DISCUSSION PAPER SERIES

IZA DP No. 727

# Benchmarking Structural Change in Transition

Martin Raiser
Mark Schaffer
Johannes Schuchhardt

February 2003

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

# Benchmarking Structural Change in Transition

**Martin Raiser**
*EBRD*

**Mark Schaffer**
*CERT, Heriot-Watt University and IZA Bonn*

**Johannes Schuchhardt**
*Humboldt University and MicroDiscovery, Berlin*

Discussion Paper No. 727
February 2003

IZA

P.O. Box 7240
D-53072 Bonn
Germany

Tel.: +49-228-3894-0
Fax: +49-228-3894-210
Email: iza@iza.org

IZA Discussion Paper No. 727
February 2003

# ABSTRACT

## Benchmarking Structural Change in Transition*

The transition to market-based economic systems in the countries of Central and Eastern Europe and the former Soviet Union involves fundamental shifts in the allocation of resources and deep changes in the structure of production and employment. This paper uses a simple model of economic development and structural change with technology spillovers to benchmark structural change in the transition economies and simulate the path of adjustment from central planning. We then analyse data from 10 accession candidates and 12 CIS countries to measure the progress in structural change that has taken place thus far and to assess the further structural changes that should be expected, with particular attention to the implications for accession.

JEL Classification: O14, O40, P20

Keywords: structural change, transition, adjustment

Corresponding author:

Mark E. Schaffer
Centre for Economic Reform and Transformation
Department of Economics
School of Management
Heriot-Watt University
Edinburgh EH14 4AS
UK
Tel.: +44 131 451 3494
Fax: +44 131 451 3008
Email: m.e.schaffer@hw.ac.uk

* The opinions presented in this paper are solely those of the authors and not necessarily those of the EBRD or other institutions with which they are affiliated. The paper was prepared for the Phare-ACE Project on the Macroeconomics of Accession (P97-8034-R). Financial assistance from Phare-ACE is gratefully acknowledged. The authors also wish to thank participants at a Phare-ACE workshop in Prague in July 2001, Peter Sanfey and two anonymous referees for comments on earlier drafts, and Giovanni Mangariotti and Akram Esanov for superb research assistance.

## 1. Introduction

It is widely known that the economies of Central and Eastern Europe (CEE) and the former Soviet Union (FSU) face significant challenges in reallocating resources, as a result of serious structural distortions inherited from central planning. This paper presents a simple model, which allows us to benchmark structural change during transition with reference to a stylised pattern of resource allocation in a market economy. Using this framework, we simulate the effect of central planning as well as transition and subsequently confront the resulting stylised pattern with the evidence from 10 accession candidates and 12 CIS countries. The focus is on employment allocation across industry, agriculture and services. Our analysis thus complements the large body of literature studying adjustment at the product or firm level and highlights common patterns and differences across countries.

Our simulations reproduce the well-known observation of overindustrialisation in centrally planned economies. Deindustrialisation during transition results as demand adjusts to reflect consumer preferences and efficiency gains in industry set free redundant resources. As long as full employment is maintained, transition is associated with an increase in welfare. Allowing for frictions in the adjustment process and permanent shifts in labour participation rates makes the analysis compatible with the widely observed J-curve pattern of output during transition.

The paper ties in with two main strands of literature. A first strand builds on Baumol (1967) and examines the impact of shifts in the sectoral allocation of resources on economic growth and development (for a recent contribution see Kongsamut, Rebelo and Xie , 1998). A major focus on this literature is the process of deindustrialisation, which started in the United States around the early 1970s and is now characteristic of all developed market economies (Spilimbergo, 1995; Clarida and Hickok, 1994). This literature has some bearing on the transition economies, as they have experienced a process of accelerated deindustrialisation. This paper builds on a simple model of structural change and development presented by Rowthorn and Ramaswamy (1997) that allows us to capture the effect of central planning and transition on the process of industrialisation and deindustrialisation.

The second strand in the literature begins with the pioneering work of Chenery and various co-authors (Chenery and Taylor, 1968; Chenery and Syrquin, 1975; Syrquin and Chenery, 1989) and tries to measure the extent of structural distortions and adjustment for the transition economies. Winiecki (1988) compares the structure of employment in socialist and market economies at similar levels of per capita income and finds that the former are biased towards industry and against services.[1] A similar result is reached by Döhrn and Heilemann (1996), again comparing economic structure at similar levels of per capita income but using the structure of production rather than employment.

Jackman and Pauna (1995) compare the structure of employment in the CEE countries to that prevailing in two groups of EU member countries – a northern and southern

[1] Ofer (1987) provided a similar analysis for the Soviet Union.

group, distinguished by the relative importance of agriculture in the latter. Relative to either of the two EU benchmarks, CEE economies are characterised by excessive industrial employment, but also have a higher proportion of employment in agriculture. Jackman and Pauna also find significant labour reallocation between 1989 and 1994. However, because EU member countries themselves have experienced marked shifts in their employment structures away from manufacturing and agriculture towards market oriented and community services, the adjustment so far has been insufficient relative to a shifting benchmark.

One problem with this "benchmarking" literature is that it is not clear whether the cross-country patterns of development and structural change established by Chenery and others are stable over time. To allow for greater flexibility in the benchmarking exercise, we develop a model of structural change that allows economic structure to differ across countries with similar levels of per capita income, while retaining the idea of a stylised pattern of development followed by the majority of countries during their development.

Section 2 introduces a stylised model of structural change, which serves as an analytical framework for the paper. Some evidence in support of the model is provided and some implications for the analysis of development patterns across countries are pointed out. Section 3 applies the model to the case of central planning and transition. With the help of simulations, it is shown how the model can predict excessive industrialisation of centrally planned economies. The transition is simulated as a return to market equilibrium. The discussion also addresses the issue of aggregate output performance during transition and links the model to the discussion about the causes of the transition recession observed in Central and Eastern Europe and the former Soviet Union. Section 4 uses Chenery-type cross-sectional regression analysis with data from 50 market economies to generate market economy benchmarks for the structure of employment. It then uses these benchmarks and data from 10 accession candidates and 12 CIS countries to measure the progress in structural change that has taken place thus far and to assess the further structural changes that should be expected. Section 5 concludes.

## 2. Economic development and structural change

The observation that the structure of production and employment changes during the process of development and that the rise of certain sectors at the expense of others is a hallmark of modern economic growth dates back to Fourastie (1949) and Simon Kuznets (1956).[2] Both authors established the fall in the importance of agriculture, the rapid rise in industry and the gradual increase in the weight of services in the economy as a stylised pattern of development using historical time series data for industrialised economies.

[2] Petit (1987) traces the theory back to contributions by G.B. Fisher and C. Clark in the first half of the twentieth century.

The first to test for the existence of stylised development patterns using a large cross country data set were Chenery and Taylor (1968).[3] For the purposes of this paper it is sufficient to note the following three stylised facts they established:

- the share of agriculture in GDP and employment falls as economies grow richer;

- the share of industry in GDP and employment rises but the relationship between per capita incomes and the share of industry in employment is non-linear;

- the share of services in GDP and employment rises unambiguously as economies grow richer.

Several arguments are usually provided as explanation for the empirical regularities observed in the cross-country regressions. For instance, a generally accepted proposition is that the share of an individual's expenditure on food tends to decline as his income goes up. Abstracting from international specialisation, a decline in demand for food should ensue in a shift of resources out of agriculture. Non-unitary income elasticities of demand for industrial goods or services may also account for the shift of resources between these sectors. On the supply side, productivity may grow at different rates across sectors of the economy. Sectors experiencing more rapid productivity growth will require increasingly fewer resources for a given level of demand.[4]

In what follows, we present a simple model of structural change developed by Rowthorn and Ramaswamy (1997). While the model is based on several quite restrictive assumptions, it predicts the stylised patterns of development well and provides a convenient analytical framework with which to examine the impact of central planning and transition. As an interesting "by-product", by slightly amending the model, we obtain interesting and, to our knowledge new, predictions concerning the comparison of development patterns across countries.

### 2.1 A simple model

Rowthorn and Ramaswamy's (1997) model of structural change and development was originally motivated by an attempt to account for the fall in industrial employment in developed market economies without recourse to a non-unitary income elasticity of demand for industrial goods. Evidence for the industrialised countries indeed suggests that the share of manufacturing in GDP at constant prices has remained roughly constant since reaching its peak sometime during the 1960s or early 1970s (see also Clarida and Hickok (1994) for the USA).[5] Rowthorn and Ramaswamy therefore

[3] For subsequent analyses in the same tradition see Chenery and Syrquin (1975) and Syrquin and Chenery (1989).

[4] Of course, each country's specific path of structural change will differ due to the effects of international specialisation, differences in economic policies (e.g. trade or exchange rate policy) among other factors. We are interested here in deriving a stylised pattern that abstracts from as many country specifics as possible.

[5] In current prices, the share of manufacturing in national income has tended to fall since the 1960s and the share of services in national income has increased monotonically over the last century. These

construct a model where changes in the structure of employment are driven primarily by changes in sectoral productivity levels. The model generates the same dynamics of changes in employment shares across sectors that have become to be accepted as stylised facts of development (see above).

In order to isolate the effects of changes in productivity levels on the structure of employment, a closed economy setting is assumed.[6] Real output is given by:

$$Y \equiv Y_a + Y_i + Y_s \quad (1)$$

where $Y_a$, $Y_i$, $Y_s$ stand for output, measured at constant prices in agriculture, industry and services respectively.

The demand side of the economy is characterised by the following equations:

$$Y_a = bL \quad (2)$$

$$Y_s = cY \quad (3)$$

Industrial output is determined as a residual in this closed economy setting.

$$Y_i = Y - bL - cY \quad (4)$$

Following equation (2) the demand for agricultural products is assumed to be fixed per capita. This is an – admittedly extreme – representation of the idea that the real income elasticity of demand for food is less than unity (in this case it is zero). There is no population growth and full employment is assumed:

$$L = L_a + L_i + L_s \quad (5)$$

Hence aggregate agricultural output is constant. Equation (3) denotes the constant real income elasticity of demand for services. The model is in real quantities, abstracting from relative price changes. It should be clear that as relative demand for agricultural products falls, while the relative demand for services remains constant, the share of industry in total output is increasing and asymptotically approaches the value (1-c).

The supply side of this economy is characterised by exogenous productivity growth in the three sectors A, I, and S. Productivity in each sector is given by:

---

stylised facts are consistent with an increase in the relative price of services and an own price elasticity of demand for services less than unity, as posited by Fuchs (1968) among others. The present model abstracts from relative price changes. As will be shown, one implication of this abstraction is that preferences are Leontief-type and hence no substitution across sectors in response to relative price changes is assumed.

[6] This is of course a highly restrictive assumption. Allowing for trade and specialisation among countries introduces resource endowments and possibly geographical factors as important determinants of resource allocation across different activities (see Chenery and Syrquin, 1975 for a broader empirical framework also including the effects of trade policies).

$$y_a = \frac{Y_a}{L_a} = f(y_a(0), t) \tag{6}$$

$$y_i = \frac{Y_i}{L_i} = g(y_i(0), t) \tag{7}$$

$$y_s = \frac{Y_s}{L_s} = h(y_s(0), t) \tag{8}$$

where a lower-case y denotes output per worker in the sector, in each case a function of its initial level and exogenous, disembodied technical change. Hence the model assumes constant returns to scale and a constant marginal product of labour.[7]

To clarify the underlying features of this setup and its basic assumptions a graphical representation of the model is useful. We will come back to it when we examine the welfare consequences of employment adjustment within our framework below. Since the consumption of agricultural goods is fixed, it is convenient to concentrate on the two-dimensional space for industrial goods and services. The presentation is easily expanded to include agriculture without changing the basic results.

Starting from equation (3), we know that the ratio $(Y_i + Y_a)/Y_s$ is constant. Thus, in the two-dimensional $Y_i$ $Y_s$ space, all consumption points lie on a straight line intersecting the $Y_s$ -axis at the point $Y_s^0 = \frac{c}{1-c} Ya$ . This is the schedule CC in Figure 1. Its slope is given by c/(1-c) in our model.

The supply side in the model is given by a constant returns to scale, one-factor production function. Hence, marginal productivity is equal to average productivity and is constant and the marginal rate of transformation is also constant. Thus the production possibility curve is simply a downward sloping straight line, the slope of which is given by the relative productivities $y_s/y_i$. This is the schedule PP in Figure 1. Market equilibrium is obtained at point E where CC and PP intersect.

[7] For an integration of a model of structural change into a dynamic general equilibrium growth model with capital accumulation see Kongsamut, Rebelo, and Xie (1998).

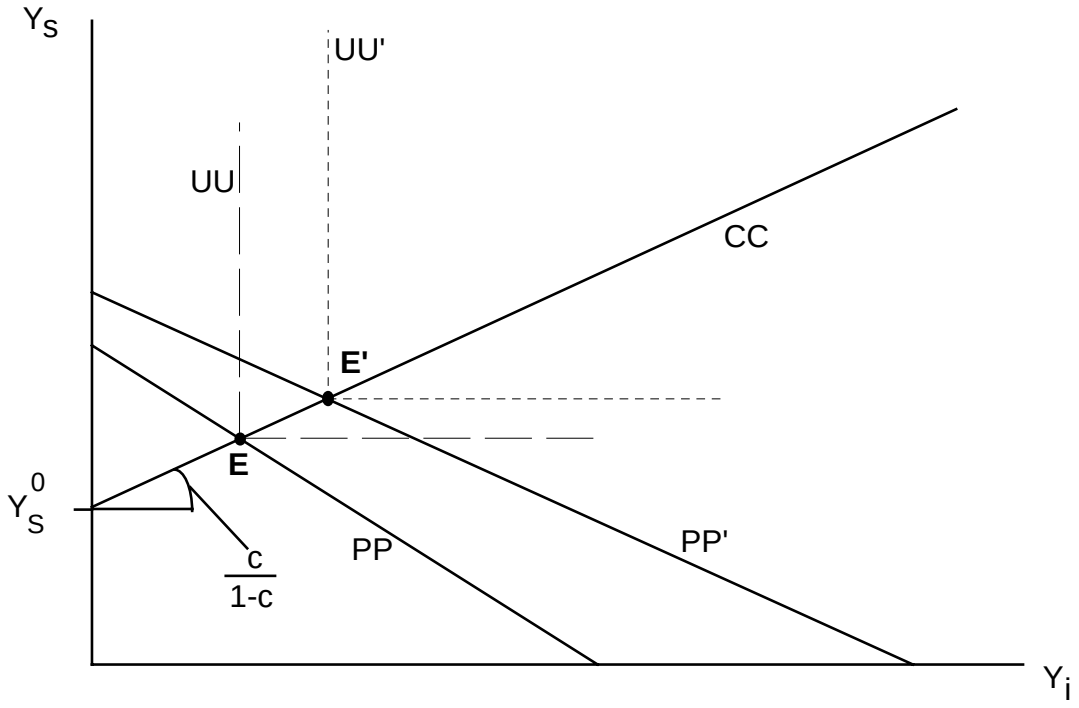



**Figure 1: Market Equilibrium and Productivity Growth**

Now, let this economy experience productivity growth and assume that this is faster in industry than in services. The result is an outward shift of PP and at the same time a rotation anticlockwise, so that the slope of the new transformation curve PP' is flatter. The new intersection is at E'.

Which type of preferences are consistent with this new equilibrium? For modelling purposes, we do not want to place constraints on the relative rates of productivity growth in industry and services. Requiring indifference curves to go through points E and E' at the point of tangency with the PP schedule irrespective of the relative rates of productivity growth in industry and services leaves only Leontief-type preferences as consistent with the assumptions of the model. In fact, this should not come as a surprise, since agricultural consumption is fixed by assumption. The restriction to Leontief preferences simplifies the analysis considerably and is not critical to the basic results. The welfare gains from productivity growth and the shift of the production frontier from PP to PP' are represented by the outward shift of the indifference curve from UU to UU'.

