterization

The key step in the computational model is selecting values for the various parameters in the model. Table 1 lists the different parameters and the values chosen. Both sectors have constant returns to scale and the same marginal product for labor and capital. The private

sector is more efficient than the state sector, defined as different values for *A*.[2] Individuals are assumed to save two percent of their wage income and capital depreciates at a straight line rate of seven percent per time period. The key parameters in the labor supply function, $ù1$ and $ù2$, are set to 0.15 and 0.06 respectively. These parameters affect the speed of transition, as they influence the private sector wage rate, which in turn affects how fast the de novo sector hires workers. The higher the values, the higher the private sector wage, the slower the rate of hiring and the higher the unemployment rate. Appendix A presents simulations with different values for $ù2$.

Table 1: Parameter Values for Computational Model		
Function	Parameter Value	
State sector production function	A_1	0.80
	$á_1$	0.45
	$â_1$	0.55
Private sector production function	A_2	1.00
	$á_2$	0.45
	$â_2$	0.55
Savings rate from wages	*ê*	0.02
Capital depreciation rate	ä	0.07
Private capital accumulation	ö	0.60
Share of subsidy to state	*ã*	0.20

capital		
Profits tax relative size	*epτ*/τ	5.00
Labor supply	$\grave{u}_1$	0.15
	$\grave{u}_2$	0.06
Initial labor allocations	L_s	0.90
	L_p	0.10
Initial capital allocations	K_s	0.95
	K_p	0.05

[2] These restrictions on á and â are made to simplify the structure of the model and to minimize the differences between the two sectors in order to highlight the efficiency differences.

We assume that twenty percent of the state subsidy goes to capital, ã=0.2; that the profit tax rate is five times the earnings tax rate, *epτ*τ/=5; and that private sector capital accumulates at the rate of sixty percent of savings, ö=0.6. Discussions in the text and in Appendix A illustrate how variations in these parameters affect the speed of transition. They do not, however, alter the qualitative characteristics of the transition associated with different subsidy regimes. The experiments in Appendix A also illustrate that the values selected for ã and for *epτ*τ/are conservative in terms of unemployment, GDP, and the likelihood of a *00ssL*/successful transition. Lastly, the beginning labor and capital allocations assume the state sector employs ninety percent of the labor force and ninety-five percent of the capital. Initially there is no unemployment, wages in the state sector equal average productivity, , meaning that all output goes to labor, and in the private sector, wages equal their marginal product, *0sYw*=*0020pppL*/*Yw*α=.

The final step setting the initial conditions calculates private sector profits, given its labor force, wage rate, and capital stock and then sets the subsidy and taxes for the first transition period.[3] From this we derive the level of savings, given wages, profits and the tax on earnings and capital. These lagged values for the subsidy and for savings determine the next period.s capital in the state and private sectors, following eqs 3 and 10. , and *1t1tpsKK*++

Modeling the Transition

The transition begins with a permanent shock to the state sector that reduces the value of its output given the initial labor force and capital. This is achieved by a reduction in the value of A_1 from .8 to .7. This change in A_1, absent any subsidy, deceases state sector output

[3] Subsidy rates, $ó_s$ and $ó_u$, in the first year of the transition are set to half their normal magnitude to smooth the subsidization process. One may envision such a scenario if the subsidization process begins half way through the first time period.

and employment by about twenty-five percent. The level of private sector employment and its wage rate are then determined by eqs. 7 and 8. The level of unemployment can then be determined as well as the output of each sector, and thus total output. From this information, private sector profits, savings, the state subsidy, and tax rates can be determined, and the cycle repeats. The economy is then iterated for 100 time periods. (A time period is arbitrarily based on what one wants to assume is the appropriate lag between savings and subsidy in one period and capital and state sector labor and wages in the next and the rate of depreciation.)

