

# **The Czech economic transition: exploring options using a macrosectoral model\***

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## **Abstract**

The processes that will drive the next stage of the Czech transition are likely to be similar to those promoting real convergence in the countries of the EU periphery. We draw on previous modelling research on these latter economies to construct and calibrate a small macrosectoral model of the Czech Republic. Model simulations explore some key policy issues facing CEE-country decision-makers: labour market reforms, disinflation and industrial development. Our analysis suggests that much can be learned from the experience of countries like Ireland and Portugal which have converged substantially towards EU average living standards.

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## [1] Introduction

The first phase of the transition of the former command economies of Central and Eastern Europe (CEE) involved considerable disorganisation and a very basic overhauling of industrial and institutional capacity (Blanchard, 1997). Mechanisms operating during this phase entailed substantial inter-sectoral reallocation of labour between the public and private sectors as well as between manufacturing and marketed services. The impact of restructuring generated the well-known U-shaped pattern for GDP and total employment in all CEE countries once the transition process was initiated.

However, the processes that characterised the initial years of CEE transition cannot be taken as the pattern of behaviour for the future. The next stage of transition for the advanced CEE countries is more likely to resemble the paths followed in recent decades by the so-called cohesion countries of the EU periphery: Ireland, Portugal, Spain and Greece. Structural adjustment in these countries lagged behind that of the more developed core EU states. The driving forces behind cohesion include progressive trade integration, foreign direct investment flows, technological catch-up and externally aided programmes of infrastructural and human-capital development (ESRI, 1997). It is probable that similar processes and adjustment mechanisms will operate in the CEE countries during the second phase of their transition, as the initial restructuring and institution-building stage approaches completion.

In this paper we draw on our experience of studying development processes in the countries of the EU periphery to explore scenarios that highlight policy issues that have become increasingly important for CEE-country decision-makers. Such a study takes us beyond the initial analysis of Blanchard, 1997, which was based on a range of small insightful theoretical models. We now need tools that permit the examination of structural and policy issues in more quantitative detail. Empirical model frameworks are useful in identifying barriers to real convergence and in exploring the quantitative implications of different policy choices. In this paper we design and calibrate a multi-sectoral macromodel of the Czech economy drawing on models previously used to study convergence processes in the poorer EU member states (Bradley *et al.*, 1995; ESRI, 1997).

The fact that the second phase of transition will involve continuing large structural changes in the CEE economies suggests that an innovative modelling strategy is required. Conventional empirical models are typically concerned with the study of the effects of external shocks as they feed through a fixed model structure. The primary purpose of CEE empirical models, on the other hand, should be to study the consequences of changes in the underlying model structure. In this sense the present analysis is partly positive and partly normative. It is positive in that the model (in the baseline scenario) is driven by conventional market mechanisms; e.g. wage determination impacts on cost competitiveness, which in turn affects output and employment. It is normative however in that the relevance of the various scenarios we study depends on the actions and decisions not just of policymakers but of the other important social partners - entrepreneurs, unions etc. - as well.

Our modelling strategy requires a sectorally disaggregated database in order to explore the sectoral mechanisms underlying aggregate developments.<sup>1</sup> Our database is designed to be used to quantify parameters in the model's behavioural equations. In some cases, useful information on parameter values can be extracted from the limited run of seven or eight annual data points available. However, for many of the crucial mechanisms reasonable values cannot be identified from the Czech data because of the large structural shifts in behaviour that occurred over the transition period. Here we are forced to fall back on previous modelling research on the EU periphery economies and seek to make use of parameter estimates from these existing macro-models.

Our thinking here is that standard macroeconomic relationships - such as the responsiveness of manufacturing output to competitiveness pressures - must already exist in CEE economies, but there are simply too few recent data observations for the relevant coefficients and elasticities to be quantified with any degree of robustness or precision. Furthermore, once transition is complete, CEE economies are likely to converge in terms of underlying structure and economic mechanisms and will end up

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<sup>1</sup> The construction of such a national database for a CEE economy is itself no small task. Furthermore, reliable data are only available since the mid-1990s, with serious consequences for model calibration.

as more or less well functioning small open economies. Thus we may be able to foresee many aspects of their likely future properties and structure by looking at the cohesion economies of the present EU.

The paper is organised as follows: First, we present a brief overview of the model constructed to explore the implications for convergence in living standards of the scenarios we have selected to analyse (Full details of the model are presented in the appendix). Several scenarios, each of them more or less amenable to the influence of Czech decision makers, are then explored. One set of simulations compares the consequences of different types of labour-market behaviour. A second set compares the consequences of various counter-inflation strategies – one based on exchange rate appreciation and the others based on fiscal policy. A third set highlights some of the differences between industrial strategies based on indigenous versus FDI-driven export-led growth.

## **[2] Overview of the Czech macromodel**

The Czech Republic is modelled as a small open economy, with production disaggregated into four sectors: manufacturing, market services (including building and construction and utilities), agriculture and non-market or public services (including health and education). Most of the behavioural modelling is focused on manufacturing and market services with simpler models of agriculture and the public sector.<sup>2</sup>

The bulk of manufacturing is treated as being internationally tradeable, with prices determined exogenously. World demand plays no role in output determination in the conventional small-open-economy traded goods sector, apart from its (off-model) influence on the exogenous world price. We allow for world demand to play an additional role in our model, as in Bradley and Fitz Gerald (1988, 1990), by assuming that traded output is produced by multinational companies (MNCs), each of which produces a single identical good in its plants located in different countries. In the absence of transport costs, tariffs etc., this good will sell at the world price, which is

independent of cost conditions in any particular small open economy. Implicitly, differing risk characteristics associated with the various locations ensure that, for marginal changes in cost competitiveness, production continues to take place at each location. A worsening of country cost competitiveness, however, will lead to a reduction in the share of total output supplied by the plant in that country. Hence, traded-sector output is, as in the conventional treatment, influenced by cost conditions. In addition, an exogenous increase in world demand causes MNCs to expand output at each of their plants. Supply is therefore influenced by both cost competitiveness and world demand.

We model market services and the remaining segment of manufacturing as non-tradeable (internationally). Prices of non-tradeables are a mark-up on relevant unit labour costs, and non-traded output is determined at the intersection of domestic demand and the associated supply curve.

Aggregate country supply consists of home-market sales and exports. Domestic demand comprises home-market sales and imports. Thus, the trade-balance surplus is determined residually as aggregate supply less domestic demand.