Given this basic set-up, a general solution for the share of employment in each sector can be derived, where the structure of employment depends on the parameters b and c and on the distribution of productivity levels across the three sectors of the economy:

$$\frac{L_a}{L} = \frac{b}{y_a} \qquad (9)$$

$$\frac{L_i}{L} = \frac{\left(1-\frac{b}{y_a}\right)(1-c)y_s - bc}{cy_i + (1-c)y_s} \tag{10}$$

$$= \frac{\left(1-\frac{b}{y_a}\right)\left(\frac{1-c}{c}\right)\left(\frac{y_s}{y_i}\right) - \frac{b}{y_i}}{1+\left(\frac{1-c}{c}\right)\left(\frac{y_s}{y_i}\right)}$$

$$\frac{L_s}{L} = \frac{[b(y_a - y_i) + y_a y_i]\frac{c}{y_a}}{cy_i + (1-c)y_s} \tag{11}$$

$$= \frac{1+b\left(\frac{1}{y_i}-\frac{1}{y_a}\right)}{1+\left(\frac{1-c}{c}\right)\left(\frac{y_s}{y_i}\right)}$$

Further, from (1)-(4) we have:

$$Y = \frac{1}{1-c}(bL + Y_i) \tag{12}$$

and, using (7) and (10)

$$y = \frac{Y}{L} = \frac{[b(y_a - y_i) + y_a y_i]\frac{y_s}{y_a}}{cy_i + (1-c)y_s} \tag{13}$$

From this general solution two observations can be made. First, average productivity in the economy is a non-linear function of productivity levels in each of the subsectors. The non-linearity is caused by the fact that the employment shares, which weigh the contribution of each sector to average productivity or per capita income, are themselves a function of the productivity levels in the subsectors. Second, a general feature of the model is that the share of employment in agriculture declines as long as productivity in agriculture increases. However, what happens to the distribution of employment across industry and services cannot be inferred without knowing the form that technological progress takes in the three subsectors.

In Rowthorn and Ramaswamy (1997), productivity in each sector is modelled as an exponential function of time, implying a constant rate of productivity growth. Furthermore, the rate of productivity growth in services is assumed to be slower than in industry and agriculture. This is a crucial assumption, as it fundamentally affects

the distribution of employment in the long run.[8] From equation (10) it can be seen that as $y_i$ (and $y_a$) grow large in absolute terms, i.e., $(\frac{1}{y_i} - \frac{1}{y_a}) \rightarrow 0$, as well as relative to $y_s$, i.e., $(\frac{y_s}{y_i}) \rightarrow 0$, the share of employment in services will tend towards unity. What happens to the share of employment in industry depends on how quickly employment in services grows relative to the decline of employment in agriculture. If initial employment in agriculture is sufficiently large, and therefore employment in services and industry sufficiently small, industrial employment will follow an inverse U-shaped pattern commensurate with the stylised facts in industrialised economies.

Assuming that the rate of productivity growth in services is smaller than that in industry, it also can be shown that average productivity is a monotonic function of time (for proof, see Appendix 1). In other words, given exogenous technological progress, average incomes in this economy will steadily increase. Moreover, in the long run, as all workers end up in the service sector, growth in the economy at large declines to the rate of growth in services. This is, of course, the classic result of "unbalanced growth" first established by Baumol (1967).

Empirically, the model can be used to derive a unique relationship between the level of productivity in each of the three sectors and the allocation of employment, given by equations (9)-(11). When initial productivity levels are set equal in all three sectors (as in Rowthorn and Ramaswamy) and by implication across all countries, there is a monotonic relationship between productivity levels, time and per capita income. Under these assumptions, the model reproduces the predictions of a Chenery type cross-country regression analysis of employment shares against per capita incomes. However, if countries are allowed to differ in their initial productivity levels, then the structure of employment will no longer be uniquely related to time or the level of GDP per capita. Countries will then follow similar but not equal development patterns.

The simulation in Figure 2 shows the paths of employment shares in agriculture (black), industry (red), and services (green) over time and for given levels of per capita income. We assume that the process of industrialisation starts with zero employment in industry, $L_i(0) = 0 = Y_i(0)$. The parameter c is set at 0.6 and b is set at 1. Initial productivity levels and employment in agriculture and services are given and held fixed across countries. We assume an initial share of agricultural employment of 80 per cent and thus a ratio of productivity in services to agriculture of 6:1.[9] Productivity growth in industry and agriculture is set to be the same (2.25 per cent per annum) and larger than productivity growth in services by a constant parameter $\lambda = 1.5$ (i.e. productivity growth in services is 1.5 per cent per annum).

[8] There is substantial evidence justifying this assumption for the US economy (Clarida and Hickok, 1994; Kongsamut, Rebelo and Xie, 1998), although difficulties in the measurement of services preclude definitive conclusions.

[9] The initial agricultural employment share corresponds roughly to that observed in today's poorest and least industrialised economies. The productivity ratio of services to agriculture is given by $Y_s^0 = \frac{c}{1-c} Ya$ ; $Y_a = bL = 1$; $L=1$; $L_a^0 = 0.8$ and $L_s^0 = 0.2$. Thus $y_s^0 = 7.5$ and $y_a^0 = 1.25$.

The range of simulations shown in Figure 3 vary the initial productivity level in industry, $y_i(0)$, and reveal that a higher initial productivity level implies that the level of employment in the industrial sector peaks sooner, but the maximum level of industrial employment is lower. Note that one implication of this is that in a cross-section of countries, which vary in their initial productivity level, the relationship between the share of employment in industry and aggregate income per capita (productivity) may either have a flatter U-shape or the downward sloping portion of the U may be absent entirely. The reason for this is that a country with a higher initial productivity level in industry may be on the declining part of employment share curve as pictured in Figure 3, and at the same time have a higher employment share in industry than a country with a lower initial level that is at its peak industrial employment share.

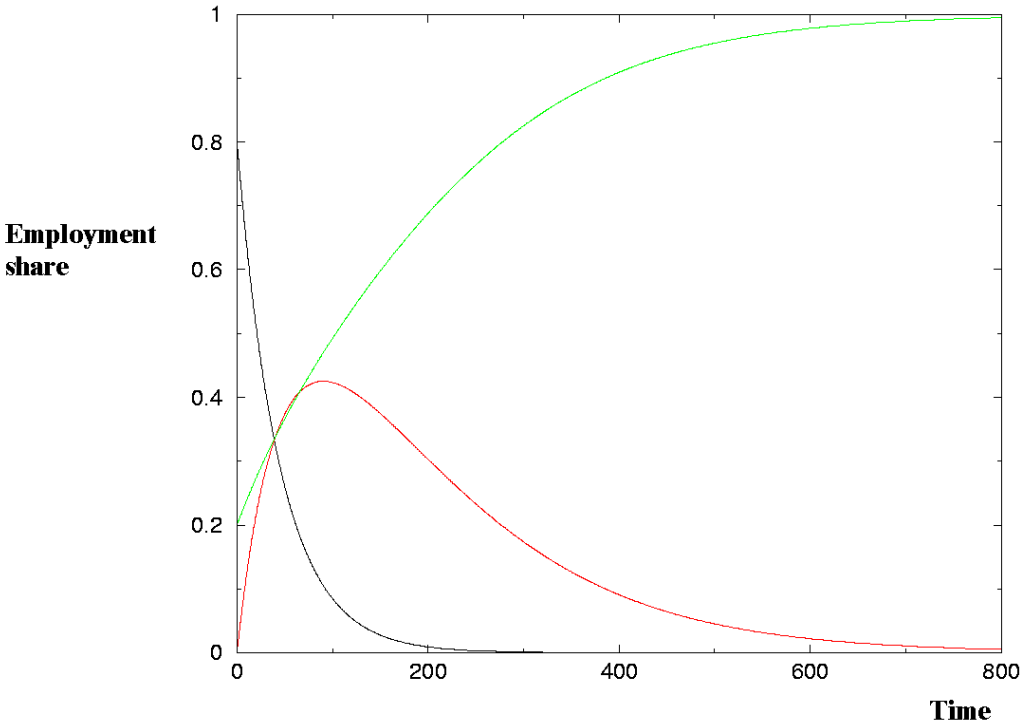



**Figure 2: Employment Shares in Basic Model**

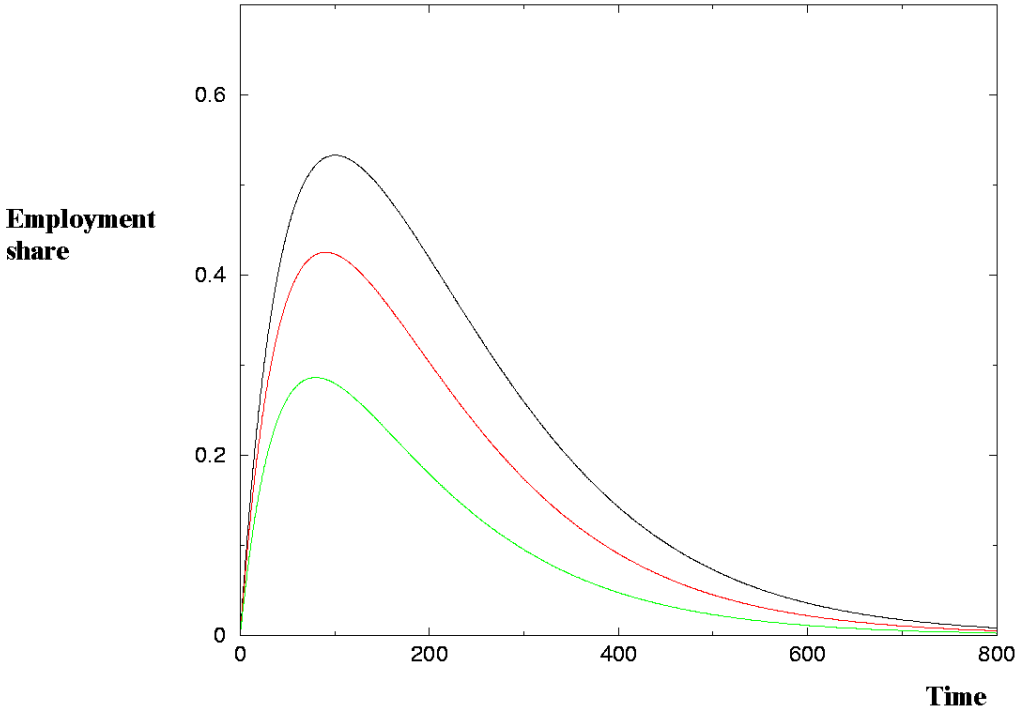



**Figure 3: The Effect of Varying Initial Conditions**

## 2.2 Introducing technological spillovers

A major drawback of the model presented above is the closed economy assumption. Here we relax this assumption in one important respect, namely by allowing technological spillovers between countries. Allowing technology to move across countries but still maintaining a closed goods market assumption requires some justification. As mentioned above, allowing trade in goods (and/or factors) would introduce differences in resource endowments, trade policies, exchange rates and other variables as determinants of resource allocation, with the result that stylised patterns become far more difficult to identify and simulate. Moreover, the assumption of technological imitation without trade in goods in some ways fits the former Council of Mutual Economic Assistance countries, where trade remained highly isolated from the global economy until the breakdown of central planning. We introduce a further specific assumption about the pace of technological adaptation from the West in centrally planned economies below. Finally, unless productivity levels are allowed to converge across countries, one implication of the model presented in the previous section is that initial differences in productivity in the services sector are translated into long-run differences in per capita incomes, which does not seem plausible.

Assuming convergence within sectors and across countries, productivity growth in each sector can be described by the following equation:

$$\frac{dz_j}{dt} = \alpha_j + \varepsilon_j\left(z_j^*(t) - z_j(t)\right) \qquad (14)$$

where $z_j = \ln(y_j)$, $\alpha_j$ is the rate of productivity growth ($\alpha_a = \alpha_i = \lambda\alpha_s$), and $\varepsilon_j$ is a convergence parameter that links the productivity growth rates to the log of productivity in the leading economy, $z_j^*$. We assume that the convergence rate in services is lower than in industry and agriculture.[10] Specifically, in the simulations below, we assume $\varepsilon_i = \varepsilon_a = 0.01$ and $\varepsilon_s = 0.005$.

Technological progress in the model arrives in the form of exogenous innovations. The world consists of a technological leader – described by the model in the previous section – and a number of technological followers. Both the leading and following economy generate innovations in each sector at a constant rate $\alpha_j$. However, the follower country benefits from the innovations by the leader through spillovers that raise the size of its innovations (see Gomulka, 1990 or Aghion and Howitt, 1997, chapter 2.6). The further away a country is from the leading technology, the greater the size of its innovations, or more appropriately, the greater the productivity raising effects of its innovative activity.

The implications of introducing technological spillovers for the structure of employment in the course of development is illustrated in the simulations appearing in Figure 4. In these simulations, we abstract from differences in initial conditions and concentrate on the impact of different starting points in time on the patterns of development. Parameter values are the same as in Figure 2. The main effect of getting a late start in development is that the productivity gap to the technological leader (or the country's technological steady state) is increased relative to countries starting to converge at an earlier date. The main result is that follower countries industrialise more rapidly and achieve a peak in the share of industrial employment earlier and at lower levels of per capita income than the technological leader.[11] Moreover, the share of industrial employment peaks at a lower level. Again, an implication of this is that in a cross-sectional analysis of countries including both early industrialisers and late developers, the relationship between the share of employment in industry and aggregate income per capita (productivity) may either have a flatter U-shape or the

[10] This assumption can be supported on various grounds. Our model is a closed-economy model, but may still justify the modelling with reference to the fact that international trade promotes diffusion of new technology, and hence diffusion of new technology should be slower in sectors producing non-tradeables. Secondly, services include a number of activities (e.g., government, education, etc.) where technological diffusion may be particularly difficult because of local constraints. The model does not assume perfect factor markets within each country, which would imply that marginal productivities in each sector should be the same. The underlying production function is constant returns to scale and hence factor mobility would imply convergence of productivity levels across sectors. As Poirson (2000) shows, the assumption of large differences in sectoral productivity levels is borne out by the evidence for developing countries.

[11] This result requires some restriction on the rate of productivity growth and the rate of convergence in the three sectors. Were convergence much more rapid in services, peak industrialisation in the follower could be delayed.

downward sloping portion of the U may be absent entirely – because the share of employment in industry peaks at a lower level in a late developer.

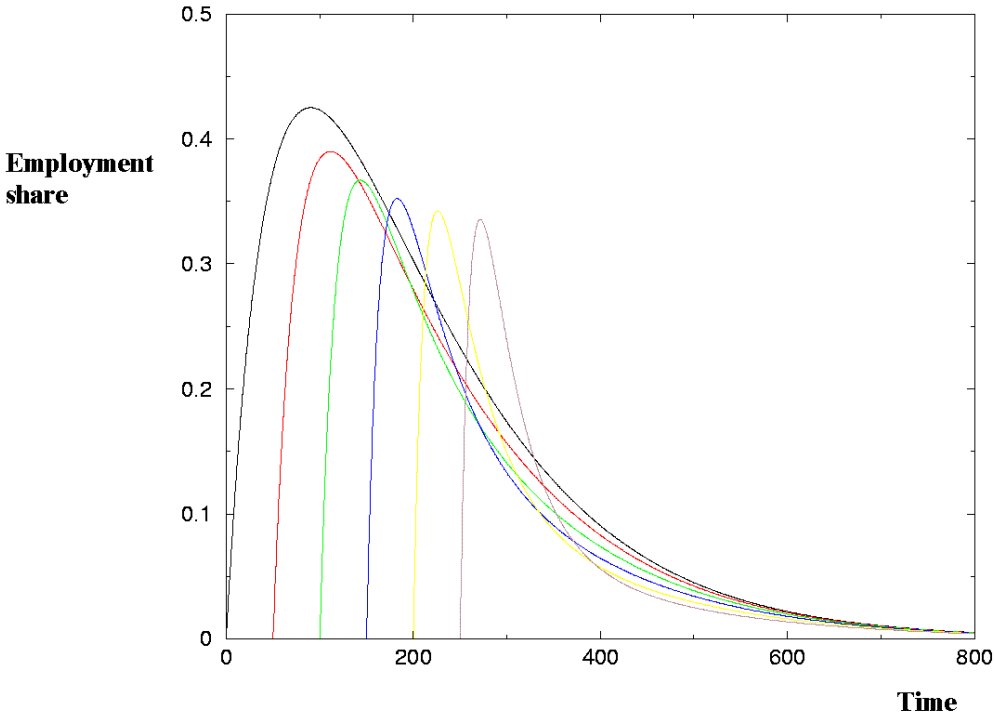



**Figure 4: Late Start in Development and Technological Spillovers**

Are these implications of the modified Rowthorn/Ramaswamy model borne out by the historical evidence? The lack of long time series data for many economies precludes a robust test of the model, but the evidence in support of it is quite strong.