The state subsidy and unemployment benefit rates, $ó_s$ and $ó_u$, are varied in different simulations to examine how they affect the transition.s speed and success. The experiments displayed in Figs. 1 and 2 vary $ó_s$ between 0.0 and 0.25 and $ó_u$ between 0.0 and 0.2. Fig. 1 shows the sequence of unemployment levels for each of the experiments and Fig. 2 the sequence of total output. The heavy unmarked line shows the sequence without any subsidies, the harshest form of shock therapy. In all the experiments with subsidies unemployment in the early years of the transition is lower than in the unsubsidized case. These subsidies considerably slow down the speed of transition, as expected. Fig. 2 shows that there is a significant loss in aggregate output over the short and medium term associated with these subsidies and taxes. The simulations also indicate that if the subsidies, and associated taxes, become too high the transition stalls completely, output collapses, and long term unemployment becomes one hundred percent. Increasing $ó_u$ from 0.1 to 0.2 with $ó_s$ = 0.2 or increasing $ó_s$ from 0.2 to 0.25 with $ó_u$ = 0.1 leads to this economic collapse.

An interesting feature of the model is that scenarios with higher levels of unemployment in the early stages of the transition had higher rates of GDP growth during most of the transition. The explanation for this relationship lies in the labor supply function. The higher the level of unemployment, the lower the wage rate in the de novo sector. The lower wages

have two beneficial consequences. First, lower wages mean higher profits for the de novo firms, which increases savings, which in turn leads to faster expansion of the private sector. Second, the new enterprises hire more labor and at a faster rate, raising output and lowering unemployment in the medium and long term. Tichit (2002) presents results showing a positive relationship between growth and unemployment for twenty-five transitional

countries, suggesting this is a common pattern among transition countries.

The value of *ö* strongly affects the speed and likely success of the transition. The higher this value, the higher the rate of increase in private sector capital, which in turn increases this sector.s ability to hire workers forced out of the state sector. Also, the faster the private sector expands the less likely higher values for the state and unemployment subsidy rates are to thwart the transition. With faster job creation unemployment will be lower, reducing the total cost of the benefit program, and the tax rate can be lower for a given subsidy rate. It will be useful to get a brief view of how variations in *ö*.s magnitude affect the transition. The dashed lines in Figs. 1 and 2 show the trajectory of unemployment and output with $ó_s$ = 0.25 and $ó_u$ = *0.*1 but *ö*=0.7 rather than 0.6*.* The transition fails with these subsidy rates and the lower rate of de novo firm creation and growth but succeeds with the higher level of *ö*. Government policies can affect the level of *ö,* and thus the speed of transition, though this parameter is not treated endogenously in the subsequent section. The causal links between government actions and the rate of de novo firm creation are less direct and less well understood than the links between subsidies, taxes and the speed of transition. For that reason, *ö* is kept exogenous and discussion focuses on the subsidy and tax rates.

There are several important results in the simulations shown in Figs. 1 and 2. One is the demonstration that there is a trade-off between the speed of transition and growth in total output. A transition government can slow down the speed of transition by taxing the de novo private sector in order to subsidize the state sector. Slowing down the transition reduces

unemployment in the short run but in the long run it lowers growth and increases unemployment because labor is held in the less productive state sector rather than transferring to the more productive private sector. A second result is that it is possible for a government to be too responsive to the demands for subsidies. Once the level of subsidies, either for the state sector or for the unemployed, pass a threshold the transition collapses. As the decision to subsidize the state sector and the unemployed through taxes on earnings and the private sector is a political decision, we next explore the political conditions that affect the tax and subsidy levels. The central question now is whether it is possible to have a successful transition with a public sector that responds to political demands for subsidies to ameliorate the effects of job destruction.

A Political Economy Model of Transition

This section makes the choice of tax and subsidy policies

endogenous and examines conditions that lead to faster or slower reforms and economic growth. The political part of the model consists of two equations. The first relates the political support for parties espousing liberal policies to the employment distribution by sector. The second part then relates subsidy and tax policies to the liberal party.s support. Once these components are described and included in the model several different scenarios are simulated to see how conditions affect the speed and success of the transition.