Factor demands are determined by output and relative factor costs. Setting the cost of capital exogenously allows the issue of wage determination to be emphasised.<sup>3</sup> We model wage determination in the manufacturing sector as the outcome of a bargaining process between unions and employers. Bargaining theory points to four important explanatory variables: output prices, a wedge comprising tax and terms-of-trade effects, the rate of unemployment (or “Phillips curve” effect) and labour productivity; Layard, Nickell and Jackman (1991).<sup>4</sup> Examination of the sectoral wage inflation data suggests that wage inflation in the industrial sector is passed on to workers in market services, as in the “Scandinavian model”; Lindbeck (1979).<sup>5</sup>

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<sup>2</sup> For a more complete description of the background to the prototype HERMIN model, see Bradley *et al*, 1995 and ESRI, 1997.

<sup>3</sup> It proved impossible to find a domestic interest rate that provided a meaningful measure of the cost of capital. The underdeveloped nature of the Czech capital market, the prevalence of domestic credit constraints and the ability to borrow abroad support our treating the cost of capital as exogenous; Jonás, 1997.

<sup>4</sup> The tax wedge arises because workers try to bargain in terms of a take-home wage denominated in consumer prices rather than in terms of gross pre-tax wages denominated in producer prices.

<sup>5</sup> The Scandinavian model is based on the notion that wage setters, in the knowledge that tradeable

Details of the model and its calibration are presented in the Appendix.

### **[3] Exploring scenarios for the next stage of Czech transition**

#### *3.1 Reformed and unreformed labour market scenarios*

We first examine the performance of the economy under different assumptions about the process of wage formation. In the first “unreformed labour market” scenario we illustrate the situation that appeared to prevail in the Czech economy up to about 1997, where labour-market participants took little account of the need to maintain cost competitiveness in the tradeable segment of manufacturing.

What we have in mind in this simulation is a situation where workers in the typical manufacturing firm behave in a purely myopic way immediately after liberalisation, raiding the firm's revenue and driving up labour's share of added value. Since there were hardly any independent owners of the firm (in the sense of profit maximising stock holders) during these early years, the workers' power dominated. Furthermore, the management (who were to become the future owners in many cases) were quite content to drive down the value of the firm so that it could subsequently be purchased cheaply. This is obviously a crude characterisation of what went on, but it arguably captures an important element of the process.

Once workers began to realise the consequences of these actions, and once privatisation got underway, the wage bargaining system changed and began to take account of wider developments in the economy.

##### *3.1.1 The unreformed labour market*

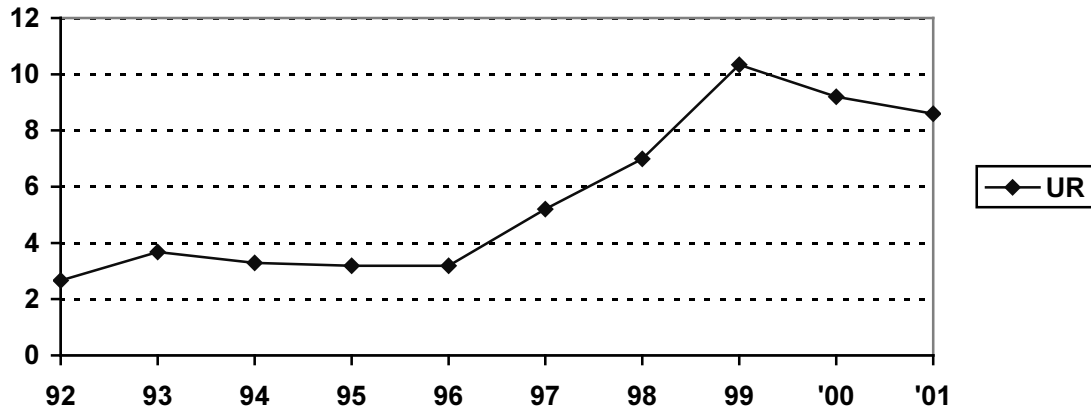
In calibrating our baseline Czech model in the Appendix, we assume that wage bargaining maintains a relatively constant share of labour in value added (i.e. the

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prices cannot deviate from world levels, calculate the scope for wage increases on the basis that the profit share in tradeables remains fairly constant.

elasticity of wages with respect to productivity is set equal to one), and that higher unemployment reduces the scope for wage increases (the Phillips-curve term). These behavioural assumptions reflect a pattern of behaviour that arose only with the onset of recession and the increase in unemployment in 1997 charted in Figure 1.

**Figure 1:** The Rate of Unemployment in the Czech Republic, 1992-2001



Data prior to 1997 show a consistently rising labour share of value added with an elasticity of wages with respect to productivity of about 1.05 and no sensitivity to (the very low and stable) rate of unemployment.<sup>6</sup> In the present simulations we demonstrate the negative implications for competitiveness and real convergence of such behaviour, had it continued into the future.

To illustrate the point more starkly, besides suppressing the sensitivity of wages to unemployment we raise the elasticity of wages with respect to productivity to a value of 1.5.

Projecting the model forward under this “unreformed labour market” scenario suggests that the Czech Republic would fail to converge on EU living standards, as shown in Table 1.

<sup>6</sup> Between 1992 and 1996 labour’s share of value added in manufacturing rose by almost 10 percentage points, from just above 50 to just below 60 percent, before falling back to the low 50’s in 1999.

**Table 1: Unreformed labour market**

	<b>2001</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>
<b>gr (OM<sup>*</sup>)</b>	5.00	5.00	5.00	5.00
<b>gr (OM)</b>	4.9	3.2	3.5	3.7
<b>gr (GDPFC)</b>	3.5	1.6	2	2.3
<b>UR</b>	8.6	11.1	13.5	14.9
<b>RDEBT</b>	17.6	26.6	43.9	62.1

The table reports on the model projections for the growth rates (gr) of world manufacturing output (OM\*, which is exogenous), domestic manufacturing (OM) and GDP at factor cost (GDPFC), as well as the associated levels of the unemployment rate (UR) and public debt/GDP ratio (RDEBT).

The table shows that growth in Czech manufacturing output is consistently below the 5 per cent baseline world manufacturing growth rate. This is the only way of measuring within the model whether the Czech Republic experiences real convergence or divergence.<sup>7</sup> With Czech manufacturing output growing less rapidly than world manufacturing output, the Czech economy diverges rather than converges on EU living standards in this scenario.

Unemployment in this scenario rises to 14.9 percent in 2015 (from the 10.3 percent in the data for 1999), and the debt-GDP ratio rises to 62 percent (from the historical figure of 15 percent achieved in 1999). Central to the divergence result is the competitiveness loss associated with the excess of wage inflation over productivity growth, and the knock-on effect this has on the demand for market services. This simulation illustrates the crucial lesson that if labour market institutions fail to deliver cost competitiveness, real convergence on Western European living standards is unlikely.