Table 1 presents data on employment shares in agriculture, industry and services for the UK, the USA, Germany, Japan and South Korea. The starting points are chosen to reflect broadly the period of economic take-off identified by Walt Rostow's (1960) historical analysis of industrialisation or in the case of the UK and Germany the earliest data we could find. Useful comparisons can be made between the USA, Germany and the UK on the one hand and the USA, Japan and South Korea on the other. The UK was the technological leader during the 19$^{th}$ century. It had achieved a share of industry in total employment of over 40% by the 1840s and was to increase this share further to over 50% by the turn of the century. Neither of the UK's main followers, the USA and Germany, reached a similarly high peak in industrial employment. In the USA's case, this might be attributed to the considerable importance of agriculture in its trade during the 19$^{th}$ century, but this was not the case in Germany. While the time it took these three economies to reach the peak of

industrial employment does not seem to differ much, at least there seems to be evidence that industrial employment peaks at lower levels in follower countries.[12]

In the second group of countries (USA, Japan, South Korea) there is clear evidence that the time profile of industrialisation is much reduced in follower countries. The USA has been the technological leader throughout most of the 20th century. Its industrialisation lasted from around the 1840s until the early 1960s, when industrial employment reached its peak. Japan's take-off is typically dated around the 1870s (indeed industry's share in employment in 1870 was only 4% compared with 12% in the USA in 1840). However, Japan reached a peak in industrial employment by the early 1970s, 20 years earlier than the USA measured in years after take-off. In South Korea, industrialisation only started after World War II. Within less than 40 years the peak in industrial employment was reached and since the late 1980s, industrial employment in Korea has been declining (see also Rowthorn and Ramaswamy, 1997).

[12] Indeed, with the exception of the centrally planned economies and a city economy such as Hong Kong, no other economy has ever reached a share of employment in industry exceeding 50%.

## Table 1: Employment shares and economic development – United Kingdom, Germany, United States, Japan and South Korea, 1840-present

**Panel A – share of employment in agriculture, in per cent**

| Year | United Kingdom | Germany | United States | Japan | South Korea |
|---|---|---|---|---|---|
| 1840 | 22.3 | Na | 68.6 | - | - |
| 1860 | 18.8 | Na | 59.4 | - | - |
| 1880 | 13.2 | 46.7 | 50.1 | 82.3 | - |
| 1900 | 9.1 | 40.1 | 37.6 | 70.0 | - |
| 1920 | 7.1 | 30.5 | 27.4 | 53.6 | - |
| 1940 | 5.9 | 25.9 | 17.6 | 44.7 | 79.7 |
| 1960 | 3.6 | 13.4 | 6.5 | 32.6 | 69.4 |
| 1980 | 2.2 | 5.9 | 4.3 | 19.4 | 58.6 |
| Present | 2.1 | 3.1 | 3.2 | 5.9 | 14.8 |

**Panel B – share of employment in industry, in per cent**

| Year | United Kingdom | Germany | United States | Japan | South Korea |
|---|---|---|---|---|---|
| 1840 | 44.2 | Na | 14.9 | - | - |
| 1860 | 48.7 | Na | 19.9 | - | - |
| 1880 | 48.1 | 35.5 | 24.8 | 6.6 | - |
| 1900 | 51.1 | 37.8 | 30.1 | 13.8 | - |
| 1920 | 47.3 | 41.4 | 34.3 | 21.0 | - |
| 1940 | 46.1 | 42.2 | 32.6 | 26.9 | 8.0 |
| 1960 | 47.4 | 47.2 | 35.1 | 29.7 | 10.1 |
| 1980 | 36.8 | 44.4 | 33.8 | 34.4 | 23.2 |
| Present | 29.4 | 37.7 | 19.5 | 34.3 | 33.2 |

**Panel C – share of employment in services, in per cent**

| Year | United Kingdom | Germany | United States | Japan | South Korea |
|---|---|---|---|---|---|
| 1840 | 26.0 | Na | 17.7 | - | - |
| 1860 | 26.8 | Na | 19.8 | - | - |
| 1880 | 31.4 | 16.5 | 24.0 | 9.9 | - |
| 1900 | 33.9 | 20.5 | 31.0 | 14.6 | - |
| 1920 | 43.5 | 27.4 | 37.4 | 23.5 | - |
| 1940 | 47.1 | 31.8 | 45.9 | 27.7 | 7.2 |
| 1960 | 48.1 | 38.9 | 54.3 | 37.6 | 18.7 |
| 1980 | 60.2 | 49.1 | 61.8 | 46.2 | 17.9 |
| Present | 67.3 | 59.2 | 77.3 | 59.4 | 51.9 |

**Notes:** Shares do not add to 100% because of small residual employment in other undefined sectors. Figures are for the year given or closest to it. For the United Kingdom, figures are for the first year of the decade (1841, 1861 etc.), figures for 1940 are from 1931 and for present from 1993. For Germany, figures are for 1882, 1895, 1925, 1939, 1961, 1980, 1992, figures post 1946 are for West Germany only. For the United States, services data for 1840 are from 1850, 1980 data are from 1970 and present data from 1994. For Japan, 1980 data are from 1970 and present is from 1993. For South Korea, data for 1940 are from 1955, data for 1980 are from 1970 and present is from 1993.

**Sources:** For data up to 1980, B. R. Mitchell (1983), International Historical Statistics, various volumes. For present data, International Labour Office, Yearbook of Labour Statistics, various issues.

This evidence confirms that patterns of structural change are hardly stable over time.[13] When benchmarking employment shares for the transition economies, it is important to bear in mind the role of different starting points. We now turn to an analysis of central planning and transition using the same analytical framework.

## 3. Central Planning, Structural Distortions and Transition

### 3.1 Central planning and structural change

It is well established that one of the distinctive features of centrally planned economies was their large industrial sector. In the context of our model, this could be accounted for by a lower demand for services (a lower value for the parameter c), or by a large productivity handicap in the industrial sector relative to market economies with the same level of income.

There is substantial evidence to support the claim that low central planners' preferences for services and lower productivity in industry relative to market economies were important features of the socialist economic system (e.g., Gregory and Stuart, 1986; Easterly and Fischer, 1994). One explanation that would concur with the idea of a technological handicap as a cause of overindustrialisation is that the centrally planned economies could simply not reproduce the high level of innovations characteristic of growth in the West. Centrally planned economies might still be able to imitate the market leader's technology, but with a lag that keeps them permanently poorer than market economies. Following Gomulka (1986, 1990), this idea can be expressed by writing the productivity equations for the three sectors in the following way:

$$\frac{dz_j}{dt} = \alpha_j + \varepsilon_j\left(z_j^*(t) - z_j(t) - \ln(k_j)\right) \qquad (15)$$

where all variables are defined as in equation (14), and k is a handicap relating long-term productivity in centrally planned economies to the market leader's productivity level by a constant proportion (we assume k = 0.5 in the simulations).[14]

Figure 5 shows the impact of central planning on the allocation of labour for two countries starting at the same time t into their economic development. The grey line at the top is the path of the parameter c, the share of income spent on services. We assume it drops from 60 per cent to 50 per cent with the introduction of central planning at t = 70, and then returns to 60 per cent with the start of transition at t = 135 (more about which below). The red line is the share of labour in industry in the

[13] Chenery and Syrquin (1989) similarly find largely differing time slope coefficients across countries in their estimations of basic Chenery-type regressions using panel data for 100 countries. However, the authors do not analyse sytematically whether this variation is due to the mechanisms of catch-up as suggested here. Indeed, the same paper argues that development patterns are essentially stable over time.

[14] In other words, long-term productivity growth rates in the two economic systems will be the same. This is what seems to have happened during the 1970s and 1980s, when Soviet economic growth converged on the rate achieved in the USA.

technological leader. Four scenarios are illustrated: (1) the benchmark path of the share of labour in industry in a late developer without the introduction of central planning (grey); (2) the impact of a lower value of c only (brown); (3) the impact of a handicap k only (blue); (4) the impact of both a lower value of c and a handicap k (black).

The impact of lowering the share of income spent on services from 60 per cent to 50 per cent (scenario 2) is quite striking, leading the centrally planned economy to exceed the peak level of industrialisation achieved by the market leader. By contrast, even a relative large technological handicap of 0.6 has a relatively small effect on the structure of employment, either independently (scenario 3) or in combination with a lower c (scenario 4). From the point of view of structural distortions, central planners' preferences seem to have been more important than their inability to generate technological innovations.

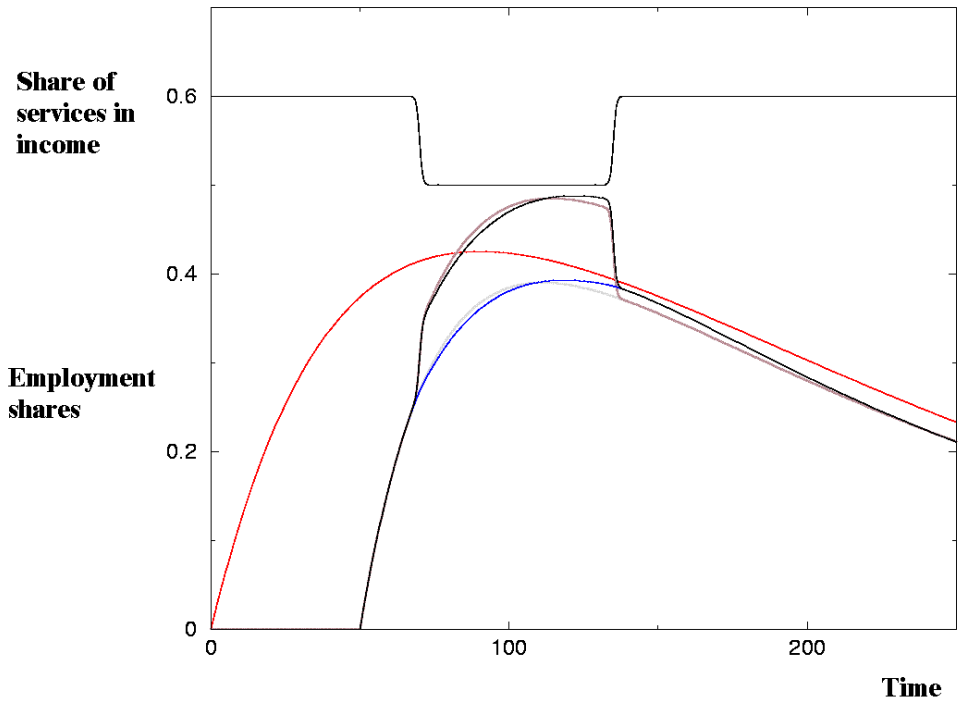



**Figure 5: Central Planning and Transition**

Table 2 verifies these predictions with the historical evidence for two pairs of countries. The two pairs (Czechoslovakia and Austria; Canada and Russia/Soviet Union) have been chosen to be roughly of similar size and have experienced economic take-off at roughly the same period of time. In 1910, Czechoslovakia had a share of industry in total employment of 34% against 31% in Austria. The two countries were the most developed within the Habsburg Empire. Over the next 40 years, industry's

share in employment increased to 36% in Czechoslovakia and 37.6% in Austria, while the share of agriculture declined to around 30% in both countries. Central planning was introduced in Czechoslovakia with the first five-year plan in 1949. Since then industry gained 10% of the labour force in every decade and stood at 55% by 1980. Industry's share in employment in Austria increased far more moderately to a peak of 42% by the 1970s. Correspondingly, the share of services rose in Austria to 50% of the labour force, while it remained stagnant at 32% in Czechoslovakia.

A similarly striking contrast is provided by Canada and Russia, whose take-off is dated around the 1890s by Rostow (1960). Canada by that date started with a larger industrial sector than Russia, but roughly the same share of employment in agriculture. World War I put a break on Russia's industrialisation and the inter-war period similarly affected Canada. By the 1950s, both countries had an industrial sector accounting for over 30% of employment, although agriculture's share was far larger in the Soviet Union than in Canada (see Ofer, 1987 for a detailed account and explanation). By 1970, industry's share in employment had further increased in Russia to 45%, while it fell to 30% in Canada by 1961. Meanwhile the services sector was twice as large in the latter than in the former, although both countries started from a very similar share of employment in services in the 1890s.

**Table 2: Labour Allocation, Economic Development and Central Planning – Employment Shares Austria and Czechoslovakia, Canada and Russia**

**Panel A**

| | Austria | | | Czechoslovakia | | |
|---|---|---|---|---|---|---|
| Year | Share of Employment in Agriculture, per cent | Share of Employment in Industry, per cent | Share of Employment in Services, per cent | Share of Employment in Agriculture, per cent | Share of Employment in Industry, per cent | Share of Employment in Services, per cent |
| 1910 | 39.4 | 31.1 | 29.5 | 42.0 | 34.1 | 23.9 |
| 1930 | 37.1 | 32.1 | 30.8 | 34.7 | 34.9 | 30.4 |
| 1950 | 32.6 | 37.6 | 29.8 | 30.9 | 36.3 | 32.8 |
| 1960 | 23.0 | 41.4 | 35.6 | 22.5 | 46.9 | 30.6 |
| 1980 | 8.5 | 41.0 | 50.5 | 13.1 | 55.2 | 31.7 |
| 1990 | 8 | 38 | 54 | 11 | 45 | 44 |

**Notes:** Data for Austria are for 1910, 1934, 1951, 1961, 1981, and 1990. Data for Czechoslovakia for 1960 are from 1961. Employment in industry in Austria includes commerce ("Gewerbe") and in Czechoslovakia trade. While these categories are not strictly comparable, the data presented in the Table are consistent with estimates of the share of industry in employment as published in the World Development Indicators (WDR, 1996).
**Sources:** For Austria, 1910-1980, F. Butschek (1985), Die Österreichische Wirtschaft in 20. Jahrhundert, Österreichisches Institut für Wirtschaftsforschung, Stuttgart: Fischer. For Czechoslovakia, 1910-1980, A. Teichova (1988), The Czech Economy, 1918-1980, London: Routledge. For 1990, World Development Report, World Bank, 1996.

**Panel B**

| | Canada | | | Russia/USSR | | |
|---|---|---|---|---|---|---|
| Year | Share of Employment in Agriculture, per cent | Share of Employment in Industry, per cent | Share of Employment in Services, per cent | Share of Employment in Agriculture, per cent | Share of Employment in Industry, per cent | Share of Employment in Services, per cent |
| 1890 | 49.5 | 26.3 | 24.2 | 59.1 | 16.2 | 23.9 |
| 1910 | 39.5 | 27.1 | 33.4 | - | - | - |
| 1930 | 32.6 | 16.5 | 50.9 | 86.7 | 6.1 | 5.4 |
| 1960 | 14.2 | 30.2 | 55.6 | 45.8 | 35.4 | 27.8 |
| 1980 | 7 | 33 | 60 | 16 | 44 | 40 |
| 1990 | 3 | 25 | 62 | 14 | 42 | 44 |

**Notes**: For Canada, 1890-1960, data are for the first year in each decade (1891, 1911, etc.) and refer to the primary, secondary and tertiary sector. For Russia/USSR, data are for 1897, 1926 and 1959. Data do not sum to 100% because of a residual other category.
**Sources**: For Canada, 1890-1960: O.J. Firestone (1958), Canada's Economic Development, London; and S.G. Peitchinis (1970), Canadian Labour Economics, Toronto. For Russia/USSR, 1890-1960, B.R. Mitchell (1992), International Historical Statistics. Europe 1750-1988, New York: Stockton Press. Data for 1980 and 1990 from World Development Report, World Bank (1996).

## 3.2 Transition and deindustrialisation

What is the effect of economic transition on the allocation of labour? Within the structure of our model, transition could be accounted for by an increase in c back to the level in market economies and a fall in the technical handicap factor k to zero. The effect of an increase in c is to increase the output of the services sector, which requires an increase in employment as services productivity continues growing at no more than its steady state rate. The impact on the demand of labour in industry is unambiguously negative, producing the well-known pattern of labour reallocation from industry to services. The effect of a falling k is to accelerate the process of reallocation somewhat

as industrial productivity growth rises temporarily. Figure 5 shows the impact of transition on the share of employment in industry. Note that adjustment in both cases is instantaneous with no adjustment costs.

Does our model allow us to say anything about the pattern of aggregate output during the transition? Recall that output per head is given by:

$$y = \frac{Y}{L} = \frac{[b(y_a - y_i) + y_a y_i]\frac{y_s}{y_a}}{cy_i + (1-c)y_s} \qquad (13)$$

The numeraire is unaffected by a change in c, so the effect depends on whether the denominator falls or rises. This can be rewritten as: $c(y_i-y_s) +y_s$, and will rise in c for $y_i>y_s$. In other words, the model would predict a fall in output whenever productivity in industry is higher than in services at the time of transition. However, by the same token, the model would also predict that central planning raises aggregate output relative to that in a market economy, because of its preference for industrial goods, which generate faster productivity growth. This results from the model's abstraction of relative price changes and hence true economic value. Assuming true consumer preferences for services are higher than central planners' preferences for services, there would be a shortage for services under central planning. Measured at market prices, productivity in services would be higher and hence welfare should increase as the economy returns to market equilibrium.