Employment Distributions and Liberal Party Support

The primary factor determining support for the liberal party is employment in the de novo sector. Fidrmuc (2000a and 2000b) finds a fairly consistent and significant association between the amount of entrepreneurial activity and voting for the pro-reform parties in an analysis of elections in several countries. Jackson, Klich and Poznañska (2001 and 2003) in an analysis of several Polish elections using both survey data and election returns find a similar result based on the proportion of the workforce employed in jobs in the de novo

sector. These results are consistent with the theoretical models developed by Fidrmuc (1998) and Rodrik (1995) who expect workers in the emerging private sector to support reforms and to oppose taxes to fund subsidies for the state sector and the unemployed.

There is less agreement about how other factors related to the transition are associated with support for reform parties. Rodrik concludes that the unemployed should support the reform party as their policies should increase unemployed individual.s likelihood of finding jobs. Fidrmuc thinks this may be true in the early stages of the reform but as growth in the new private sector slows the unemployed will have interests comparable to those of the state sector workers. Fidrmuc.s empirical work is generally consistent with his propositions as the unemployment rate is often negatively related to the vote shares of the reform parties and positively related to the shares for the opposition. He does not have a direct measure of the relationship between votes and employment in the state sector however. Jackson, Klich and Poznañska do include a measure related to employment in the state sector and find that it is positively related to votes for the opposition party though the magnitude of the relationship is smaller than the relationship with de novo employment. They do not find any association between vote shares for any of the parties and the unemployment variable. This absence of a relationship occurs in their individual level analysis as well. The specification used here relates support for the reform party positively to the size of the de novo sector and negatively to the size of the state sector and to the proportion unemployed.

The functional form used here follows the one in Jackson, Klich and Poznañska (2001 and 2003) that uses the logistic form to relate the vote share for the reform party to a set of economic, demographic and social variables. In this case the explanatory variables are the employment shares in the private and state sector and the proportion unemployed. (Fidrmuc uses a linear form, though most recent empirical work examining multi-party elections uses

the log-odds form. See Honaker, Katz and King, 2002; Jackson, 2002; Katz and King, 1999; and Tomz, Tucker, and Wittenberg, 2002.) The electoral support function is,

*)LaLaLaa(rtu3ts2tp10t*e11V..+.+= ,

(11) where *V* is the support for the reform party at time *t*. Eq. 11 is the standard logistic expression positively relating the reform party.s support to the size of the labor force in the private sector and negatively to the size of the state sector and the amount of unemployment. *tr*

The second part of the political model is an expression relating the level of support for the reform party to the subsidy for the state sector and for the unemployed. There are two links to this association. The basic assumption is that there is a parliamentary government and that the liberal party.s ability to influence subsidy levels and tax policy is monotonically, but not linearly, related to the number of seats it holds in the parliament. An obvious functional form is again the logistic function. A second assumption is that there are a sufficient number of districts and seats per district so that the liberal party.s proportion of the seats is directly related to its share of the votes, as represented by eq. 11.[4] With the proportion of the parliamentary seats held by the liberal party denoted by *P*, these propositions are represented by the following relationships,

and *,e1bb)]P1/(P(bb[00s*2*1*...+.=σ

(12)

[4] Jackson, Klich and Poznañska, 2002, analyze the votes to seats relationship in the Polish Sejm and conclude that even with the d.Hondt formula for allocating seats if there are more than about 10 seats in a district the seat proportion is very close to the vote proportion. The d.Hondt formula is one of the least proportional allocation rules. Using a more proportional rule, such as St. Lagüe, the seats and vote proportions are close to being identical even with a small number of seats. See Benoit, 2000.

)V1(V)P1(Prr... .