### *3.1.2 The impact of labour market reform*

While circumstances can be envisaged in which there is little or no feedback from unemployment to wages, the clear consequence is high unemployment. This reflects

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<sup>7</sup> “World” demand for manufacturing-sector tradeables impacts on domestic output in the model whereas world income *per se* does not appear. Thus we have no way within the model of comparing Czech and “world” (EU) GDP growth.



the situation in Spain for example, which has had for a long time the highest rate of unemployment in the EU; Bradley *et al.*, 1995. For most other countries a build-up of unemployment of Spanish proportions would lead to wage moderation, a consequent improvement in cost competitiveness and a return to lower levels of unemployment.

The onset of recession in 1997 in the Czech Republic appeared to effect a learning process by which wage bargaining evolved to resemble more closely the situation in the average Western European economy. In our second scenario we implement a stylised reform of wage bargaining of this type. We introduce a Phillips-curve mechanism into the Czech wage-bargaining equation, allow for transitory terms-of-trade effects, and prevent further growth in labour's share of added value by reducing the elasticity of wages with respect to productivity down to a value of unity.

Amending the model to incorporate a better-functioning labour market improves performance substantially. Our basic version of the reformed labour market model, results of which are depicted in Table 2, reduces to unity the elasticity of real wages with respect to productivity and imposes a Phillips curve coefficient of -0.015 (similar to the values found for Ireland and Portugal). Moderate reform of the labour market of this type prevents divergence but is not, in and of itself, sufficient to promote convergence. Unemployment by 2015 is kept below 10 percent however, compared to almost 15 percent in the unreformed labour-market scenario, and the debt-GDP ratio is also substantially improved.

**Table 2: Reformed labour market: medium Phillips curve**

	<b>2001</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>
<b>gr (OM<sup>*</sup>)</b>	5.00	5.00	5.00	5.00
<b>gr (OM)</b>	5.2	4.9	5	5.1
<b>gr (GDPFC)</b>	3.8	2.1	2.6	3
<b>UR</b>	8	8.9	9.6	9.4
<b>RDEBT</b>	18	25	40	50

Two further dimensions of labour-market reform are also explored. We experiment with a hypothetical higher value for the Phillips curve effect, whereby unemployment exerts stronger downward pressure on wage demand, and we also explore the

consequences of having a lower than unity degree of productivity pass-through into wages.

The results of these various experiments are reported in Table 3, which compares the levels of output achieved in 2015 to that attained in the “unreformed labour market” scenario. The minimum element of reform studied is where we impose a very low value for the Phillips curve effect (along with the unitary wage elasticity with respect to productivity). This value (of -0.002) is taken from the Spanish data.<sup>8</sup> Spain of course exhibits slow convergence on EU living standards and high unemployment.

Relative to the completely unreformed case, economic performance is somewhat better. Manufacturing output in this scenario is 22 percent higher by 2015 than the level achieved in the unreformed case, while GDP is around 8 percent higher. Unemployment is also about 5 percentage points lower (with an unemployment rate of 10.2 percent compared to 14.9 percent in the unreformed case) and the debt-to-GDP ratio is also improved.

This minimal reform is insufficient to prevent divergence, however, as can be seen by comparing the result for OM to that in the second row of Table 3 with a medium Phillips curve term; as seen above in Table 2 the latter was just sufficient to prevent divergence. Performance along all fronts is improved relative to the unreformed labour-market case, apart from the fact that the lower level of wage inflation in this scenario reduces the growth of the non-tradeable services sector (OS).

Some convergence is achieved under the remaining two reform scenarios, the first of which imposes a higher value of the Phillips curve effect and the second of which reduces the extent of productivity pass-through into wages (from a value of unity down to 0.9). Not only do these extra reforms induce convergence, they also lead to improved unemployment and debt-GDP ratio outcomes.

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<sup>8</sup> There are some indications that a similar value may apply currently in the case of the Czech Republic.

**Table 3: Impact of labour market reform: changes in year 2015 relative to the “unreformed labour market” case.**

	<b>OM</b>	<b>OS</b>	<b>GDPFC</b>	<b>UR</b>	<b>RDEBT</b>
<b>Reformed labour market: low Phillips curve (-0.002)</b>	22	-2.3	8	-4.7	-7
<b>Reformed labour market: medium Phillips curve (-0.015)</b>	27	-2.7	9	-5.5	-12
<b>Reformed labour market: high Phillips curve (-0.03)</b>	30	-2.7	11	-6.2	-16
<b>Reformed labour market: medium Phillips curve and productivity pass-through into wages of less than 1 (0.9)</b>	31	-2.7	11	-6.5	-16

Note: OM, OS and GDP are in real terms (1994 prices). Values relating to these variables indicate percentage improvements. Values relating to UR and RDEBT refer to *percentage point* improvements.

To summarise, if we characterise increased labour market efficiency in terms of an increasing responsiveness of wages to unemployment, then we see a systematic improvement in performance as efficiency increases. The more efficient is the labour market, in the above technical sense, the higher is the level of output and the lower the rate of unemployment. Crucially, a substantially reformed labour market is sufficient to ensure at least some degree of real convergence. We will see later in Section 3.3 however that industrial upgrading will contribute to much more rapid convergence.

### **3.2 *Disinflation Scenarios***

Industrial upgrading can only be achieved in the medium term. In the short term, however, disinflationary policies may need to be imposed if the Czech Republic aims to adhere to the inflation targets specified in the Maastricht criteria. Whether the CEE countries should aim to do so or not is of course controversial, for reasons to do with the Balassa-Samuelson effect. Sinn and Reutter (2001) present evidence on the inflationary pressures generated in CEE economies by the playing out of this effect, which arises from the necessary structural changes underlying transition. The pressures arise from the large inter-sectoral differences in productivity growth between traded and non-traded sectors that appear over the course of economic development.<sup>9</sup> High traded-sector productivity growth pushes up wages which, given

<sup>9</sup> They report intersectoral productivity growth differentials of 10.2 percent for Hungary, 5.8 percent for Estonia, 5.5 percent for Slovenia and 4.9 percent for the Czech Republic, compared to an average of

lower productivity growth in non-tradeables, leads to an increase in their relative price. Thus the price level in transition economies will grow more rapidly than in more developed economies unless the currency appreciates automatically. If for some reason this appreciation does not take place, subscribing to EU inflation targets will require countervailing action.