We can evaluate the welfare effects of transition using the graphical representation presented earlier. Let us assume that planners' preferences are such that the centrally planned economy produces pre-transition at point $E^{CPE}$, with a schedule $CC^{CPE}$ that is flatter than that of consumers in a market economy $CC^M$, as shown in Figure 6. Welfare of consumers in the centrally-planned economy is represented by the indifference curve $UU^{CPE}$, and the welfare costs to consumers of the imposition of planners preferences can be seen as the result of the under-provision of services and over-provision of industrial goods. Transition and liberalisation results in a new equilibrium at $E^M$ and an increase in the welfare of consumers represented by an outward move to the indifference curve $UU^M$, resulting from a shift away from industrial goods and into services. Using central planners' preferences, the move from $E^{CPE}$ to $E^M$ is a welfare loss, but using market preferences, the move is a welfare gain.

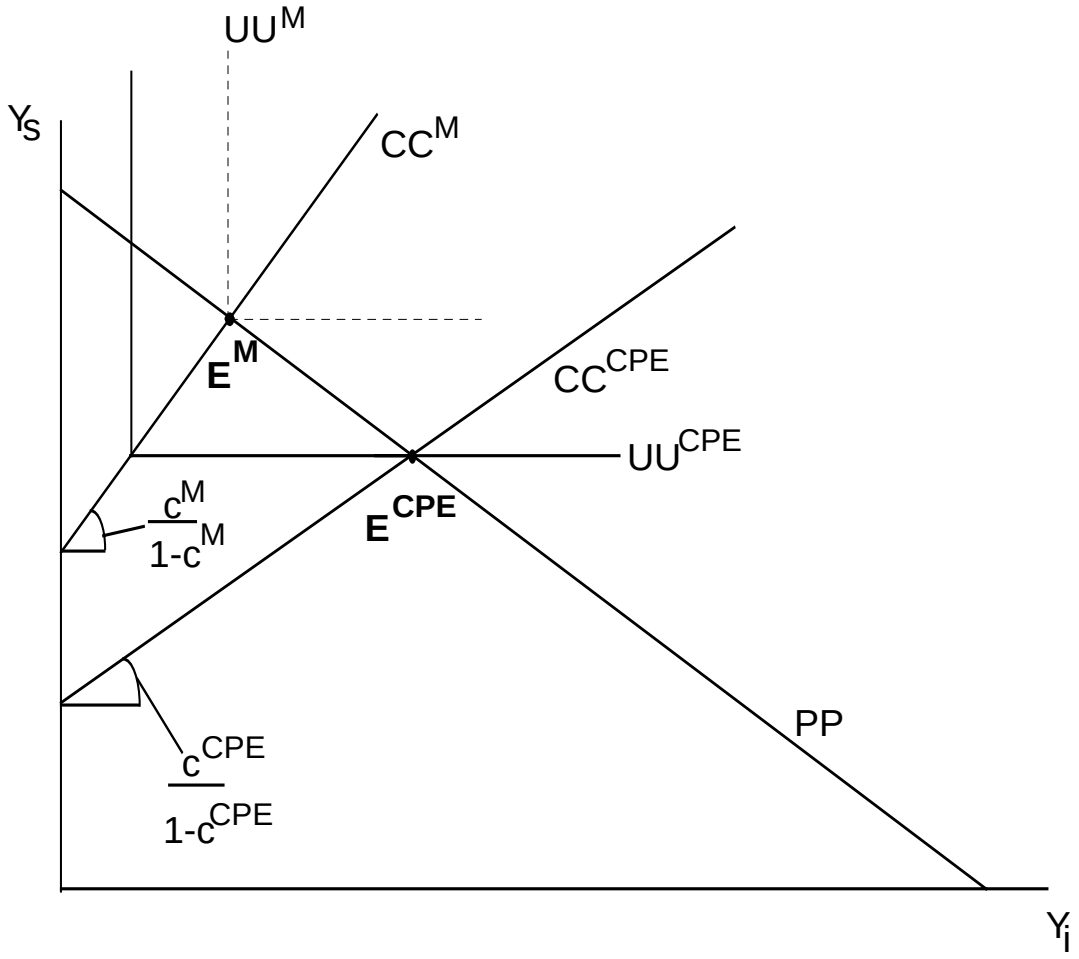



**Figure 6: The Welfare Impact of Transition**

This result echoes the debate on index number problems in evaluating the output decline in transition. Initially, many observers stated that since output was measured at historical prices, the output fall at the beginning of transition may have been but a statistical artefact. It has been pointed out, however, that most statistical offices in the region have used Paasche indices for output measurement, which would take relative price changes into account (Schaffer, 1992). Yet, the overall welfare effects of price liberalisation are still ambiguous, as shown by Roberts (1997). Once allowance is made for adjustment costs and a drop in labour participation rates, a J-curve pattern of output and welfare is fully compatible with the model presented here.[15]

## 4. Structural Adjustment During Transition: Evidence 1989-99

In order to derive market benchmarks for the structure of employment for the transition economies, we follow the basic approach of Chenery-type cross-country regressions. This methodology allows both to establish benchmarks against which the

[15] On possible sources of adjustment costs see Blanchard and Kremer (1997). De Broek and Koen (2000) show empirically that general efficiency losses rather than factor reallocation across sectors are the main causes of the output decline during the transition. Allowing individuals to leave the labour force (e.g. for the informal sector or to work abroad) obviously reduces potential output in the model and hence also accounts for part of the output decline.

economic structures of transition countries can be judged and to address the question of whether the market forces unleashed in the transition economies are moving their economic structures towards these benchmarks.

The analysis is again in terms of the structure of employment. Changes in the structure of employment in the transition countries can be measured more reliably than changes in the structure of GDP, since the complications caused by the dramatic changes in relative prices in transition countries are avoided. Reallocation and restructuring of employment is furthermore a fundamental part of the transition process and of particular interest in its own right. This is not to neglect the considerable data problems we face in the transition context. Initial excess employment was large in many companies, particularly the large-scale industrial dinosaurs. Moreover, many industrial firms were responsible for the provision of social services to their workers. Both factors would have tended to inflate industrial employment numbers. In this sense, the adjustment we observe since the beginning of transition also reflects the reduction is such inefficiencies in addition to changing preferences and technological spillovers.

The disaggregation of sectors is the same as that used for the preceding analysis, except that we further distinguish between market-oriented services, which were particularly under-developed under central planning, and non-market-oriented services. Specifically, we benchmark the following four broad sectors:

- Agriculture
- Industry (mining, manufacturing, electricity, gas, water, construction)
- Market-oriented services (trade, transport, communications, finance)
- Non-market-oriented services (health, education, government administration)

To determine the benchmark shares for each of these sectors for the transition economies, regression analysis, using data from 50 non-transition countries, is used to derive the relationships between the shares of various sectors in total employment on the one hand, to GDP per capita at purchasing power parity on the other. The estimated relationships are in line with those derived by Chenery and others: the richer the country, the lower its share of employment in agriculture, and the higher its shares of employment in industry and various categories of services. Note that the preceding discussion would suggest controlling for the starting date of industrialisation in the cross-country regressions. However, data for the date of take-off is hard to obtain. Most of the transition economies are recent industrialisers and in this sense similar to the middle income market economies included in our benchmark regressions.

We then use the estimated relationships between structure and income to analyse the dynamics of structural change in 22 transition economies – 10 accession candidates and 12 CIS countries – from the start of transition to 2000.[16] In the course of transition, countries have been experiencing both structural change, as the composition of employment has changed, and large changes in output and GDP per capita. Thus the benchmarks, as well as the actual structure of employment, have

[16] The exception throughout the analysis that follows is Turkmenistan, for which we have data only through 1999.

changed over time. We analyse these dynamics in two ways. First, we look at the changes in employment structure for two groups of countries, accession candidates and CIS countries, between 1989/90 and 2000. We construct an employment distortion index that measures the distance each country is from the sectoral structure that would be found in a typical market economy with the same per capita income. The change in the value of this index over the course of transition tells us whether a country has been moving towards a market economy structure. We then go on to use annual data on the sectoral structure of employment and GDP per capita for the period 1989/90 to 2000 to track the direction and speed of adjustment in each of the four sectors. The presentation here is graphical, showing the path each country has taken over a decade of transition.

### 4.1 Benchmarking structural change

To construct our market economy benchmarks we use data from 50 market economies for the year 1995. Employment data derive from the International Labour Organization's statistical yearbook and use the ISIC 3 classification. In a few cases these data are supplemented by data from the World Bank and national statistical yearbooks. GDP per capita data are measured at purchasing power parity expressed in 1995 dollars, and are derived from the World Bank's *World Development Report*, extended using EBRD data. The per capita incomes of the 50 market economies range from $590 (Malawi) to $26,980 (United States). The 50 market economies include 14 of the 15 EU member states, omitting only Luxembourg.[17]

The four benchmarking regressions are reported in Table 3. In each case, the sector share of employment is regressed on log GDP per capita and its square. All four regressions perform well, with high values of $R^2$ and with an F-test of the joint significance of the two income per capita variables showing them to be statistically highly significant. The insignificance of the individual coefficients in some of the regressions is a multicollinearity issue that has no implications for the benchmarks derived. Rather than eliminate one or the other income term, we include them both in all regressions for simplicity and consistency.

[17] Argentina, Australia, Austria, Bangladesh, Belgium, Bolivia, Canada, Chile, China, Costa Rica, Denmark, Egypt, El Salvador, Finland, France, Germany, Greece, Honduras, Hong Kong, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Malawi, Malaysia, Mauritius, Mexico, Netherlands, New Zealand, Norway, Pakistan, Panama, Peru, Philippines, Portugal, Singapore, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Syria, Trinidad and Tobago, Tunisia, Turkey, United Kingdom, United States, and Venezuela.

**Table 3: Benchmarking Regressions**

| Independent variables: | Dependent variable: share of employment in | | | |
|---|---|---|---|---|
| | Agriculture | Industry | Market services | Non-market services |
| Log GDP per capita | -0.38390<br>(0.036) | 0.32560<br>(0.019) | 0.08198<br>(0.576) | -0.03740<br>(0.808) |
| (Log GDP per capita)$^2$ | 0.01082<br>(0.293) | -0.01600<br>(0.042) | 0.00058<br>(0.945) | 0.00548<br>(0.533) |
| Constant | 2.78970<br>(0.001) | -1.37035<br>(0.023) | -0.49013<br>(0.441) | 0.12316<br>(0.853) |
| $R^2$ | 0.883 | 0.4544 | 0.7141 | 0.4784 |
| F(2, 47) | 176.4<br>(0.000) | 19.57<br>(0.000) | 58.71<br>(0.000) | 21.55<br>(0.000) |
| Number of observations | 50 | 50 | 50 | 50 |

The fitted curves are plotted in Figures 7.1-7.4 along with the data for the 50 market economies. The standard relationships between income per capita and sectoral employment hold: as income rises, employment in agriculture falls, employment in services rises, and employment in industry rises, flattens and then starts to fall (de-industrialisation), with a maximum share of industry in employment of 28% reached at a per capita income of $26,300 in 1995 prices.

Note that in our cross-sectional analysis, the downward portion of the U-shape for industrial employment is almost entirely absent. This is entirely consistent with our model, as noted in sections 2.1 and 2.2. The early starters in our sample have higher peaks of industrial employment than the late starters, and although their shares of industrial employment may be declining they still typically exceed those of the late starters. It is also worth noting that in this simple benchmarking analysis, EU membership is not associated with an atypical employment structure. Figures 7.1-7.4 show that the EU countries tend to be found fairly close to, and on both sides of, the fitted benchmarks.