(13)

The functional form in eq. 12 is chosen specifically to give a reverse logistic relationship between liberal seats and policy. In this form, if the liberal party has only a few seats, increasing its proportion of seats does not have as large an impact on subsidy levels as if it had a more substantial

number of seats. Then, at higher proportions adding more seats reduces the subsidies by a smaller amount. The parameter b_0 is used to set a ceiling on the subsidy rate, which is set to 0.25 for each state worker, the rate at which the transition failed in the previous simulations. The form in eq. 13 follows the form used in conventional votes to seats analyses. (See Benoit, 2000; Jackson, Klich and Poznañska, 2002; and King, 1990.)

Eqs. 12 and 13 give the following relationship between subsidies for the state enterprises and liberal party support,

$$\sigma = \ldots + bb_1 e^{rr_{00}[bb_0 + V/(V1)]} \quad (14)$$

Eqs. 11 - 14 make the tax and subsidy level, and thus the speed of transition, endogenous. The rate of job formation in the de novo section and the rate of job loss in the state sector determine the support for the reform party, which in turn sets the speed of the transition by determining the level of the subsidy for the state sector. A similar set of expressions describe the relationship between unemployment benefits and liberal party support.

Simulations

Simulations are run for three sets of electoral parameters, eq. 11, and three sets of pararmeters for the level of the subsidy, eq. 14. Table 2 shows the values of these parameters.[5] (To simplify matters, the subsidy rate for the unemployed is set to half the rate for state enterprises for all simulations, $\sigma_u = 0.5\sigma_s$. This way only one set of results need to

[5] All simulations are done with the same model parameters shown in Table 1 and used in the simulations shown in Figs. 1 and 2.

be presented.) The variations in electoral parameters vary the vote share of the liberal party for a given level of de novo job creation. The parameters for the lowest and highest rates of political response simulations are taken, with some small modifications, from estimation done with the 1993 and 1997 Polish elections. (Jackson, Klich, and Poznañska, 2001.)

Table 2: Parameters in Political Simulations

	Political Response				Subsidy Policy Response		
Level	a_0	a_1	a_2	a_3	b_0	b_1	b_2
High	-0.905	.00	2.00	1.50	0.250	8.00	40.00
Medium -	0.70 3	.00	2.00	1.50	0.263	3.00	15.00
Low	-0.501	.00	2.00	1.50	0.263	3.00	12.00

The parameters in the subsidy equation, eq. 14, are chosen quite arbitrarily, as there is no empirical research to guide their selection. All three sets of parameters are

chosen so that the highest subsidy rate is 0.25 per state sector worker, which amounts to about a third of the initial state sector wage. The relationship between liberal support and the subsidy rate for each scenario in Table 2 is shown in Fig. 3. In the scenario labeled High the subsidy rate falls the most sharply with increased liberal support, but only after that support reaches about twenty percent. Below that level of support, there is almost no change in the level of the subsidy as V_r increases. In the other two scenarios subsidy rates decline more gradually, though still retaining the reverse S-shape. The subsidy rates in the low scenario are always higher than in the medium scenario, regardless of the level of liberal support.

Table 3 shows the employment share in the private sector for selected time periods for the different political responsiveness and state subsidy simulations. The transition is successful in six of the simulations, meaning that in the long run all workers are either employed in the private sector or unemployed.[6] The speed of transition, as measured by the private sector

[6] Recall that the values selected for *ã* and *ep/*ττare ones least associated with a successful transition.

share of employment after twenty periods, is quite different among these successful scenarios. These shares vary from thirteen to thirty-three percent. In all of the successful transitions long run GDP converges to the same level as in the case with no subsidies, though this convergence takes longer for larger subsidies. Fig. 4 plots GDP, relative to year 0, for each of the different scenarios. The top, darker line is the GDP trajectory with no subsidies. The lighter lines are the GDP trajectories for the successful scenarios.