In the following simulations, we assume that the Czech economy is as described by the “reformed labour market” model of the previous section, with a unitary wage elasticity with respect to productivity and a medium value for the Phillips curve term. We then explore the consequences of various policies aimed at reducing the economy’s inflation rate by 2 percent

We begin by modelling the current Czech strategy. Along with Poland and Hungary, the Czech Republic has adopted a flexible exchange rate and an inflation-targeting monetary policy regime.<sup>10</sup>

Inflation targeting is most successful if it is credible. If credibility succeeds in minimizing nominal rigidities the exchange-rate based deflation is potentially costless. However, wage rigidities frequently prevail in the short run so there are likely to be some costs involved. We therefore run both flexible wage and sticky wage scenarios. Our sticky wage scenario is implemented by preventing wage inflation from falling below the level that would have prevailed had the strategy not been implemented.

The first disinflation scenario explored below is the exchange-rate based strategy. Counter-inflationary fiscal policies can also be implemented, and for countries such as Bulgaria, Estonia and Lithuania, who have opted for a fixed exchange rate regime, this is the only route to disinflation, as in the case of current EMU member states. We explore these fiscal options in our Czech model also, in order to explore the issues and trade-offs involved.

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2 percent for the EU.

<sup>10</sup> The mean inflation target set by the Czech National Bank is currently 5 per cent, falling to about 3 per cent by the year 2005.

Two stylised counter-inflationary fiscal policies are explored. The first policy attempts to reduce inflation through a cut in government current expenditure, implemented in the model simulations through a cut in public sector employment. This impacts on prices via the wage bargaining process. A second strategy is to cut indirect taxes. This has an immediate impact on consumer prices and can have further knock-on impacts on wage bargaining through the tax wedge mechanism, depending on the credibility of the exercise.

### 3.2.1 *Exchange-rate based disinflation*

We first examine the scope for exchange-rate policy to reduce the inflation rate by 2 percent. If there is no downward wage stickiness, as may be the case for example if the policy is completely credible, then there are no effects on real economic activity. An appreciation of 2 percent is required in year 1 (2001), while the currency must have appreciated by 10 percent by 2005 for inflation to be kept at the new lower rate.

Real costs arise however if wage inflation is downwardly sticky. In this case, because wage declines make no contribution via non-traded prices to the reduction in inflation, the currency appreciation must be greater. This simulation requires an appreciation of 6.4 percent in year 1 to reduce consumer-price inflation by 2 percent, and an overall appreciation of over 30 percent by 2005 if inflation is to be kept at the new lower level. The real effects of this policy are charted in Table 4.

Manufacturing sector output is sharply affected, though the impact on GDP is moderated by an expansion in non-traded services. With wage stickiness the price of domestic value added does not fall as much as traded-goods prices so the real purchasing power of domestic wages rises, which props up consumption and non-traded output. GDP is nevertheless down by over 2 percent relative to the baseline, if wage inflation remains sticky out to the year 2005. In this case unemployment will have grown by 2 percentage points, and the debt-to-GDP ratio by somewhat more.

**Table 4: Exchange-rate based disinflation with downward wage stickiness**

	<b>2001</b>	<b>2005</b>
<b>Percentage difference from base: OM</b>	-2.1	-10.8
<b>OS</b>	.4	3.1
<b>GDPFC</b>	-.4	-2.2
<b>Changes from base: UR</b>	.5	2
<b>RDEBT</b>	.3	3.4

The overall cost of exchange-rate based disinflation will depend therefore on the extent and duration of wage stickiness in the economy. If wages adjust rapidly, as may be the case if the policy stance is extremely credible, then the real cost may be much less than Table 4 indicates.

### 3.2.2 *Disinflation by Fiscal Contraction*

Disinflation can also be effected by cuts in government current expenditure. This is implemented in the model through cutting public sector employment. This impacts on prices through the wage bargaining channel, and cannot therefore be accomplished if wages are downwardly sticky. Because real effects arise even if wages are not sticky as defined above, policy credibility may not be sufficient to ensure wage flexibility.

Our calculations indicate that government employment would need to be cut by 9 percent in year 1 in order to bring the rate of inflation down by 2 percent, and public employment would need to be a full 29 percent lower by 2005 if the inflation rate is to remain at the new lower level.

This fiscal contraction has negative real effects even if wage inflation is not sticky. GDP is down more than 1 percent by 2005 and unemployment is up by more than 4 percentage points; Table 5. While the impact on government debt will be positive, the surplus funds cannot be used to boost the economy (via a fiscal feedback rule, for example, that maintains the debt ratio at a constant level), because this would offset the disinflationary effects achieved.

**Table 5: Disinflation induced by a cutback in government employment, with no downward wage stickiness**

	<b>2001</b>	<b>2005</b>
<b>Percentage difference from base: OM</b>	.9	3.5
<b>OS</b>	-.1	-1.2
<b>GDPFC</b>	-.4	-1.2
<b>Changes from base: UR</b>	1.3	4.3
<b>RDEBT</b>	-.3	-5.2

This is a costly counter-inflation strategy. Recall that it cannot work if wages are sticky. It can only be implemented successfully therefore if its goals command strong public support. If wages are flexible on the other hand, the alternative exchange-rate based strategy can bring inflation down costlessly.<sup>11</sup>

### 3.2.3 *Disinflation via Indirect Tax Cuts*

A second counter-inflationary fiscal strategy is to cut indirect taxes. This has an immediate impact on consumer prices and can have further knock-on effects on wage bargaining through the tax wedge mechanism if the policy is credible (so that wage stickiness is minimised). Overall, a reduction in indirect tax rates stimulates the economy through both these channels, but has negative consequences for the debt ratio. Hence, this strategy is only viable if the debt consequences can be ignored. This is unlikely to be the case for most of the CEE countries as they struggle to satisfy the Maastricht debt criteria.

It turns out that the consequences of this policy strategy do not depend very strongly on whether there is wage stickiness or not, because the wage bargaining mechanism in the Czech model allows for only temporary tax wedge effects. Engineering a sustained 2 percent reduction in the inflation rate requires a reduction of between 1 and 2 percentage points in the indirect tax rate in year one, and by 2005 the indirect tax rate must have been cut by between 10 and 12 percentage points.

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<sup>11</sup> A separate issue arises as to whether credibility and higher wage flexibility can be more easily achieved through the implementation of fiscal or of monetary stabilisation policies.

Tables 6 and 7 respectively report results for the sticky and flexible wage cases. The results are marginally better in the latter case, where GDP is up 4.6 percent and unemployment down by almost 4 percent by 2005, compared to an increase in GDP of 3.8 percent and a fall in unemployment of around 3 percent when wages are downwardly sticky. These beneficial effects arise as a consequence of the fact that this policy represents a fiscal expansion whereas the previous fiscal disinflation scenario entailed a fiscal contraction. The debt-to-GDP ratio rises by between 12 and 15 percentage points in the present case.