**Figure 7.1**
**Benchmarking Agriculture:**
**50 Market Economies in 1995**

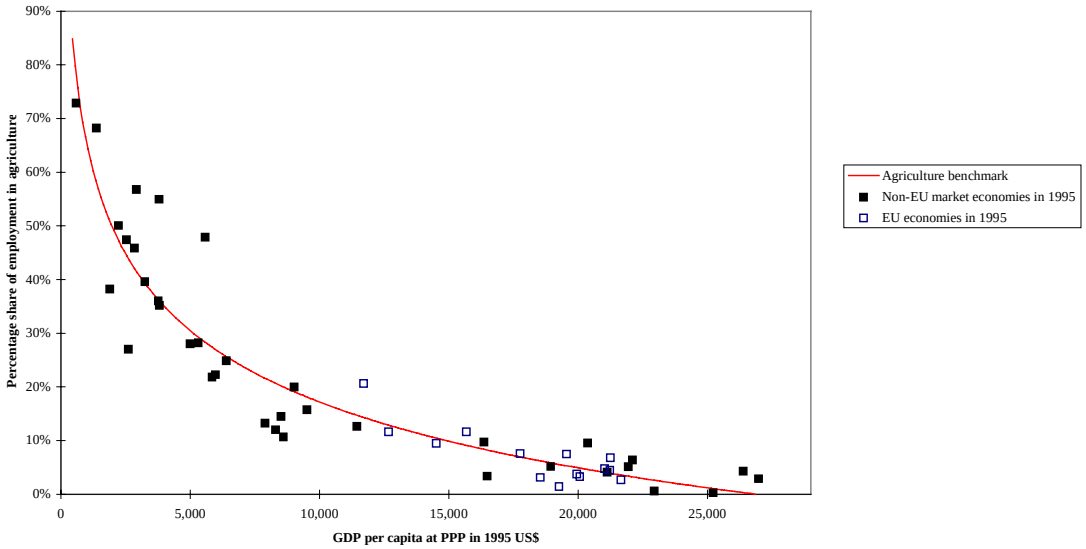



**Figure 7.2**
**Benchmarking Industry:**
**50 Market Economies in 1995**

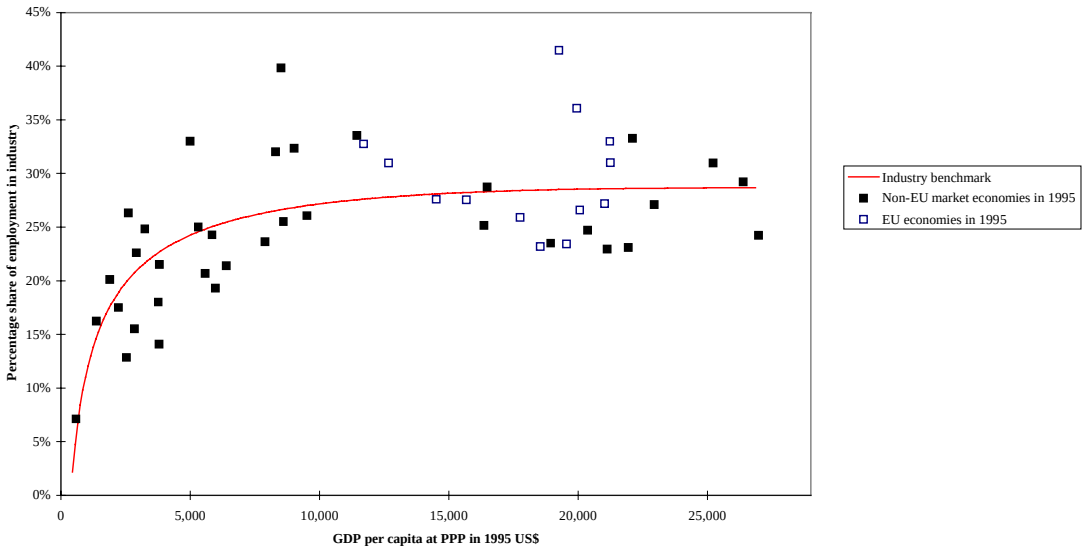


**Figure 7.3**
**Benchmarking Market Services:**
**50 Market Economies in 1995**

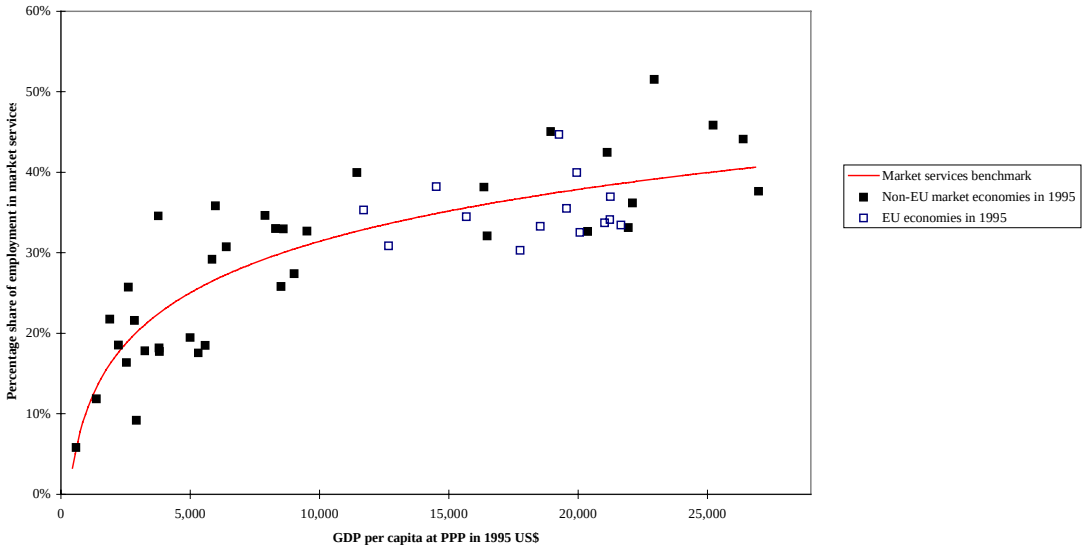
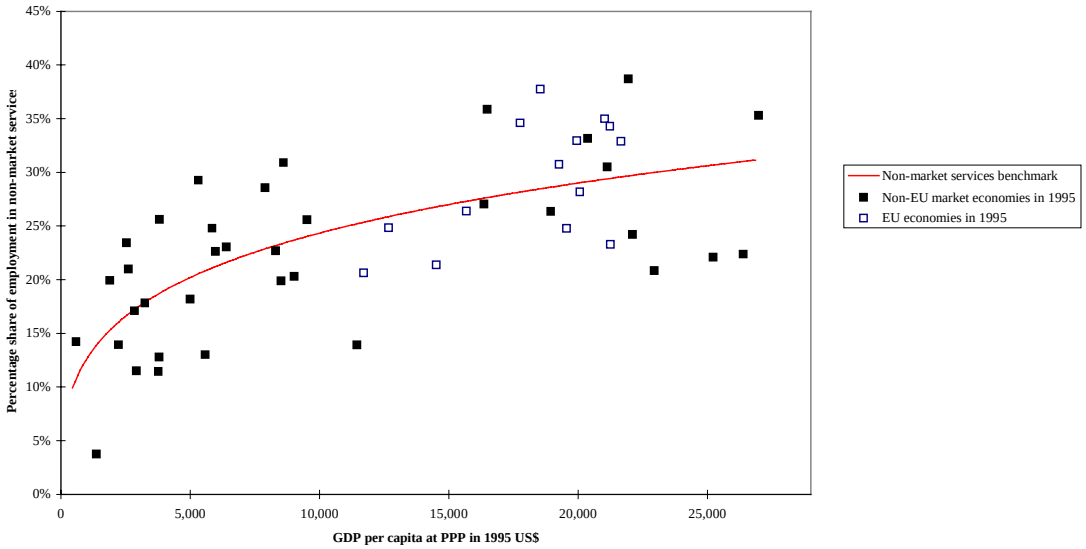



**Figure 7.4**
**Benchmarking Non-Market Services:**
**50 Market Economies in 1995**




## 4.2 Structural change in transition: accession candidates and CIS countries

Table 4 presents the average sectoral employment shares – both actual and the market economy benchmarks – for two groups of countries, the 10 accession candidates and the 12 CIS countries, for the start of transition in 1989/90 and for 2000, along with the group average GDP per capita. We also calculate an index of the extent of the combined sectoral deviations from their respective benchmarks. This overall

distortion index is defined as half the sum of the absolute value of (s-s*), where s is the actual share of employment in a sector, and s* is the benchmark share. The distortion index is a measure of the overall distance of an economy from a market economy with the same per capita income. No distortions means an economy with a structural identical to the market economy benchmark in all sectors and a distortion index of zero; the maximum value for the index is 100%. The last row of Table 4 shows the average distortion index for the accession candidates and for the CIS countries at the start of transition and in 2000. The raw data on annual sectoral employment shares and the distortion index for individual countries are reported in Appendix 2.

**Table 4: Structural Change in Transition**

| | Accession Candidates | | CIS Countries | |
|---|---|---|---|---|
| | 1989/90 | 2000 | 1989/90 | 2000 |
| GDP per capita, 1995 US$ | 7,399 | 7,146 | 4,888 | 2,679 |
| Shares of employment: | | | | |
| Agriculture | | | | |
| - Actual | 17.7% | 15.6% | 29.4% | 39.8% |
| - Benchmark | 23.5% | 25.2% | 31.7% | 45.4% |
| Industry | | | | |
| - Actual | 41.9% | 31.9% | 31.1% | 18.3% |
| - Benchmark | 25.8% | 25.4% | 23.8% | 19.4% |
| Market-oriented Services | | | | |
| - Actual | 20.9% | 29.4% | 13.4% | 17.4% |
| - Benchmark | 28.3% | 27.6% | 24.5% | 18.5% |
| Non-market Services | | | | |
| - Actual | 18.7% | 23.0% | 23.7% | 22.7% |
| - Benchmark | 22.3% | 21.9% | 19.9% | 16.6% |
| Distortion index | 16.8% | 12.4% | 14.1% | 12.3% |

The distortion index at first glance tells a surprising story: at the start of transition, the accession candidates had economies that were more distorted – further from what would be found in comparable market economies – than were the CIS countries; and in 2000, the two groups of countries had on average the same remaining level of distortions (index=12.4% for the accession candidates vs. 12.3% for the CIS average).

A closer look at the sectoral employment shares in Table 4 explains this apparently paradoxical finding. At the start of transition, the accession candidates were already distant from the agricultural benchmark (17.7% actual vs. 23.5% benchmark); a decade of transition later, the average share of employment in agriculture had fallen to 15.6%, whereas the benchmark increased to 25.2% because of the average decline in income. The CIS countries, by contrast, actually increased the share of agriculture in

total employment, and the average CIS country was closer to the agricultural benchmark in 2000 than was the average accession candidate.

In industry, the accession candidates started much further from the industry benchmark than did the CIS countries. Both groups of countries decreased their shares of employment in the course of transition, but whereas in 2000 the accession candidates were still very over-industrialised (31.9% share of industry in employment vs. 25.4% benchmark), the CIS average was about the same (in fact, slightly *under*) the relevant benchmark (19.4%).

The adjustment in market-oriented services was large in both groups of countries – both had increased employment in this sector during transition and were close to the relevant benchmark as of 2000. In non-market oriented services, however, the CIS countries were on average far from the benchmark, with employment in this sector significantly above what would be found in market economies of a comparable income.

These country group averages, however, conceal both differences between different countries within the groups, as well as the path taken in the course of transition and the trend as of 2000. For this reason we turn to a more detailed graphical analysis.

### 4.3 Structural change in transition: a detailed analysis

For each of the four sectors of interest – industry, agriculture, market-oriented services and non-market services – we plot the path each transition country has taken during the course of 10 years of transition. The position of each country in 2000 is marked in the figure by a small ■. For each sector we first present all 22 transition countries in our sample, and then in separate figures the 10 accession candidates and 12 CIS countries. Individual countries are identified in the latter two figures.

Figures 8.1-8.3 present our results for industry. Figure 8.1 shows that the transition countries began the transition with very large industrial sectors; for most transition countries, industrial employment was on the order of 15 percentage points higher than in market economies with the same income per capita. The few exceptions to this pattern are the poorest transition countries, which started the transition with levels of industrial that were close to the benchmark. With respect to the change observed in the course of transition, an interesting pattern emerges. All 22 transition countries saw significant declines in the share of employment working in industry, but the observed adjustment takes one of two forms: the wealthier transition countries find themselves in 2000 with levels of industrial employment that are still significantly above the market economy benchmark. By contrast, in 2000 the poorer transition economies have shares of employment in industry that are at or even below the market economy benchmark.

The path of structural change in industry in the accession candidates is shown in Figure 8.2. The “sideways-U” shape observed for most of these countries reflects the J-curve of output in the course of transition, with an initial large decline in measured GDP followed by recovery. The decline in the share of employment predicted by our

model is in fact observed, with all the accession candidates moving towards the market economy benchmark. As of 2000, however, not only are all 10 countries still employing a larger share of their workforce in industry, but in most of the countries the adjustment has slowed or even halted entirely. Indeed, most have shares of industrial employment that are stabilising at levels that are not only above the benchmark for market economies of the same GDP per capita, but are also well above the peak of the market economy benchmark that is observed at a far higher level of income. This finding is therefore unaffected by potential mismeasurement of GDP per capita in the accession candidates.

The pattern observed in the CIS countries is rather different, as Figure 8.3 shows. The European CIS countries – Russia, Ukraine, Belarus – show declines in the share of industry in employment that leave these countries well above the market economy benchmark, though in the cases of Russia and Ukraine (but not Belarus) the evidence suggests that the adjustment is continuing. The remaining CIS countries are different: they were as likely as not to start the transition with smaller industrial sectors that were not far from the market economy benchmark, and in 2000 they have shares of employment in industry that are either comparable to or below that found in typical market economies at the same level of income.

**Figure 8.1**
**Benchmarking Industry:**
**Transition Economies in 2000 and Change from Pre-Transition**

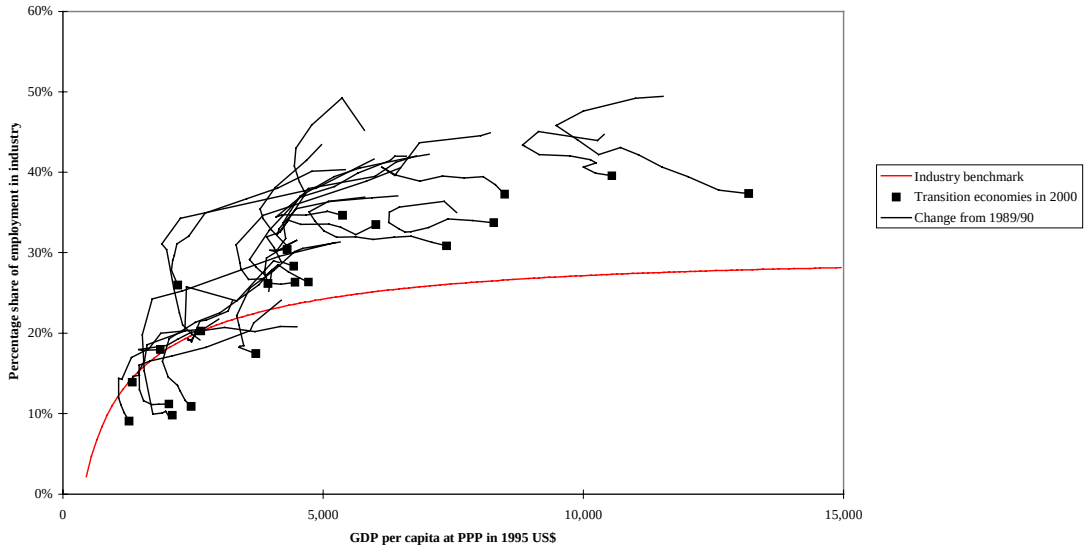


**Figure 8.2**
**Benchmarking Industry:**
**Accession Candidates in 2000 and Change from Pre-Transition**

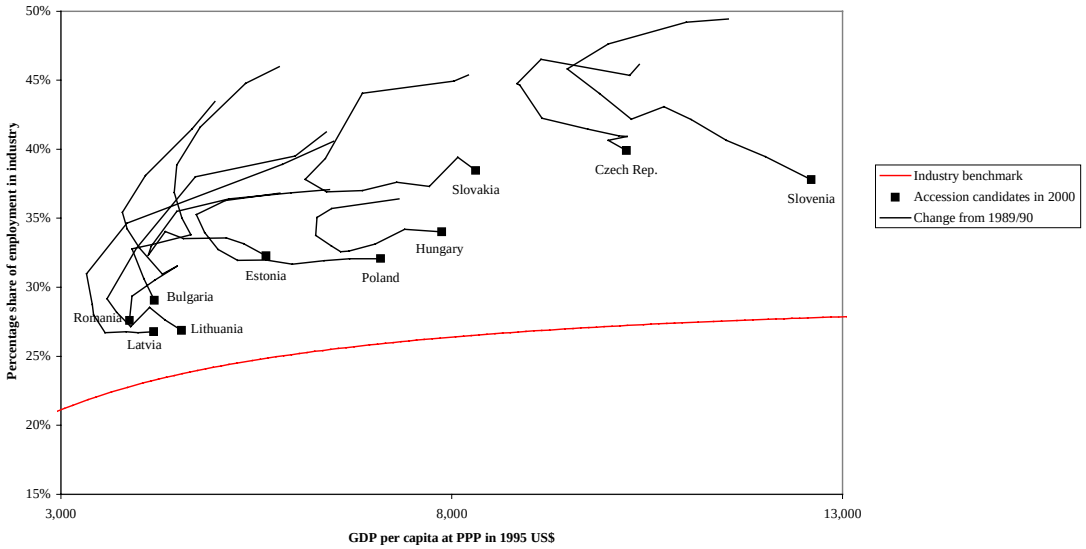
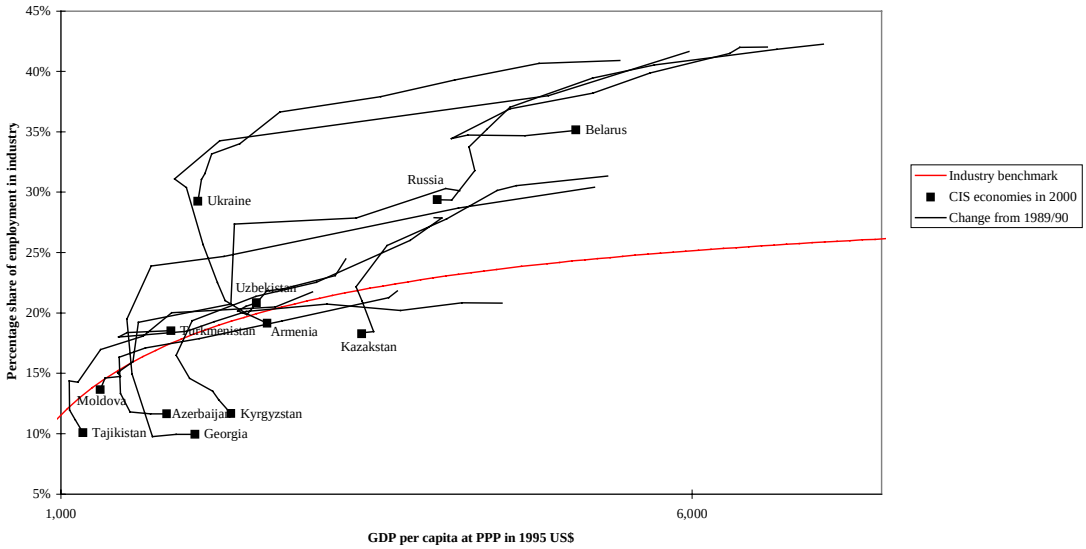



**Figure 8.3**
**Benchmarking Industry:**
**CIS Economies in 2000 and Change from Pre-Transition**




We turn now to agriculture (Figures 9.1-9.3). Most of the 22 transition countries began the transition with agricultural labour forces that relatively small – though not markedly so – compared to market economies of comparable incomes. The pattern of adjustment during transition is here somewhat surprising, with the direction of adjustment clearly correlated with the level of income. In the lower income transition countries, especially the non-European CIS countries and the poorer accession candidates (Romania, Bulgaria), the share of total employment in agriculture has

increased, in several cases by 20 percentage points or more. This adjustment has brought the poorer transition countries close to the relevant market economy benchmark, despite the fact that the large GDP declines experienced by these countries in effect raised the benchmark. Almost all the richer and more advanced reformers, by contrast, have seen continued declines in agriculture's share of total employment, taking them further *away* from the market economy benchmark, though by 2000 the rate of decline had slowed considerably.

After a decade of transition, most of the advanced reformers find themselves with levels of agricultural employment that would normally be found in developed market economies with much higher levels of income. Indeed, the 14 EU countries in our regression analysis had in 1995 an average agricultural employment share of 7.0%, ranging from 1.4% in the UK to 20.6% in Greece. If we take the 8 more rapid and advanced reformers and exclude Bulgaria and Romania, we find the average share of employment in agriculture was 10.9%, ranging from 5-7% in the Czech Republic and Slovakia to 19-20% in Lithuania and Poland. Put another way, these 8 accession candidates already have agricultural labour forces that are comparable in scale to the lower income EU member states.