Table 3: Size of De Novo Sector, as Percent of Labor Force

		Subsidy Resp. = Low			Subsidy Resp. = Med			Subsidy Resp. = High		
Time	No	Political Support			Political Support			Political Support		
	Tax	Low	Med	High	Low	Med	High	Low	Med	High
1	9.7	3.4	3.4	3.4	3.7	3.7	3.7	3.0	3.0	3.0
2	13.6	3.5	3.5	3.5	3.8	3.8	3.8	3.0	3.0	3.0
3	17.9	4.0	4.0	4.0	4.3	4.3	4.3	3.5	3.5	3.5
4	22.6	4.7	4.7	4.7	5.1	5.1	5.0	4.0	4.0	4.0
5	27.6	5.7	5.6	5.6	5.9	5.9	5.9	4.7	4.8	4.8

5		5.5	5.4	5.4	5.9	5.9	5.8	4.7	4.6	4.6
10	49.9	9.2	9.2	9.2	10.0	10.1	10.1	7.8	7.7	7.7
20	74.9	14.6	15.1	16.0	18.2	22.8	33.3	12.8	13.0	13.1
50	93.6	13.0	85.6	89.1	88.7	90.6	91.3	14.5	14.2	86.9
100	96.1	0.8	95.8	95.9	95.9	95.9	96.0	1.5	1.0	95.8

The scenarios where the transition was not successful present interesting cases. These are shown as dashed lines in Fig. 4. One, the Low-Low case, is expected because electoral support for the liberal party is weakly related to the growth of the de novo sector *and* increases in liberal support lead to small reductions in state and unemployment subsidies. This is likely the case some expected when they predicted it would be difficult to have both economic and democratic reforms simultaneously because the job destruction would lead to political opposition to the reforms and to demands for continued subsidies for the state enterprises, which would slow or halt the transition.

The other two failed cases represent interesting scenarios. Both are for simulations with a very steep association between liberal support and the reduction in state subsidies, but only after liberal support passes a particular threshold. In the scenarios where liberal support is weakly or moderately related to de novo job creation, this support never gets past the threshold where it reduces subsidies and the associated taxes sufficiently to sustain the transition. This slows and eventually halts the transition. Such a circumstance can arise if the political institutions are structured in a way that disadvantages the fledgling liberal constituency and reduces its ability to influence policy. One such disadvantage would be if the liberal party must gain a substantial number of seats in order to have an influence on policy, as might happen in a two party system. A second disadvantage would be if the liberal party does not gain seat shares proportional to its vote share because of the way the districts are drawn and/or because of the votes to seats rule used. Jackson, Klich and Poznañska (2002) discuss these latter situations in detail for the Polish election in 1993. They show that the liberal parties. shares change significantly with changes in the allocation of seats per district, the votes to seats rule used, and the vote threshold for getting any seats at all.

The rate at which the de novo sector can expand and absorb the workers laid off in the state sector is critical to successful reforms. The importance of the growing de

novo sector can be seen if we change the rate at which savings are translated into new enterprises and employment. This is the *ö* parameter in the economic model. The simulations are rerun with this parameter increased to 0.7 and decreased to 0.5. The question is whether some of the unsuccessful transitions would have been successful with the higher rate of de novo sector expansion and whether some of the successes might have not been so with slower rates of expansion. The results are as expected. With *ö*=0.7 the only unsuccessful transition is when there is low political response and the subsidy response is very high and steep -- the case where there is very little change in subsidy rates associated with a change in liberal support

for low levels of support. The results change substantially when *ö* is lowered. With *ö=0.5* three of the successes are now not successful. These are with low political response and a middle subsidy response, the middle political response and a low subsidy response, and the high political and subsidy response. The last result means that there were no situations of a successful transition when the subsidy rate is not responsive to increases in liberal support at low levels of that support. Different values for *ã* and *ep/*ττ would also change the proportion of successes.