**Table 6: Fiscally-induced disinflation: indirect tax cuts with downward wage stickiness**

		<b>2001</b>	<b>2005</b>
<b>Percentage difference from base:</b>	<b>OM</b>	.5	3.9
	<b>OS</b>	.6	4.6
	<b>GDPFC</b>	.5	3.8
<b>Changes from base:</b>	<b>UR</b>	-.4	-3.1
	<b>RDEBT</b>	1	12.3

**Table 7: Fiscally-induced disinflation: indirect tax cuts with no downward wage stickiness**

		<b>2001</b>	<b>2005</b>
<b>Percentage difference from base:</b>	<b>OM</b>	.7	3.2
	<b>OS</b>	.4	6.7
	<b>GDPFC</b>	.4	4.6
<b>Changes from base:</b>	<b>UR</b>	-.4	-3.7
	<b>RDEBT</b>	.7	14.6

In summary, if wages are perfectly flexible (which requires that the disinflation strategy is fully credible and anticipated) the ideal way to engineer the required reduction in inflation is via an appreciation of the currency. The shock will be costless in this case. A fiscal contraction on the other hand will generate substantial real effects even if wages are not downwardly sticky. Negative real effects also emerge from currency appreciation if there is downward stickiness of nominal wages (as will be the case if the strategy is not fully understood and supported by the general public); in this case, however, fiscal contraction cannot succeed in cutting inflation.



The other fiscal instrument studied is a reduction in the indirect tax rate. This represents a fiscal expansion however, which raises the debt to GDP ratio. This may not be a desirable outcome for most of the transition economies. If the debt constraint is binding, appreciation may be the only way to achieve disinflation if wages are sticky, and is far preferable to fiscal contraction if wages are flexible.

### 3.3 *Indigenous versus FDI-led Growth Scenarios*

Our final group of scenarios is concerned with long-term issues. We take the reformed labour market of earlier sections as given and explore the consequences of two different development paths. The first scenario is based on an industrial strategy that seeks to promote convergence through increased dynamism in the indigenous sector of manufacturing, while the second examines the likely consequences of a convergence strategy based on inward investment rather than indigenous revival.

#### 3.3.1 *The consequences of indigenous-led growth policies*

Labour market reform alone, as seen in Section 3.1 above, will improve the prospects of Czech convergence. Other supporting institutional and policy changes will be necessary to speed up the process however. In this variant of the model we conceptualise the consequences of an industrial policy that succeeds in achieving export-led growth through active support of indigenous manufacturing.<sup>12</sup>

The calibration of the manufacturing output equation (OM) reflected the current degree of openness of the Czech economy. Exposure to the world economy will rise as trade integration proceeds, raising the share of tradeables relative to non-tradeables in manufacturing.<sup>13</sup> In the present scenario we increase the elasticity of manufacturing output with respect to world output by 50 per cent (from 0.5 to 0.75) and make the

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<sup>12</sup> In practice, policies to support indigenous industry coexist with policies to encourage inward FDI. We treat them separately purely for the purposes of exposition.

<sup>13</sup> In terms of model structure, this requires altering coefficients to increase the dependence of OM on  $OM^*$  and decrease the dependence on domestic demand FDOM in equation (2). For given levels of  $OM^*$  and FDOM the changes should not affect OM. For this reason, we set indices so that the ratio of  $\log(FDOM)$  to  $\log(OW)$  for 2001, the moment of change, is unity; ESRI (1997).

appropriate adjustments to the manufacturing-sector price equation.<sup>14</sup> Such changes would be consistent with an increase in export orientation for the existing goods mix as well as with a shift in product mix towards goods with higher income elasticities.

Since this path represents an evolution of the existing manufacturing base, however, there is likely to be a less radical alteration in the production technology than would occur if the export-led growth strategy were FDI-driven. There is also no increase in profit outflows in this scenario.

This variant is superimposed on the reformed labour market of Table 2 with a unitary elasticity of productivity to wages and a medium value for the Phillips curve term.. The difference between the results reported in Tables 2 and 8 arises solely from the increased openness of the economy to world trade. Comparison of these tables, and of Tables 3 and 10, reveals that increased openness is associated with improved economic performance in terms of the level of output achieved, the rate of unemployment in the longer term and the public debt/GNP ratio.

**Table 8: Indigenous-led growth**

	<b>2001</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>
<b>gr (OM<sup>*</sup>)</b>	5.00	5.00	5.00	5.00
<b>gr (OM)</b>	5.07	5.67	5.63	5.57
<b>gr (OS)</b>	4.00	0.94	1.32	1.69
<b>gr (GDPFC)</b>	3.79	2.59	3.06	3.47
<b>UR</b>	8.79	7.80	6.95	5.28
<b>RDEBT</b>	18.23	24.31	33.06	39.40

The explanation is as follows. The higher the elasticity of Czech manufacturing output with respect to world demand, the more the Czech economy benefits from exogenous world growth. The expansion in the traded sector feeds through to domestic income and further boosts the production of non-traded market services.

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<sup>14</sup> Increased openness will result in an increase in the weight of world prices in the pricing equation. For example, if the whole (1-XSHR) of manufacturing output which is initially assumed to be non-traded became tradeable, the impact of world prices on domestic manufacturing prices would rise by  $(1 - a_2)$ , where  $a_2$  is the elasticity of domestic prices with respect to world prices in equation (1). So every 1% switch in the output equation raises the coefficient on world prices in the pricing equation by  $(1 - a_2)/(1 - XSHR)$ .

Superficially this appears to be an attractive route to real convergence. However, such a route may not be open to newly emerging market economies, as it is extremely difficult for indigenous industry to expand its export orientation rapidly (O'Malley, 1989; Barry, Bradley and O'Malley (1999). It is illustrative in this regard to compare the experiences of Portugal and Ireland, the two recent success stories among peripheral EU member states. In both cases FDI inflows were the driving force behind the increased export orientation of the manufacturing sector (Barry and Bradley, 1997; Cabral, 1995).<sup>15</sup> Portugal's development path was much less FDI-dependent than Ireland's however. Thus it remains a much less open economy than Ireland, and its convergence performance has been less dramatic; Barry (2002).

We now turn to an examination of the likely consequences of the Czech Republic being able to attract substantial inflows of export-oriented FDI.

#### *4.2 The consequences of FDI-led growth policies*

Most CEE-bound FDI is as yet home-market oriented and is relatively low-tech; Lankes and Venables (1996), Holland et al. (2000), Braconier and Ekholm (2001). It is clear however that uncertainty about CEE public policy, CEE public administration and the timing of eventual EU accession deters capital-intensive high-tech FDI, and that once these uncertainties diminish the nature of FDI inflows to CEE countries is likely to change; Barry and Hannan (2001). The present scenario evaluates the consequences of the Czech Republic following an FDI-led development path once these uncertainties are overcome.