**Figure 9.1**
**Benchmarking Agriculture:**
**Transition Economies in 2000 and Change from Pre-Transition**

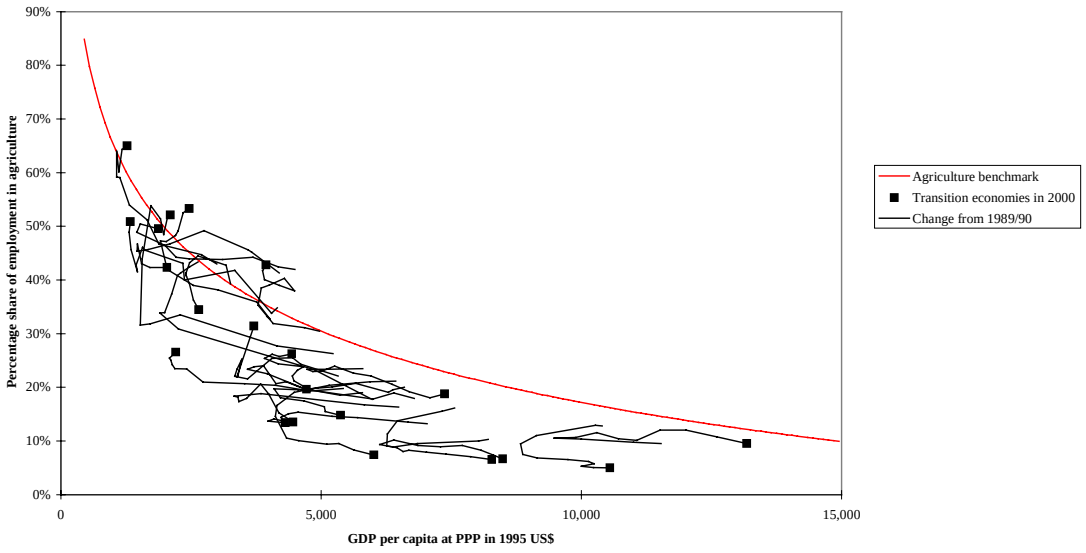


**Figure 9.2**
**Benchmarking Agriculture:**
**Accession Candidates in 2000 and Change from Pre-Transition**

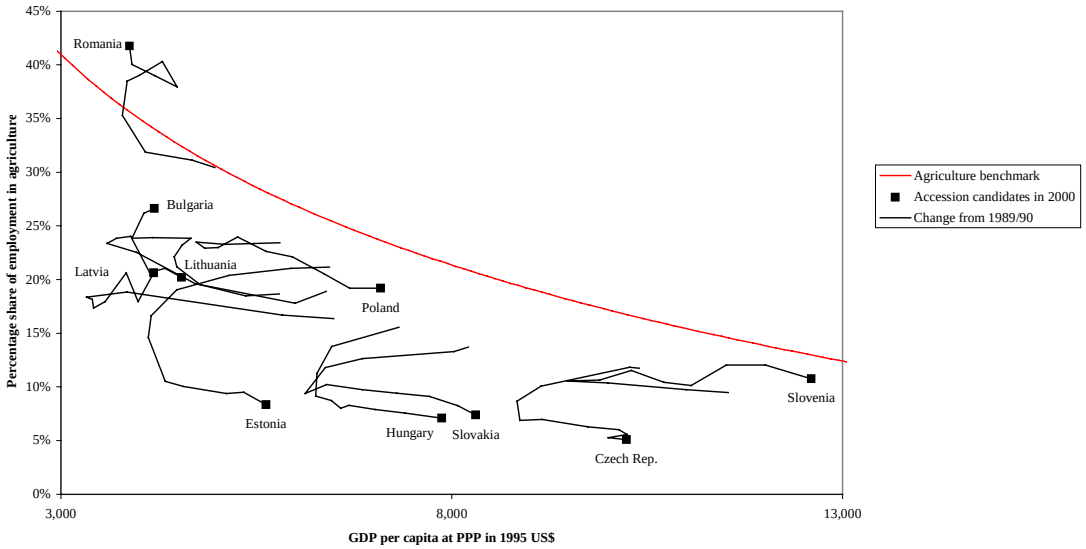
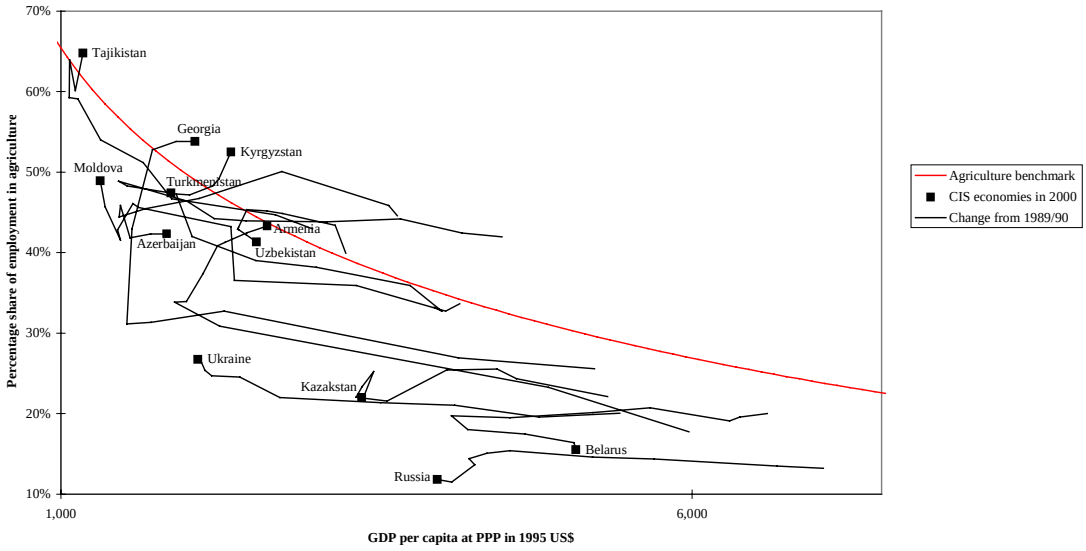



**Figure 9.3**
**Benchmarking Agriculture:**
**CIS Economies in 2000 and Change from Pre-Transition**




As discussed earlier, market-oriented services were under-provided under central planning. We would expect that in the course of transition countries labour should move into this sector. What the data show in Figures 10.1-10.3 is that in fact all countries have moved towards the market economy benchmark, but not all have increased the share of labour in market services. All the transition economies did indeed start the transition with small market-oriented service sectors. The richer and

most of the middle-ranking transition countries adjusted by increasing the share of employment in services, seen as an upward movement in the figures. Most of the poorest transition countries did not, however, adjust in this way – they moved closer to the benchmark by keeping roughly the same market service size and simply becoming poorer, seen as a horizontal movement leftwards.

**Figure 10.1**
**Benchmarking Market Services:**
**Transition Economies in 2000 and Change from Pre-Transition**

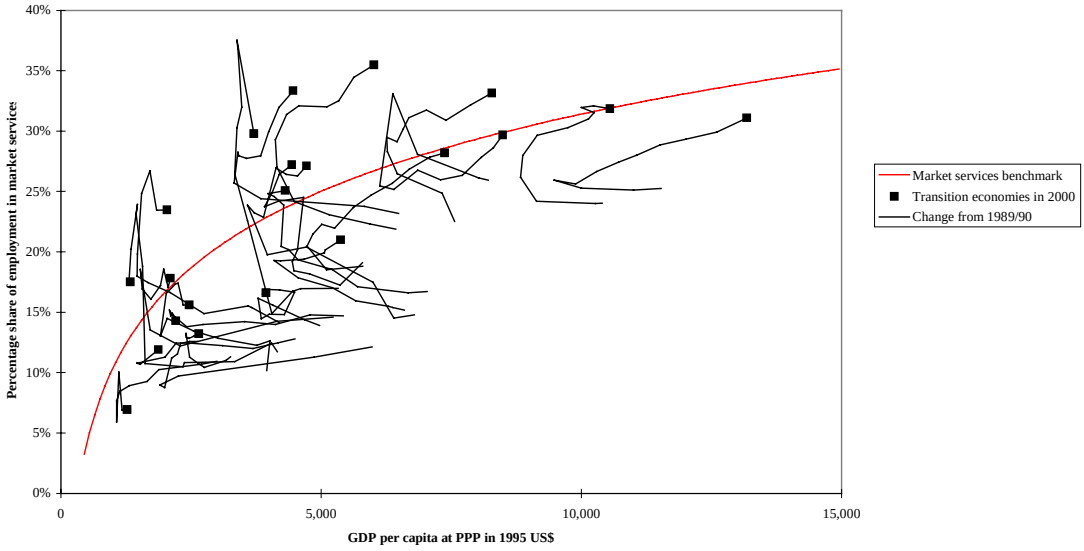



**Figure 10.2**
**Benchmarking Market Services:**
**Accession Candidates in 2000 and Change from Pre-Transition**

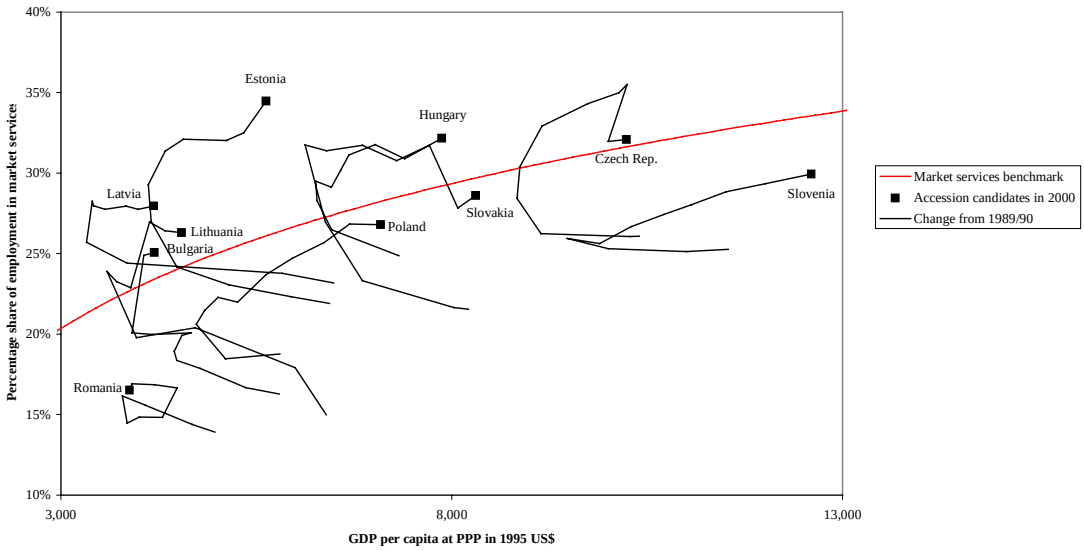
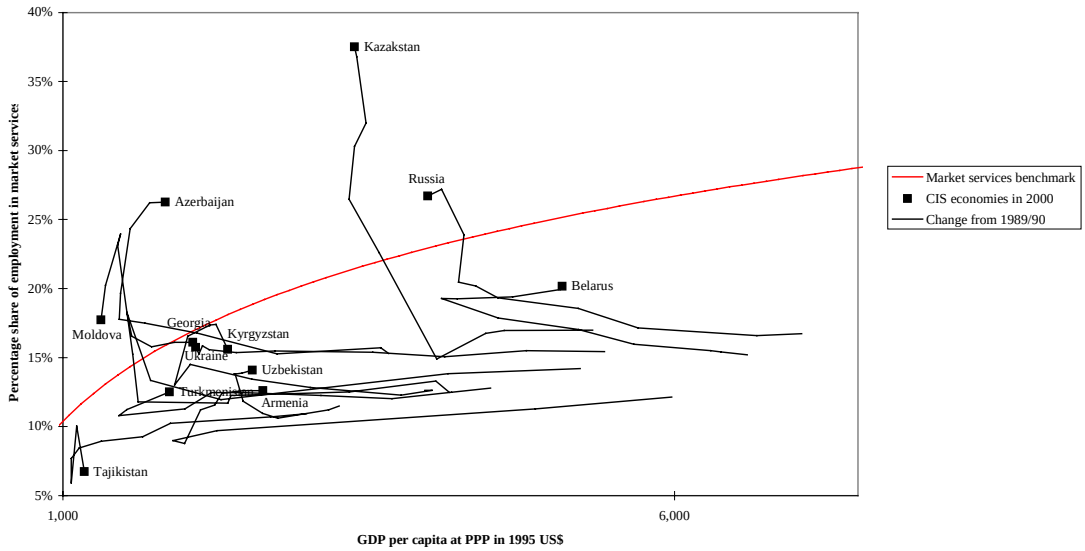


**Figure 10.3**
**Benchmarking Market Services:**
**CIS Economies in 2000 and Change from Pre-Transition**




In the case of non-market services – health, education, government – the starting point for the transition countries was on average not far from the market economy benchmark (Figures 11.1-11.3), but with the accession candidates starting with shares of employment that were in general somewhat below the market economy benchmark (Figure 11.2) and with most of the CIS countries starting with levels that were above the benchmark (Figure 11.3). In the course of transition, most of the accession candidates (Figure 11.2) saw increases in the share of employment in non-market services to levels that are now close the benchmark. The changes in the shares for the CIS in the course of transition shows more variation (Figure 11.3), but the current position does not; almost all remain well above the market economy benchmark, and there is no clear pattern of countries adjusting towards the benchmark. Whereas the accession candidates for the most part now have an aggregate level of employment in this sector that is similar to that seen in market economies of a similar income, the CIS countries employ more people in health, education and government than would comparable market economies.