An important implication of the results in this model and the supporting empirical evidence is that so long as the de novo sector expands sufficiently rapidly during the transition then simultaneous economic and political reform is possible. The speed of the transition will be slower than if the most stringent policies with respect to subsidies for the state sector are pursued, our base case. The major difference is that with the political transition, unemployment is lower in the early stages of the transition as the subsidies hold workers in the old state sector. There is then a period where unemployment is higher with the political transition but in the successful scenarios long run unemployment is nearly identical to the case with no subsidies. The political transition, however, comes at a cost of a lower GDP, though in the long run the GDP levels in even the poorer performing, but successful, scenarios approach those in the base case. This ability to catch up to the performance in the base case is not true, however, in the very poorest performing scenarios with low political responsiveness to the growth of the private sector and/or with high taxes and subsidies even if there is political support for the liberal party. Thus, it is possible for the economic and political reforms to fail, but there is a wide range of cases where both succeed.

Expanding the Electoral and Policy Connections

The concluding section explores how the political model might be expanded to reflect better some of the political dynamics. In a full model the parameters in the electoral system,

denoted here by *a*, should not be independent of the size of the de novo sector and the subsidy parameters, denoted by *b*, should not independent of the electoral process as in the simulations reported here. The parameters in the electoral model should be a function of the platforms of the competing parties as well as of the importance of economic policy in voters. decisions. In the standard spatial model of electoral competition the coefficient relating people.s vote decisions to their policy preference is partially a function of the distance between the competing parties. platforms. Ultimately, if the parties have identical positions, this issue receives no weight in the vote decision. The further one party.s positions differ from the person.s preferred point relative to the competitor.s position, the greater weight this issue receives in the vote decision.

This more elaborate model creates a dynamic process that has substantial implications for the model in this paper, and for the ultimate relationship between the growth of the de novo sector and the tax policies that affect the speed and level of the economic transition. The larger the size of the de novo sector the more the distribution of voter preferences shifts towards favoring lower subsidies and tax rates and a faster transition. If the opposing party does not shift its platform, or policies, in response to the shift in voter preferences the weight given to differences in economic policy will be large, producing greater support for the liberal party. This is the implicit assumption in the model presented here in what is called the high response scenario and represented by a high value for a_1.

The shift of the median voter to a stronger pro-reform position is likely to force a party that might otherwise oppose a fast transition to adopt a more liberal position if it hopes to be competitive electorally. As this party.s position becomes more centrist on economic policy, and closer to the position of the liberal party, the smaller the coefficient on the size of the de novo sector in the electoral model, as found in the low response scenario. In this setting this lower coefficient does not mean that the system is less responsive to constituents favoring a

faster and complete transition. It simply means that both the liberal and non-liberal parties are closer to agreeing on subsidy and tax policy and the speed of transition. When, or if, this partial convergence occurs the parameters is the subsidy equation will shift indicating lower subsidies and taxes even if the support for the liberal party has not increased.

What we are likely to find is that if the de novo sector is growing and if the opposition party is a pragmatic party that values winning elections, the electoral model is likely

to resemble the less responsive model in terms of its parameters, but simultaneously the difference in the tax rate that is likely associated with different electoral outcomes will be smaller. In other words, as the political process moves closer to the parameters that define the less responsive system, tax policy will be closer to the parameters that define the low tax regimes in the simulations. The next version of the model needs to make the parameters in the party support and tax policy equations a function of the size of the de novo economy. The current model does show, however, that economic and political reforms are mutually compatible as both depend upon the growth in the de novo sector.