In this variant of the model, as in the indigenous-led growth variant of Table 8, we again increase the elasticity of manufacturing output with respect to world output from 0.5 to 0.75, with corresponding changes made to the output price equation. Several complementary changes are implemented to reflect better the FDI-driven scenario however.

First, we change the CES technology in manufacturing to make it less responsive to domestic relative factor prices. Rather than leading to a substitution of capital for

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<sup>15</sup> Zemplerova (1998) confirms that, in the Czech case also, firms with foreign participation are more

labour, higher domestic relative wages in the FDI-driven scenario lead to a reduction in the exposure of multinational companies to the economy under discussion (Bradley and Fitz Gerald, 1988).<sup>16</sup> This particular change proves to have only very slight effects however.<sup>17</sup> Reducing the elasticity of substitution from 0.5 to 0.3, for example, raises the level of GDP in 2015 by only 0.01 percent.

Next, we increase the rate of Hicks neutral technological progress to reflect the process of technological diffusion that accompanies inward investment (Blomstrom and Kokko, 1998). This is incorporated by increasing the rate of disembodied total factor productivity growth from 4.3 per cent to 6.5 per cent. The effects of this are discussed below.

Finally, we need to take a position on the likely fraction of manufacturing profits that will be repatriated by the foreign-owned sector of Czech industry. In the year 1999 (the last within sample observation), this fraction was almost 25 %. In Ireland, on the other hand, this fraction has recently been above 60 per cent. In the present simulations we select three values - of 40, 32.5 and 25 per cent - as the alternative endpoints that this fraction may reach by 2015. This reflects the likelihood that foreign presence in the Czech Republic will over this period remain lower than in Ireland.

Positive profit repatriations create a distinction between GDP and GNP of course, so the outcomes of these simulations are reported in terms of the lower GNP numbers.

Table 9 presents results for the indigenous-led and FDI-led scenarios, compared to the reformed labour market case with no increase in export orientation. We saw in Section 3.1 of the paper that such labour-market reforms were just sufficient to prevent divergence from EU living standards. As manufacturing output and GNP rise relative to this in all our present simulations, it is clear that either of these export-led growth scenarios will promote convergence.

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export-oriented than domestically-owned firms.

<sup>16</sup> Changing any of the CES parameters while requiring the new factor demand system to reproduce the same in-sample predictions for employment and investment requires compensating changes in the other CES parameters also. How this is done is explained in detail in Kejak and Vavra (1999).

The difference between the first two rows in Table 9 is that the rate of technological progress in the manufacturing sector is higher in the FDI case, while profit repatriation remains set at the last within-sample value. (The lower value for the CES elasticity of substitution makes little difference to the results, as discussed above).

**Table 9: Indigenous versus FDI-driven export-led growth: changes in year 2015 relative to the “reformed labour market” case without increased export orientation**

	<b>OM</b>	<b>OS</b>	<b>GNP</b>	<b>UR</b>	<b>RDEBT</b>
<b>Indigenous-led growth</b>	8.8	3.6	14.4	-4.1	-11
<b>FDI-led growth: 25% of profits repatriated</b>	16.5	5.3	19.1	2.1	-8
<b>FDI-led growth: 32.5% of profits repatriated</b>	16.5	4.4	16.5	2.4	-5
<b>FDI-led growth: 40% of profits repatriated</b>	16.5	3.7	13.8	2.6	-2

Note: Values relating to OM, OS and GNP indicate percentage improvements in real terms. Values relating to UR and RDEBT refer to *percentage point* improvements or disimprovements.

Comparison of the indigenous-led and FDI-led scenarios reveals a trade-off between output and employment, in that the higher rate of technological progress associated with the FDI-led scenario stimulates output whilst increasing the rate of labour shedding.

Manufacturing output is not influenced by the rate of profit repatriation of course. This is not true of services output however, as profit outflows reduce demand. GNP is also adversely affected by profit repatriation, and at high rates of repatriation GNP is reduced relative to the indigenous-led growth scenario. Profit repatriation also has knock-on consequences in terms of higher unemployment.

Finally, we examine the sensitivity of the FDI-led outcome to variations in the rate of technological progress. Tables 10 and 11 have the same high rate of profit repatriation as each other, while Table 10 has a slightly lower rate of labour-shedding

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<sup>17</sup> Of course, if the model was subjected to a shock that radically altered relative factor prices, the outcome would be sensitive to the value of the elasticity of substitution.

technological progress. This is set at 5.4 percent per annum, compared to the rate of 6.5 percent in Tables 9 and 11. Higher technical progress raises output and GNP but results in a somewhat worse employment outcome.

**Table 10: FDI-led growth: high profit repatriation: medium technical progress**

	<b>2001</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>
<b>gr (OM<sup>*</sup>)</b>	5.00	5.00	5.00	5.00
<b>gr (OM)</b>	5.07	5.95	5.92	5.88
<b>gr (OS)</b>	3.95	0.84	1.23	1.64
<b>gr (GNPFC)</b>	3.23	2.14	2.65	3.11
<b>UR</b>	8.13	9.00	9.56	9.32
<b>RDEBT</b>	18.27	25.26	36.54	46.53

**Table 11: FDI-led growth: high profit repatriations: high technical progress**

	<b>2001</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>
<b>gr (OM<sup>*</sup>)</b>	5.00	5.00	5.00	5.00
<b>gr (OM)</b>	5.07	6.22	6.18	6.13
<b>gr (OS)</b>	3.95	0.90	1.35	1.82
<b>gr (GNP)</b>	3.23	2.28	2.82	3.31
<b>UR</b>	8.13	9.93	11.45	12.06
<b>RDEBT</b>	18.27	25.57	37.49	48.06

Based on the experiences of Ireland and Portugal, the case represented in Table 11 is the one we deem most relevant to the Czech Republic. Relative to the case of indigenous-led growth, the more likely FDI-led growth outcome has a higher rate of unemployment, a higher debt/GNP ratio, and an about equal level of GNP. Whilst the indigenous-led growth scenario is superior to the FDI-led scenario, it is likely to be much more difficult to achieve in a world economy dominated by large multinationals, with associated barriers to entry for firms from newly emerging market economies.

## **[5] Concluding remarks**

Several interesting lessons emerge from the various scenarios we have examined. The first is that real convergence is by no means automatic. This is apparent also from the EU periphery experience. Greece for example has barely converged on average EU living standards over the last thirty years, while Ireland experienced little convergence over the 1960s, 70s and 80s; Barry (2002). The importance of the general policy environment to convergence is explicitly recognised by Fischer *et al.* (1998) who, in forecasting the growth prospects of CEE economies, supplement the standard growth-regression variables with measures of the degree of liberalisation prevailing across a range of markets.