**Figure 11.1**
**Benchmarking Non-Market Services:**
**Transition Economies in 2000 and Change from Pre-Transition**

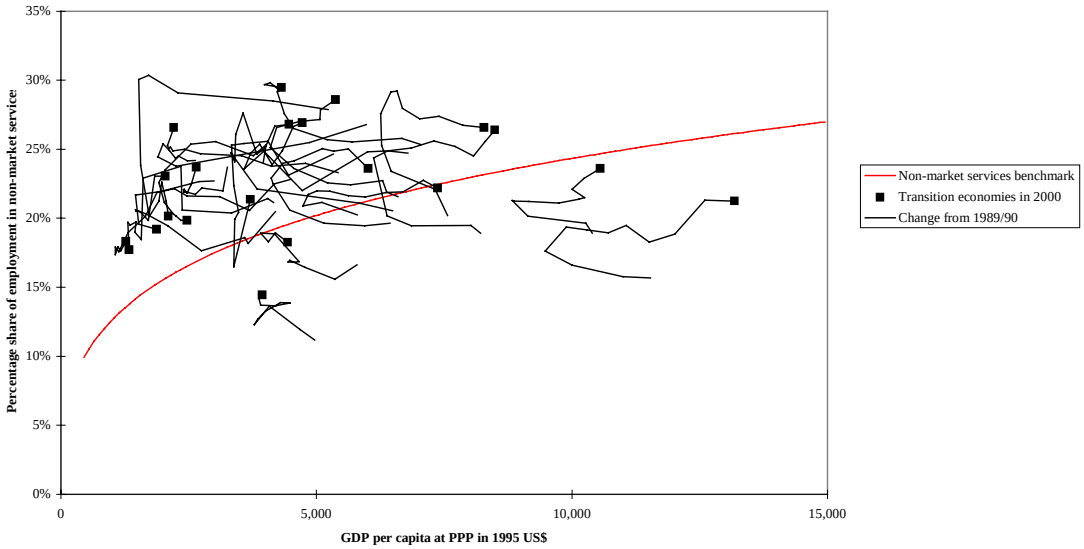



**Figure 11.2**
**Benchmarking Non-Market Services:**
**Accession Candidates in 2000 and Change from Pre-Transition**

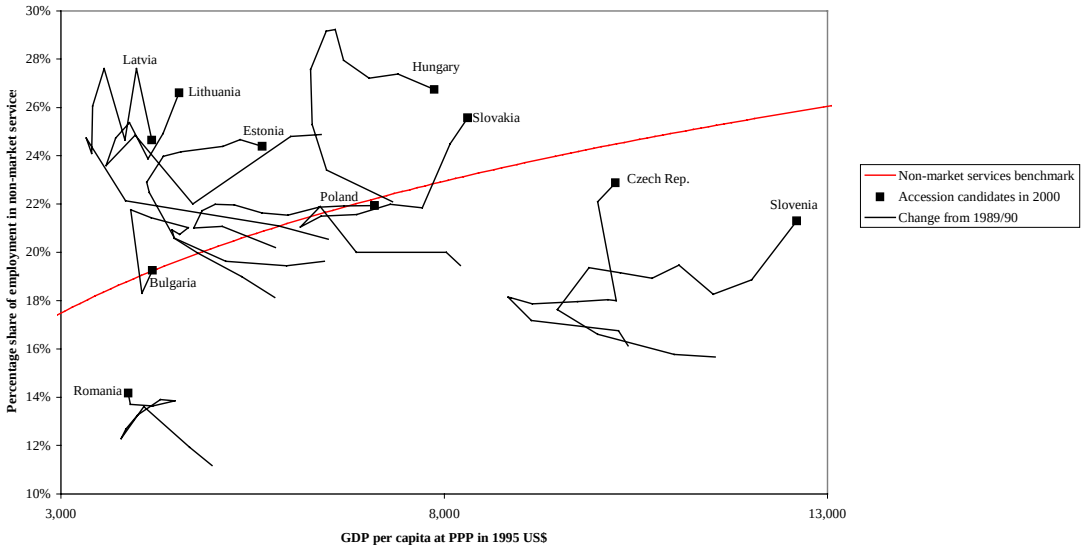
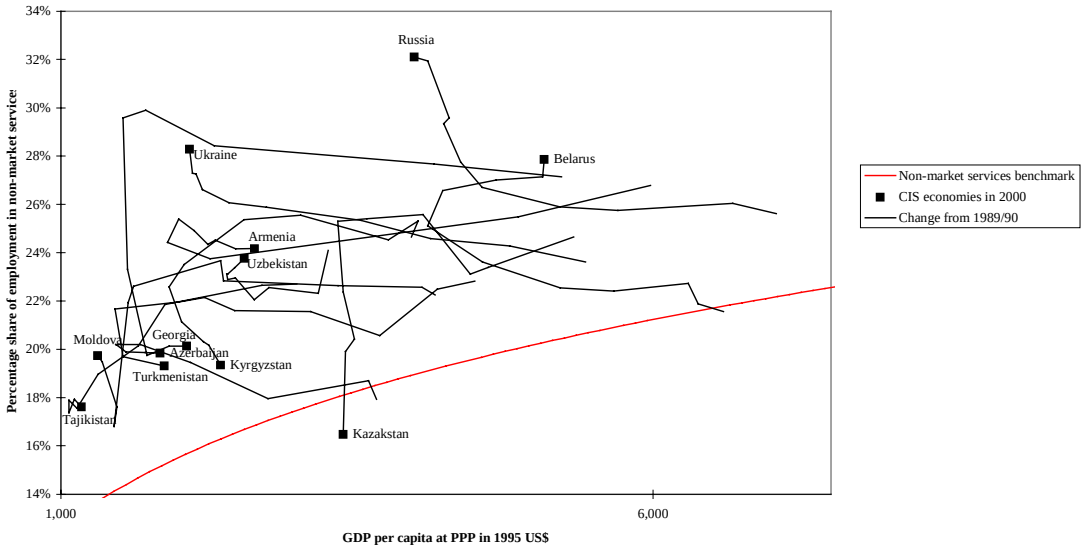


**Figure 11.3**
**Benchmarking Non-Market Services:**
**CIS Economies in 2000 and Change from Pre-Transition**




Our findings in this section may be summarised as follows.

The share of employment in industry, which in all accession candidates and almost all CIS countries was well above their respective market economy benchmarks at the start of transition, has fallen in all transition countries. In all accession candidates, however, the share of employment in industry in 2000 remains well above what would be found in market economies of comparable incomes. Indeed, the more developed and faster reformers amongst the accession candidates still have shares of industrial employment that are well above what would be found even in a typical high income market economy. There are signs, moreover, that adjustment is slowing in these countries. The picture for the CIS countries is mixed. The European CIS countries (Russia, Ukraine, Belarus) still have excessively large industrial sectors, but the poorer southern and Asian CIS countries have levels of industrial employment that are at or even below the market economy benchmark.

In agriculture, we again see a difference between the richer and more advanced accession candidates and the poorer transition countries. The richer accession candidates started the transition with agricultural labour forces that were significantly below what would be found in market economies of comparable incomes. These countries have, moreover, continued to shed agricultural labour, so that as of 2000 the share of agricultural in their labour forces is even further below the market economy benchmarks than it was at the start of transition. The shares of employment in agriculture now observed in most of these countries is now comparable to the range observed in the less wealthy members of the European Union. The CIS countries again present a different picture; the European CIS countries started with, and still

have, agricultural labour forces that are lower than would be expected of comparable market economies, and the poorest CIS countries have increased the shares of their employment in agriculture to the point where they are now all close to the market economy benchmark.

The picture with respect to the market-oriented service sector (trade, finance, transport, communications etc.) is encouraging for almost all the accession candidates. The share of employment in this sector has increased markedly during transition, and is now in most cases at or even above the market economy benchmarks. The picture for the CIS countries is more mixed but still encouraging; in general these countries are now close to the benchmark. By contrast, the developments in non-market services (health, education, government) are worrisome. Many of the accession countries, and almost all of the CIS countries, have shares of employment in non-market services that are much greater than would be found in market economies of a comparable income.

## 5. Conclusions

This paper has presented a framework to benchmark structural adjustment in the transition economies. The simple model we provide allows us to examine both the causes of overindustrialisation in centrally planned economies and the pattern of adjustment towards market-based equilibrium during the transition. We simulate two channels through which central planning may have led to over-industrialisation. These two channels are the preferences of central planners for industrial goods over services and the technological handicap, which slowed the rate of industrial productivity growth. The results of our simulations suggest that the distortion in preferences probably was a more important reason for overindustrialisation than the technological handicap.

Turning to the transition, the prediction of rapid deindustrialisation obtained from the analytical framework is strongly borne out by the evidence. Adjustment in the accession countries has by no means been faster than in the CIS. One major difference in the pattern of adjustment across the region has been changes in agricultural employment. In the richest transition countries agriculture has shed employment during transition and is now generally smaller than would be predicted by income levels. This might be explained by a relatively high reservation wage among industrial workers due to the existence of a social safety net and relatively high mobility out of temporary unemployment. Thus workers in the advanced countries have preferred the experience a spell of unemployment to the return to “the village”. The opposite is true in most CIS countries, where such a safety net was not available and many people have been forced back into subsistence farming (EBRD, 2000).

The empirical analysis suggests a number of implications for accession: (1) Structural adjustment in industry is far from complete in all the accession candidates. Further downsizing in industry is to be expected in the long run, if these countries are to continue to move towards adopting a market economy industrial structure. The pace of adjustment in industry shows signs of slowing in a number of countries, however. (2) In agriculture, the wealthier and more rapidly reforming accession candidates have

continued to reduce the shares of their labour forces in agriculture, and are now actually quite close to what is seen in many EU member states. Agriculture has been a particular problem for EU policy making for many years, and this finding suggests that in the long run the impact of the accession countries on this problem may not be as great as might have been feared. (3) A number of the accession candidates have shares of employment in non-market-oriented services that are significantly greater than would be expected in market economies of similar incomes, with potentially significant implications for the public finances of these countries.

Turning to the issue of economic development patterns more generally, the paper raises the interesting hypothesis that patterns of industrialisation may change systematically depending on the date of take-off and the distance to the technological leader in the world. While direct empirical tests of this prediction may be difficult, it would seem worthwhile to conduct further research into the matter and draw implications for development strategies. Thus, as industrialisation is no longer available as a major outlet for surplus rural labour, the focus of policies might shift towards creating the conditions for employment in services.

The analysis presented in this paper remains incomplete in several important respects. The model is very simple and suffers from restrictive assumptions. As a heuristic device it is nevertheless quite powerful. More sophisticated theoretical research has begun, however, to integrate economic growth and structural change into a unified analytical framework (Kongsamut, Rebelo and Xie, 1998). Empirically, the benchmarks we have derived fail to control for the effects of economic specialisation in the global market and the availability of natural resources, which may have an important bearing on the allocation of employment. Measures of natural capital across the world have recently been calculated by the World Bank (Serageldin, 1997) and could be integrated into the analysis in future research (for a first attempt see Döhrn and Heilemann, 1996). Finally, a closer examination of variations in the patterns of adjustment across transition economies would seem promising, in particular regarding the dynamic implications of large-scale labour reallocation from industry back to agriculture in the CIS.

**References**


Baumol W. (1967), "Macroeconomics of Unbalanced Growth: the Anatomy of Urban Crisis". American Economic Review Vol. 56, No. 5, pp. 415-426.

Baumol W., R. Nelson and E. Wolff (1995), "Introduction: The Convergence of Productivity, Its Significance and Its Varied Connotations". In: W. Baumol ed. *Productivity Convergence.*

Broek de M. and V. Koen (2000), "The Great Contractions in Russia, the Baltics and the Other Countries of the Former Soviet Union: A View from the Supply Side". IMF Working Paper, No. 39, 2000.

Chenery H.B., and L. Taylor (1968), "Development Patterns: Among Countries and Over Time". *The Review of Economics and Statistics*, Vol. 50, pp. 391-416.

Chenery H.B., and M. Syrquin (1975), *Patterns of Development, 1950-1970*, Oxford University Press, London.

Döhrn R. and U. Heilemann (1996), "The Chenery Hypothesis and Structural Change in Eastern Europe". *Economics of Transition*, Vol. 4, No. 2, pp. 411-423.

EBRD (1997), *Transition Report 1997*, European Bank for Reconstruction and Development, London.

Fourastié, J. (1949), *Le grand espoir du XXème siècle*. Paris: PUF.

Fuchs, V. (1968), *The service economy*. New York: Columbia University Press.

Gomulka S. (1986), "Soviet Growth Slowdown: Duality, Maturity and Innovation", *American Economic Review, Papers and Proceedings*, May.

Gomulka S. (1990), *The Theory of Technological Change and Economic Growth*, Routledge, London and New York.

Gomulka S. and M. Schaffer (1987), "Kaldor's Stylised Facts and Systemic Diffusion Effects in Productivity Growth". In: G. Fink, G. Poll and M Riese (eds.) *Economic Theory, Political Power and Social Justice*, pp. 313-343.

Jackman R. and C. Pauna (1995), "Labour market policy and the reallocation of labour across sectors". Mimeo, London School of Economics.

Kongsamut P., S. Rebelo, and D. Xie (1998), "Beyond Balanced Growth", University of Rochester, mimeo.

Kunte A., K. Hamilton, J. Dixon, M. Clemens (1997), "Estimating National Wealth. Methodology and Results". The World Bank, mimeo.

Mason E. (1984), “The Chenery Analysis and Other Considerations”. In *Economic Structure and Performance,* Academic Press.

Ofer G. (1987), “Soviet Economic Growth 1928-1985”. Journal of Economic Literature, Vol.25, No. 4, pp. 1767-1833.

Petit, P. (1987), “Services”. In J. Eatwell et al. (eds.), *The New Palgrave: A Dictionary of Economics*, Macmillan.

Poirson H. (2000), “Factor Reallocation and Growth in Developing Countries”. IMF Working Paper No. 94, June 2000, Washington DC.

Roberts, B. (1997), “Welfare change and the elimination of the shortage economy in Russia”. *Economics of Transition*, Vol. 5, No. 2, pp. 427-51.

Rostow, W. (1960), *The Stages of Economic Growth: A Non-Communist Manifesto,* Cambridge University Press.

Rowthorn R. and R. Ramaswamy (1997), “Deindustrialisation: Causes and Implications”. IMF Working Paper No. 42, 1997.

Schaffer, M.E. (1992), “The Polish State-Owned Enterprise Sector and the Recession in 1990”. *Comparative Economic Studies*, Vol. 34, No. 1, Spring.

Serageldin I. (1996), Sustainability and the Wealth of Nations. First Steps in an Ongoing Journey”. ESDS Monograph Series No. 5, The World Bank, Washington, D.C.

Spilimbergo A. (1997), “Deindustrialisation and Trade”, IMF mimeo.

Syrquin M., and H.B. Chenery (1989), *Patterns of Development 1950 to 1983*, World Bank Discussion Paper No. 41.

Winiecki J. (1988), *The Distorted World of Soviet Type Economies*, Routledge, London and New York.

**Appendix 1: Proof of monotonicity of output**

We have:

$$Y_a = bL \tag{A1.1}$$

$$Y_s = cY \tag{A1.2}$$

$$\begin{aligned} Y &= Y_a + Y_i + Y_s \\ &= bL + Y_i + cY \\ &= \frac{1}{1-c}(bL + Y_i) \end{aligned} \tag{A1.3}$$

Since c, b and L are all constant, the behaviour of Y only depends on the behaviour of $Y_i$ over time.

$$Y_i \equiv L_i y_i \tag{A1.4}$$

Using

$$L_i = \frac{(1-c)y_s - b(1-c)\frac{y_s}{y_a} - bc}{cy_i + (1-c)y_s} \tag{A1.5}$$

we have

$$Y_i = \frac{(1-c)y_s - b(1-c)\frac{y_s}{y_a} - bc}{c + (1-c)\frac{y_s}{y_i}} \tag{A1.6}$$

The denominator of equation (A1.6) falls monotonically as long as $\frac{dy_i}{dt} > \frac{dy_s}{dt}$, which is one of the assumptions made in the model.

The numeraire of (A1.6) can be rearranged as:

$$y_s(1-c)(1-\frac{b}{y_a}) - bc \tag{A1.7}$$

For all $b<y_a$ this will be monotonically increasing. But we know that:

$$Y_a \equiv y_a L_a = bL \tag{A1.8}$$

Dividing through by $L_a$ yields

$$b = \frac{L_a}{L} y_a \qquad \text{(A1.9)}$$

which implies $b<y_a$ with a strict inequality (except in the trivial case of zero employment in both industry and services).

Thus as long as productivity growth in industry is faster than in services, the model will exhibit monotonic output growth and the rate will gradually decline towards the rate of productivity growth in services.

## Appendix 2: Annual data on employment shares and the distortion index

The data on employment shares were compiled from various sources, primarily the CIS *Statistical Yearbook* (various years), the ILO *Yearbook of Labour Statistics* (various years), and the statistical yearbooks produced by individual countries. Because of changes in data series definitions and coverage, and because of residual categories of employment in the raw data for some countries, there is an unattributable residual for a number of countries in some years. This residual can be negative because of chainlinking of sectoral data series using definitions that are not fully compatible.