Fig. 1: Unemployment Rates00.20.40.60.810510203550TimePercentó(s)=0,ó(u)=0 ó(s)=.1,ó(u)=.1 ó(s)=.2,ó(u)=.1 ó(s)=.2,ó(u)=.2 ó(s)=.25,ó(u)=.1ö=.7

Fig. 2: Total Output012345051020355010 0TimeYear 0 = 1ó(s)=0,ó(u)=0 ó(s)=.1,ó(u)=.1 ó(s)=.2,ó(u)=.1 ó(s)=.2,ó(u)=.2 ó(s)=.25,ó(u)=.1ö = .7

Fig. 3: State Subsidy Equations00.050.10.150.20.250.00.10.20.30.40.5Liberal SupportSubsidy RateLoMedSteep

Fig. 4: Annual GDP012345051020355075100TimeGDP (Year 0 = 1)BaseLoLoLoMedLoHiMedLoMedMedMedHiHiLoHiMedHiHi

Appendix A
Variations with the Computational Model

Several of the computational model.s parameters should nominally be thought of as policy variables even though they are not treated as such. The government sets the level of the profits tax rate relative to the earnings tax and can vary the proportion of the state subsidy going to capital. This appendix varies these two parameters to illustrate how they change the time path for the transition. The parameter in the labor supply function is also varied to illustrate the impact increasing the equilibrium wage has on the speed of transition and the levels of unemployment and GDP. Overall, these variations alter the timing of the transition but not the depiction of the transition in any qualitative or substantive way.

The moderately subsidized scenario from Figs. 1 and 2, *,1.02.0us*==σσ and *0.2e*= is used in these simulations. These experiments are done with twenty percent and with zero percent of the state subsidy going to capital, *ã* = 0.2 and *ã*

= 0.0, and with the profits tax rate set at five times and twice the earnings tax rate, */0.5/pep*=ττττ and . (The simulations in Figs. 1 and 2 use *ã* = 0.2 and 5.0=*ep/*ττ.) Figs. A1 and A2 show the time path for GDP and unemployment for these four scenarios and for the case with no subsidies.

There are interesting and important variations in the time paths for the different scenarios, though all have the same overall features. All have the same long run unemployment and GDP levels and relative to the no subsidy case all have slower GDP growth, lower unemployment in the short run, and higher unemployment in the medium term.[7] Among the alternative programs with the same subsidy rates those with a lower proportion of tax revenue

[7] The simulations for *ã* = 0.2 and *0.5/ep*=ττ, the scenario with the slowest GDP growth, and for the no subsidy scenario, were extended for 200 time periods, at which point GDP was virtually identical, confirming the convergence.

coming from the profits taxes, 2.0=*ep/*ττ, dominate those with a higher proportion, 5.0=*ep/*ττ, for the same subsidy rates. The scenarios with a lower profits tax had both lower unemployment and faster GDP growth. With higher rates of personal saving from income this advantage might be smaller, or non-existent.

The scenarios comparing the proportions of the subsidy going to capital in the state sector present more ambiguous results. When twenty percent of the subsidy goes to capital, *ã* = 0.2, peak unemployment is lower than when all of the subsidy goes to labor, *ã* = 0.0. On the other hand, GDP growth is slower when capital is subsidized. These results might sound paradoxical, but are quite straightforward. Without capital subsidies the state sector shrinks faster, contributing to higher unemployment, which in turn increases the rate at which the private sector expands, thus raising the GDP growth rate because resources move to the more efficient private sector more quickly.

The final scenario examined raises the equilibrium wage by increasing the value for $\grave{u}_2$ from 0.06 to 0.08. This is done for the scenario with *ã* = 0.2, and 5.0=*ep/*ττ, the slowest transition among the subsidized scenarios. The results are shown as the dashed lines in Figs. A1 and A2. Peak unemployment is higher and GDP growth slower with the higher wage level. These results lead to the observation made in the text that higher unemployment early in the transition is associated with higher growth rates and lower unemployment in the medium term, as this keeps the wage rate down and enables the de novo sector to expand more rapidly.