Our own methodology in assessing convergence prospects can be seen as a response to an earlier challenge by Fischer, who wrote that

“Identifying the determinants of investment, and the other factors contributing to growth, will probably require a switch away from simple cross-sectional regressions to time series studies of individual countries;” (Fischer, 1991).

We have shown with the aid of a calibrated model of the Czech economy that, had Czech wage-setting behaviour continued to operate as it did until recently, the prospects for real convergence could have been threatened. This is reflected in the EU periphery experience, where the rigidity of the Spanish labour market relative to Portugal’s helps explain Spain’s poorer convergence performance of recent times; Barry (2002).

Besides labour market reforms, we also considered the short-to-medium term issue of how disinflation could best be achieved. Issues of labour market flexibility also came to the fore in this discussion. We analysed the effects of three alternative policies to reduce the rate of inflation. A reduction in the indirect tax rate is the least painful remedy in the short term. Fiscal expansion of this sort, however, which raises the debt-to-GDP ratio, is unlikely to be consistent with the goal of satisfying the Maastricht fiscal criteria. The ideal way to engineer the required reduction in inflation in the absence of wage stickiness is via an appreciation of the exchange rate. Disinflation will be costless in this case. A fiscal contraction on the other hand will generate substantial real effects, making it an undesirable instrument in the battle

against inflation. There may be other pressing reasons for fiscal contraction of course. Fiscal contraction cannot achieve disinflation if there is downward wage rigidity, meaning that currency appreciation is the only option if tax cuts are ruled out. Currency appreciation cannot achieve disinflation costlessly in this case however.

Our final set of simulations dealt with longer-term issues of industrial development. We had seen earlier that labour-market reforms on their own did not boost growth prospects sufficiently for rapid convergence to be feasible. We therefore explored how convergence prospects could be boosted by increased export orientation. In one of our scenarios the growth acceleration is based on indigenous Czech industry, which gains in efficiency and captures world market share. This we characterise as the “South Korean” development path. Success in this regard would depend on the ability of Czech entrepreneurs to overcome entry barriers associated with the dominance of multinational firms from more highly developed market economies, entailing the development of innovative high-income-elasticity products, efficient marketing and distribution systems, and substantial process and product innovation (Porter, 1990).

The growth acceleration along the alternative development path results from export-oriented foreign direct investment inflows, which is how Ireland has developed; Barry (ed.), 1999. Success here depends on the ability of the authorities to make the business climate in the Czech Republic sufficiently attractive to capture a greater share of internationally mobile investment.

Obviously a range of supporting domestic policy interventions would be required to guide the economy along one or other of these paths. Although our scenario analysis is silent on the nature of these policies, the whole spectrum of macroeconomic, industrial and educational policies will have a role to play; Barry (2000). An area where the policies adopted and the structural changes achieved are inextricably linked is in the analysis of Structural Fund-type expenditures. An obvious next stage to the present modelling project would be to compare the likely effects of EU Structural Funds on the CEE economies with the effects found for the cohesion countries of the EU.



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## APPENDIX: The Czech Macromodel

### A.1 Output Prices

Since manufacturing contains traded and non-traded elements, output prices in the manufacturing sector (PM) are determined by a combination of exogenous world prices in domestic currency ( $P^*$ , where a star denotes an exogenous world variable) and a mark-up on unit labour costs in manufacturing (ULCM).

$$(1) \quad \ln(\text{PM}) = a_1 + a_2 \ln(P^*) + (1 - a_2) \ln(\text{ULCM})$$

In estimation, the Czech economy shows up as being fairly open and there is a high degree of price-taking, with an elasticity of 0.53 on  $P^*$ .<sup>18</sup> Price homogeneity is imposed, meaning that the mark-up elasticity is one minus the price-taking elasticity.

In line with our representation of market services as non-tradeable, the deflator of market services output (PS) is determined as a mark-up on unit labour costs in the sector (ULCS), with full pass through of costs into prices.

### A.2 Sectoral Output Levels

We model manufacturing output as a composite of traded and non-traded elements. Output is influenced by domestic and international demand (the former applying to the non-traded segment only), and by price and cost competitiveness. The price competitiveness term influences the distribution of manufacturing production between traded and non-traded elements, while cost competitiveness impacts on the attractiveness of the economy as a base for multinational firms, which respond to the level of international demand prevailing for the products they produce (Bradley and Fitz Gerald, 1988).

To reduce the number of parameters to be calibrated, we adopt the following form for the manufacturing output (OM) equation:

$$(2) \quad \ln(\text{OM}) = a_1 + a_2 \{XSHR \ln(\text{OM}^*) + (1 - XSHR) \ln(\text{FDM})\} \\ + a_3 \ln(\text{ULCM}/\text{PM}) + a_4 \ln(\text{PM}/P^*)$$

where  $\text{OM}^*$  is 'world' manufacturing output, ULCM represents unit labour costs in manufacturing, PM is the output price, FDM is a measure of domestic demand weighted by manufacturing output content (derived from the Czech input-output table), and  $P^*$  is the world manufacturing price.<sup>19</sup> The parameter *XSHR* is the average

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<sup>18</sup> The approach we developed to calibrate the Czech model attempts to make maximum use of the available annual observations. The behavioural equations are simple in structure, usually involving only two parameters. Hence, we can carry out crude curve fitting exercises. If the recovered parameters are plausible, we use them. If not, we impose values based on EU peripheral country findings (ESRI, 1997). Barrell *et al* (2000) use an alternative CEE cross-section panel approach to calibration.