Fig. A1: Unemployment Rates00.20.40.60510203550TimePercentNo Subã = .2,ô= 2ã = .0,ô= 2ã = .2,ô= 5ã = .0,ô= 5Hi Wage

Fig. A2: Total Output01.22.43.64.805102035507510 0TimeYear 0 = 1No Subã = .2,ô= 2ã = .0,ô= 2ã = .2,ô= 5ã = .0,ô= 5Hi Wage

References

Aghion, Philippe and Olivier Blanchard. 1994. .On the Speed of Transition in Central Europe.. NBER. *Macroeconomics Annual*. pp. 283-320.

Benoit, Kenneth, 2000, .Which Electoral Formula is the Most Proportional? A New Look with New Evidence,. *Political Analysis* 8(2000), pp. 381-388.

Castanheira, M. and Gérard Roland. 2000. .The Optimal Speed of Transition: A General Equilibrium Analysis.. *International Economic Review*. 41(1):219-39.

Dewatripont, M. and Gérard Roland. 1994. .Economic Reform and Dynamic Political Constraints.. *Review of Economic Studies*. 59:703-30.

Fidrmuc, Jan. 1998. .Political Sustainability of Economic Reforms: Dynamics and Analysis of Regional Economic Factors.. *Journal of Policy Reforms*. 3(2):139-56.

Fidrmuc, Jan. 2000a. .Political Support for Reforms: Economics of Voting in Transition Countries,. *European Economic Review*, 44(2000), pp. 1491-1513.

Fidrmuc, Jan. 2000b. .Economics of Voting in Post-Communist Countries,. *Electoral Studies*, 19(2000), pp. 197-217.

Honacker, James, Jonathan Katz and Gary King. 2002. .A Practical Statistical Model for Multiparty Electoral Data.. *Political Analysis* 10(1):84-100.

Jackson, John, E. 2002. .A Seemingly Unrelated Regression Model for Analyzing Multiparty Electons.. *Political Analysis* 10(1):49-65.

Jackson, John, E., Jacek Klich and Krystyna Poznańska. 1999. .Firm Creation and Economic Transitions.. *Journal of Business Venturing*. 14(5/6): 427-450.

Jackson, John, E., Jacek Klich and Krystyna Poznańska. 2001. .Economic Transition and Elections in Poland,. presented at the William Davidson Institute and Center for Economic Policy Research Annual Conference on Transitional Economies, PortoroŸ, Slovenia, June, 23-26, 2001.

Jackson, John, E., Jacek Klich and Krystyna Poznańska. 2002. *The Political Economy of Transition*. Book manuscript, Dept. of Political Science, University of Michigan, Ann Arbor, MI.

Jackson, John, E., Jacek Klich and Krystyna Poznańska. 2003. .Democratic Institutions and Economic Reform: The Polish Case,. *British Journal of Political Science*, Forthcoming.

Jurajda, .tepán and Katherine Terrell. 2001. .What Drives the Speed of Job Reallocation during Episodes of Massive Adjustment.. William Davidson Institute. University of Michigan. Ann Arbor, MI. USA.

Katz, Jonathan and Gary King. 1999. ``A Statistical Model for Multiparty Electoral Data,'' *American Political Science Review* 93: 15-32.

King, Gary, 1990, .Electoral Responsiveness and Partisan Bias in

Multiparty Democracies.. *Legislative Studies Quarterly*. (2):159-181.
Rodrik, Dani. 1995, .The Dynamics of Political Support for Reforms in Economies in Transition.. *Journal of Japanese and International Economics*. 9(4):403-25.
Roland, Gérard. 1992. .On the Speed and Sequencing of Privatisation and Restructuring.. The Economic Journal. 104:1158-68.
Roland, Gérard. 2000. *Politics, Markets, and Firms: Transition and Economics*. Cambridge, MA.: MIT Press.
Tichit, Ariane, 2002, Personal communication with author.
Tomz, Michael, Joshua A. Tucker and Jason Wittenberg. 2002. .A Convenient Statistical Model for Multiparty Electoral Data.. *Political Analysis* 10(1):66-83.