<sup>19</sup> "World output" in the Czech case is an average of EU and rest of OECD output, with weights of 80%, and 20% respectively. World prices are an average of German and US output prices, converted at the current exchange rate, with weights of 65% and 35% respectively.

ratio of exports to the sum of GDP and imports, and is a measure of the openness of the economy.<sup>20</sup>

Given the paucity of data, even the restricted number of parameters in this equation does not allow us to estimate the competitiveness elasticities with any precision, and yet these are key economic mechanisms. The coefficient on real unit labour costs represents the supply constraint on output as labour costs rise, while the relative price coefficient represents the reduction in demand for non-tradeables as their cost rises relative to world output prices. Based on the share of exports and simple curve fitting, we selected the following parameters for equation (2) as broadly representative of Czech conditions in the latter half of the 1990s:

$$a_2 = 1.0 \text{ (imposed); } XSHR = 0.50; a_3 = -0.7 \quad a_4 = 0.0 \text{ (imposed),}$$

and the implied elasticity of OM with respect to OM\* takes the value 0.5

Market services on the other hand are modelled as purely non-tradeable. A simple linear form of the service sector output equation (OS) is specified:

$$(3) \quad OS = a_1 + a_2 \text{ FDOS}$$

where FDOS is a measure of domestic demand weighted by services-output content. Estimation yielded a value of 0.8 for  $a_2$ .<sup>21</sup>

### A.3 Domestic Demand

We mentioned two components of domestic demand above. FDOM is a measure of domestic demand weighted by manufacturing-output content, and FDOS is an equivalent measure weighted by services-output content. The FDOS component in particular plays a crucial role in generating Keynesian multiplier effects. For example, the impact of changes in investment in building and construction is central to the analysis of the effects of infrastructural investments of the type financed by EU Structural Funds for example.

Household consumption (CONS) enters both FDOM and FDOS, the impact on the former serving to influence manufacturing output via the non-traded segment of the sector. A simple Keynesian consumption function formulation is used, which relates private consumption to real personal disposable income.

$$\text{Consumption} = C(\text{Personal Disposable Income})$$

$$\text{Personal Disposable Income} = \text{Income} + \text{Transfers} - \text{Direct Taxes}$$

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<sup>20</sup> This is based on the admittedly strong assumption that goods sold on the home market can be identified as non-tradeables. For several of the EU periphery economies the ratio (for the manufacturing sector) of goods exported to sales on the home market is very close to the weight of world demand relative to domestic demand in the manufacturing output equation, allowing us to constrain the parameter values in this way.

<sup>21</sup> The I-O weight on private consumption, for example, is 0.39. This implies that  $a_2$  times 0.39 of any unit increase in private consumption is produced within the services sector.

This specification assumes liquidity-constrained behaviour, which is plausible given the relatively unsophisticated nature of financial sectors in CEE countries. The data suggest an MPC of 0.7.

The public sector is accounted for as follows:

$$\text{Public Sector Borrowing} = \text{Public Expenditure} - \text{Tax Rate} * \text{Tax Base}$$

$$\text{Public Sector Debt} = (1 + \text{Interest Rate}) \text{Debt}_{t-1} + \text{Borrowing}$$

A policy feedback rule can also be used to endogenise government behaviour; i.e. in order to prevent the ratio of debt to GDP rising above a given level, tax rates can be programmed to rise automatically. This option is not used in the present simulations.

#### A.4 *The Balance of Payments*

Drawing on small open economy theory, exports and imports are not modelled separately. Aggregate supply represents total non-traded output plus home-market sales and exports of tradeables. Domestic demand comprises expenditure on non-tradeables plus home-market sales and imports of tradeables. Thus the trade-balance surplus is determined residually as aggregate supply less domestic demand, while the overall balance of payments is the net trade surplus plus net factor income from abroad.

#### A.5 *Wage Determination*

The general form of the wage equation for manufacturing is:

$$(4) \quad \ln(\text{WM}/\text{PM}) = a_1 + a_2 \Delta \ln(\text{WEDGE}) + a_3 \text{UR} + a_4 \ln(\text{LPRM})$$

where WM is the wage rate, WEDGE combines all direct and indirect tax and terms-of-trade effects, LPRM is manufacturing-sector labour productivity and UR is the unemployment rate.<sup>22</sup> Full price indexation (to PM) is imposed in the medium term.

The Czech data from the mid-to-late 1990s suggest that full pass-through of productivity takes place. However, the size of the Philips curve effect is very difficult to establish, and was selected on the basis of findings from a range of small EU economies (Bradley *et al.*, 1995; ESRI, 1997). The calibrated parameters are as follows:

$$a_2 = 0.55 \quad a_3 = -0.15 \quad a_4 = 1.0$$

#### A.6 *Factor Demands*

The evolution of the capital/labour ratio is determined by movements in relative factor prices and by technical progress (incorporated via a time trend). We use the CES form of the added value production function and impose it on both manufacturing (M)

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<sup>22</sup> The finding that the wedge effect is transitory rather than permanent is reasonably robust in the international literature (Layard, Nickell and Jackman, 1991).

and market service (S) sectors:

$$Q = A \exp(\lambda t) \left[ \delta \{L\}^{-\rho} + (1 - \delta) \{K\}^{-\rho} \right]^{\frac{1}{\rho}}$$

In this equation,  $Q$ ,  $L$  and  $K$  are added value, employment and the capital stock respectively,  $A$  is a scale parameter,  $\rho$  is related to the constant elasticity of substitution,  $\delta$  is a factor intensity parameter, and  $\lambda$  is the rate of Hicks neutral technical progress.

Drawing on the approach of d'Alcantara and Italianer, 1982, we use a marginal, or putty-clay, system where investment, which is the new vintage of capital stock, is driven by output and relative factor prices, and the capital stock is assumed to be malleable *ex ante* but not *ex post*. In the absence of data on vintage output and labour inputs, the corresponding marginal output and employment are crudely proxied by the total levels of these variables. The modified joint factor demand system can then be written in the form:

$$I = h_1 \left( Q, \frac{c}{w} \right)$$

$$L = h_2 \left( Q, \frac{c}{w} \right)$$

where  $w$  and  $c$  are the cost of labour and capital, respectively, and the capital stock is generated by a perpetual inventory formula,

$$K_t = I_t + (1 - \delta)K_{t-1}$$

Although the factor demand systems in the manufacturing and market service sectors are functionally identical, they have different estimated parameter values and there are some other crucial differences as well. For example, in the case of manufacturing, we allow a fraction of profits to be repatriated through the balance of payments to mirror the known behaviour of multinational firms. No such mechanism is included in the market service sector, where distributed profits go directly into private income.

The important parameters in the CES production function are the elasticity of substitution and the rate of technical progress. The elasticity of substitution could not be estimated from the available data. Our prior, though, is that technology in the CEE countries is towards the Cobb-Douglas end of the scale (as in Greece and Portugal) rather than at the Leontief end of the scale (as in the case of Ireland), because of the importance of FDI in the latter case (Bradley and FitzGerald, 1988). However, the build up of FDI in the Czech Republic during the 1990s makes this an intermediate case, so we imposed an elasticity of substitution of 0.5 in both the manufacturing and market services sectors.

After imposing the above value for the elasticity of substitution (0.5), the data implied that technical progress in Czech manufacturing is factor-saving (Hicks neutral) at a rate of about 4.3 per cent per year, and we use this value. The sectoral productivity data suggest that there appears to be a lower rate of technical progress in market services, in the region of 1.5 per cent per year.