The data below can be obtained in Excel format at:

http://www.som.hw.ac.uk/ecomes/data/RSS_Appendix2_data.xls

## Table A2.1: Accession candidates: sectoral employment shares, distortion index, and GDP at PPP

| Country | Year | GDP at PPP | Agriculture | Industry | Market services | Non-market services | Residual | Distortion index |
|---|---|---|---|---|---|---|---|---|
| Bulgaria | 1989 | 5792 | 0.190 | 0.452 | 0.191 | 0.166 | 0.000 | 0.203 |
| Bulgaria | 1990 | 5361 | 0.185 | 0.493 | 0.172 | 0.156 | -0.006 | 0.243 |
| Bulgaria | 1991 | 4781 | 0.195 | 0.459 | 0.182 | 0.164 | 0.000 | 0.218 |
| Bulgaria | 1992 | 4480 | 0.212 | 0.430 | 0.184 | 0.170 | 0.004 | 0.195 |
| Bulgaria | 1993 | 4448 | 0.221 | 0.408 | 0.192 | 0.168 | 0.011 | 0.177 |
| Bulgaria | 1994 | 4548 | 0.232 | 0.388 | 0.202 | 0.168 | 0.010 | 0.156 |
| Bulgaria | 1995 | 4663 | 0.239 | 0.373 | 0.245 | 0.169 | -0.026 | 0.123 |
| Bulgaria | 1996 | 4176 | 0.244 | 0.326 | 0.242 | 0.189 | 0.000 | 0.101 |
| Bulgaria | 1997 | 3909 | 0.253 | 0.320 | 0.237 | 0.189 | 0.000 | 0.102 |
| Bulgaria | 1998 | 4059 | 0.262 | 0.306 | 0.249 | 0.183 | 0.000 | 0.093 |
| Bulgaria | 1999 | 4195 | 0.258 | 0.289 | 0.264 | 0.189 | 0.000 | 0.086 |
| Bulgaria | 2000 | 4439 | 0.262 | 0.283 | 0.272 | 0.183 | 0.000 | 0.080 |
| Czech Rep | 1989 | 10399 | 0.128 | 0.447 | 0.240 | 0.189 | -0.005 | 0.172 |
| Czech Rep | 1990 | 10274 | 0.129 | 0.440 | 0.240 | 0.196 | -0.005 | 0.165 |
| Czech Rep | 1991 | 9141 | 0.110 | 0.451 | 0.242 | 0.201 | -0.004 | 0.180 |
| Czech Rep | 1992 | 8833 | 0.095 | 0.434 | 0.262 | 0.213 | -0.003 | 0.165 |
| Czech Rep | 1993 | 8872 | 0.075 | 0.432 | 0.280 | 0.213 | 0.000 | 0.165 |
| Czech Rep | 1994 | 9152 | 0.069 | 0.422 | 0.297 | 0.212 | 0.001 | 0.154 |
| Czech Rep | 1995 | 9739 | 0.065 | 0.420 | 0.303 | 0.211 | 0.000 | 0.150 |
| Czech Rep | 1996 | 10135 | 0.062 | 0.416 | 0.310 | 0.214 | -0.002 | 0.144 |
| Czech Rep | 1997 | 10245 | 0.058 | 0.412 | 0.315 | 0.215 | 0.000 | 0.140 |
| Czech Rep | 1998 | 10002 | 0.053 | 0.406 | 0.320 | 0.221 | 0.000 | 0.141 |
| Czech Rep | 1999 | 10235 | 0.051 | 0.399 | 0.321 | 0.229 | 0.001 | 0.132 |
| Czech Rep | 2000 | 10553 | 0.050 | 0.395 | 0.319 | 0.236 | 0.000 | 0.123 |
| Estonia | 1989 | 6437 | 0.212 | 0.371 | 0.219 | 0.196 | 0.002 | 0.117 |
| Estonia | 1990 | 5942 | 0.210 | 0.368 | 0.223 | 0.194 | 0.004 | 0.119 |
| Estonia | 1991 | 5151 | 0.204 | 0.364 | 0.231 | 0.196 | 0.005 | 0.122 |
| Estonia | 1992 | 4482 | 0.190 | 0.355 | 0.242 | 0.206 | 0.007 | 0.133 |
| Estonia | 1993 | 4154 | 0.166 | 0.330 | 0.270 | 0.225 | 0.009 | 0.172 |
| Estonia | 1994 | 4117 | 0.146 | 0.323 | 0.293 | 0.229 | 0.009 | 0.194 |
| Estonia | 1995 | 4338 | 0.105 | 0.340 | 0.314 | 0.240 | 0.001 | 0.228 |
| Estonia | 1996 | 4567 | 0.100 | 0.335 | 0.321 | 0.242 | 0.002 | 0.222 |
| Estonia | 1997 | 5115 | 0.094 | 0.336 | 0.320 | 0.250 | 0.000 | 0.207 |
| Estonia | 1998 | 5337 | 0.095 | 0.332 | 0.325 | 0.249 | 0.000 | 0.197 |
| Estonia | 1999 | 5626 | 0.083 | 0.323 | 0.345 | 0.250 | -0.001 | 0.199 |
| Estonia | 2000 | 6014 | 0.074 | 0.335 | 0.355 | 0.236 | 0.000 | 0.195 |
| Hungary | 1989 | 7566 | 0.161 | 0.350 | 0.225 | 0.202 | 0.062 | 0.119 |
| Hungary | 1990 | 7325 | 0.156 | 0.364 | 0.249 | 0.221 | 0.011 | 0.109 |
| Hungary | 1991 | 6465 | 0.138 | 0.357 | 0.265 | 0.234 | 0.006 | 0.122 |
| Hungary | 1992 | 6278 | 0.113 | 0.351 | 0.283 | 0.253 | 0.001 | 0.147 |
| Hungary | 1993 | 6258 | 0.091 | 0.338 | 0.295 | 0.276 | 0.000 | 0.169 |
| Hungary | 1994 | 6461 | 0.087 | 0.330 | 0.291 | 0.292 | 0.000 | 0.167 |
| Hungary | 1995 | 6577 | 0.080 | 0.326 | 0.302 | 0.292 | 0.000 | 0.171 |
| Hungary | 1996 | 6687 | 0.083 | 0.326 | 0.311 | 0.280 | 0.000 | 0.165 |
| Hungary | 1997 | 7021 | 0.079 | 0.331 | 0.318 | 0.272 | 0.000 | 0.159 |
| Hungary | 1998 | 7396 | 0.075 | 0.342 | 0.309 | 0.274 | 0.000 | 0.153 |
| Hungary | 1999 | 7872 | 0.071 | 0.340 | 0.322 | 0.267 | 0.000 | 0.145 |
| Hungary | 2000 | 8281 | 0.065 | 0.337 | 0.332 | 0.266 | 0.000 | 0.141 |
| Latvia | 1990 | 6489 | 0.164 | 0.406 | 0.232 | 0.206 | -0.007 | 0.147 |
| Latvia | 1991 | 5832 | 0.167 | 0.389 | 0.238 | 0.211 | -0.005 | 0.137 |
| Latvia | 1992 | 3843 | 0.188 | 0.346 | 0.244 | 0.221 | 0.000 | 0.170 |
| Latvia | 1993 | 3330 | 0.183 | 0.310 | 0.257 | 0.247 | 0.003 | 0.204 |
| Latvia | 1994 | 3401 | 0.182 | 0.288 | 0.283 | 0.241 | 0.007 | 0.199 |
| Latvia | 1995 | 3417 | 0.174 | 0.280 | 0.280 | 0.261 | 0.006 | 0.206 |
| Latvia | 1996 | 3565 | 0.179 | 0.267 | 0.277 | 0.276 | 0.000 | 0.195 |

| Country | Year | GDP at PPP | Agriculture | Industry | Market services | Non-market services | Residual | Distortion index |
|---|---|---|---|---|---|---|---|---|
| Latvia | 1997 | 3837 | 0.206 | 0.268 | 0.280 | 0.247 | 0.000 | 0.153 |
| Latvia | 1998 | 3988 | 0.188 | 0.262 | 0.300 | 0.251 | 0.000 | 0.163 |
| Latvia | 1999 | 4187 | 0.153 | 0.261 | 0.320 | 0.267 | 0.000 | 0.188 |
| Latvia | 2000 | 4464 | 0.135 | 0.263 | 0.333 | 0.268 | 0.000 | 0.193 |
| Lithuania | 1989 | 6789 | 0.179 | 0.421 | 0.148 | 0.247 | 0.005 | 0.194 |
| Lithuania | 1990 | 6396 | 0.189 | 0.412 | 0.145 | 0.249 | 0.004 | 0.193 |
| Lithuania | 1991 | 5999 | 0.178 | 0.395 | 0.175 | 0.248 | 0.004 | 0.181 |
| Lithuania | 1992 | 4721 | 0.196 | 0.380 | 0.204 | 0.220 | 0.000 | 0.162 |
| Lithuania | 1993 | 3969 | 0.225 | 0.328 | 0.198 | 0.249 | 0.000 | 0.158 |
| Lithuania | 1994 | 3589 | 0.234 | 0.292 | 0.239 | 0.236 | 0.000 | 0.139 |
| Lithuania | 1995 | 3713 | 0.238 | 0.282 | 0.232 | 0.247 | 0.000 | 0.127 |
| Lithuania | 1996 | 3894 | 0.240 | 0.271 | 0.229 | 0.254 | 0.006 | 0.113 |
| Lithuania | 1997 | 4135 | 0.207 | 0.285 | 0.269 | 0.239 | 0.000 | 0.137 |
| Lithuania | 1998 | 4331 | 0.210 | 0.276 | 0.264 | 0.249 | 0.000 | 0.124 |
| Lithuania | 1999 | 4544 | 0.202 | 0.269 | 0.263 | 0.266 | 0.000 | 0.122 |
| Lithuania | 2000 | 4721 | 0.196 | 0.263 | 0.271 | 0.269 | 0.000 | 0.121 |
| Poland | 1989 | 5799 | 0.235 | 0.369 | 0.188 | 0.203 | 0.006 | 0.122 |
| Poland | 1990 | 5105 | 0.234 | 0.364 | 0.185 | 0.211 | 0.005 | 0.131 |
| Poland | 1991 | 4732 | 0.234 | 0.351 | 0.205 | 0.209 | 0.002 | 0.122 |
| Poland | 1992 | 4840 | 0.229 | 0.340 | 0.215 | 0.217 | -0.001 | 0.115 |
| Poland | 1993 | 5012 | 0.230 | 0.327 | 0.223 | 0.220 | 0.000 | 0.102 |
| Poland | 1994 | 5261 | 0.240 | 0.319 | 0.220 | 0.220 | 0.001 | 0.090 |
| Poland | 1995 | 5623 | 0.226 | 0.320 | 0.237 | 0.216 | 0.001 | 0.079 |
| Poland | 1996 | 5961 | 0.221 | 0.317 | 0.247 | 0.215 | 0.000 | 0.069 |
| Poland | 1997 | 6367 | 0.205 | 0.319 | 0.257 | 0.219 | 0.000 | 0.068 |
| Poland | 1998 | 6695 | 0.192 | 0.321 | 0.268 | 0.219 | 0.000 | 0.064 |
| Poland | 1999 | 7091 | 0.181 | 0.313 | 0.279 | 0.227 | 0.000 | 0.060 |
| Poland | 2000 | 7375 | 0.188 | 0.308 | 0.282 | 0.222 | 0.000 | 0.048 |
| Romania | 1989 | 4970 | 0.304 | 0.434 | 0.139 | 0.112 | 0.010 | 0.197 |
| Romania | 1990 | 4681 | 0.311 | 0.415 | 0.144 | 0.119 | 0.011 | 0.181 |
| Romania | 1991 | 4081 | 0.319 | 0.381 | 0.156 | 0.136 | 0.008 | 0.154 |
| Romania | 1992 | 3786 | 0.353 | 0.354 | 0.162 | 0.123 | 0.009 | 0.132 |
| Romania | 1993 | 3849 | 0.385 | 0.342 | 0.145 | 0.127 | 0.001 | 0.142 |
| Romania | 1994 | 4003 | 0.390 | 0.329 | 0.148 | 0.133 | 0.000 | 0.139 |
| Romania | 1995 | 4297 | 0.403 | 0.310 | 0.148 | 0.139 | 0.000 | 0.143 |
| Romania | 1996 | 4488 | 0.380 | 0.315 | 0.167 | 0.139 | 0.000 | 0.131 |
| Romania | 1997 | 4201 | 0.390 | 0.305 | 0.168 | 0.136 | 0.000 | 0.122 |
| Romania | 1998 | 3908 | 0.400 | 0.294 | 0.169 | 0.137 | 0.000 | 0.110 |
| Romania | 1999 | 3879 | 0.418 | 0.276 | 0.165 | 0.142 | 0.000 | 0.109 |
| Romania | 2000 | 3941 | 0.428 | 0.262 | 0.166 | 0.144 | 0.000 | 0.107 |
| Slovakia | 1989 | 8211 | 0.103 | 0.449 | 0.259 | 0.189 | 0.000 | 0.184 |
| Slovakia | 1990 | 8027 | 0.100 | 0.445 | 0.261 | 0.195 | -0.001 | 0.181 |
| Slovakia | 1991 | 6855 | 0.095 | 0.437 | 0.281 | 0.194 | -0.007 | 0.177 |
| Slovakia | 1992 | 6381 | 0.088 | 0.396 | 0.331 | 0.202 | -0.017 | 0.192 |
| Slovakia | 1993 | 6124 | 0.093 | 0.406 | 0.255 | 0.244 | 0.002 | 0.185 |
| Slovakia | 1994 | 6397 | 0.102 | 0.397 | 0.252 | 0.249 | 0.001 | 0.175 |
| Slovakia | 1995 | 6858 | 0.092 | 0.389 | 0.268 | 0.251 | 0.001 | 0.162 |
| Slovakia | 1996 | 7296 | 0.089 | 0.395 | 0.260 | 0.256 | 0.000 | 0.167 |
| Slovakia | 1997 | 7712 | 0.092 | 0.393 | 0.263 | 0.252 | 0.000 | 0.155 |
| Slovakia | 1998 | 8078 | 0.083 | 0.394 | 0.278 | 0.245 | 0.000 | 0.145 |
| Slovakia | 1999 | 8308 | 0.074 | 0.385 | 0.286 | 0.256 | 0.000 | 0.143 |
| Slovakia | 2000 | 8491 | 0.067 | 0.373 | 0.297 | 0.264 | 0.000 | 0.138 |
| Slovenia | 1989 | 11535 | 0.095 | 0.494 | 0.253 | 0.157 | 0.002 | 0.220 |
| Slovenia | 1990 | 11000 | 0.097 | 0.492 | 0.251 | 0.158 | 0.002 | 0.219 |
| Slovenia | 1991 | 10003 | 0.104 | 0.476 | 0.253 | 0.166 | 0.001 | 0.206 |
| Slovenia | 1992 | 9477 | 0.105 | 0.458 | 0.259 | 0.176 | 0.001 | 0.189 |
| Slovenia | 1993 | 9890 | 0.106 | 0.440 | 0.256 | 0.194 | 0.004 | 0.171 |
| Slovenia | 1994 | 10298 | 0.115 | 0.422 | 0.267 | 0.192 | 0.005 | 0.152 |

| Country | Year | GDP at PPP | Agriculture | Industry | Market services | Non-market services | Residual | Distortion index |
|---|---|---|---|---|---|---|---|---|
| Slovenia | 1995 | 10714 | 0.104 | 0.431 | 0.274 | 0.189 | 0.001 | 0.158 |
| Slovenia | 1996 | 11062 | 0.101 | 0.421 | 0.280 | 0.195 | 0.002 | 0.149 |
| Slovenia | 1997 | 11512 | 0.120 | 0.406 | 0.288 | 0.183 | 0.002 | 0.133 |
| Slovenia | 1998 | 12012 | 0.120 | 0.395 | 0.293 | 0.189 | 0.003 | 0.120 |
| Slovenia | 1999 | 12600 | 0.108 | 0.378 | 0.299 | 0.213 | 0.002 | 0.102 |
| Slovenia | 2000 | 13180 | 0.095 | 0.374 | 0.311 | 0.213 | 0.008 | 0.099 |

## Table A2.2: CIS countries: sectoral employment shares, distortion index, and GDP at PPP

| Country | Year | GDP at PPP | Agriculture | Industry | Market services | Non-market services | Residual | Distortion index |
|---|---|---|---|---|---|---|---|---|
| Armenia | 1990 | 5976 | 0.177 | 0.416 | 0.121 | 0.268 | 0.017 | 0.229 |
| Armenia | 1991 | 4862 | 0.233 | 0.380 | 0.113 | 0.255 | 0.020 | 0.203 |
| Armenia | 1992 | 2258 | 0.309 | 0.343 | 0.097 | 0.238 | 0.014 | 0.236 |
| Armenia | 1993 | 1901 | 0.338 | 0.311 | 0.090 | 0.244 | 0.017 | 0.234 |
| Armenia | 1994 | 1995 | 0.339 | 0.304 | 0.088 | 0.254 | 0.016 | 0.230 |
| Armenia | 1995 | 2125 | 0.374 | 0.257 | 0.112 | 0.249 | 0.008 | 0.166 |
| Armenia | 1996 | 2240 | 0.408 | 0.225 | 0.116 | 0.243 | 0.008 | 0.122 |
| Armenia | 1997 | 2302 | 0.413 | 0.210 | 0.124 | 0.245 | 0.007 | 0.105 |
| Armenia | 1998 | 2475 | 0.425 | 0.199 | 0.126 | 0.242 | 0.009 | 0.082 |
| Armenia | 1999 | 2635 | 0.433 | 0.192 | 0.126 | 0.242 | 0.007 | 0.077 |
| Armenia | 2000 | 2793 | 0.444 | 0.177 | 0.126 | 0.247 | 0.006 | 0.097 |
| Azerbaijan | 1989 | 4194 | 0.413 | 0.241 | 0.141 | 0.205 | 0.000 | 0.093 |
| Azerbaijan | 1990 | 3665 | 0.452 | 0.212 | 0.154 | 0.182 | 0.000 | 0.084 |
| Azerbaijan | 1991 | 3597 | 0.456 | 0.203 | 0.155 | 0.186 | 0.000 | 0.085 |
| Azerbaijan | 1992 | 2750 | 0.492 | 0.183 | 0.149 | 0.177 | 0.000 | 0.069 |
| Azerbaijan | 1993 | 2096 | 0.467 | 0.172 | 0.166 | 0.195 | 0.000 | 0.037 |
| Azerbaijan | 1994 | 1669 | 0.457 | 0.165 | 0.175 | 0.203 | 0.000 | 0.080 |
| Azerbaijan | 1995 | 1462 | 0.454 | 0.160 | 0.180 | 0.206 | 0.000 | 0.113 |
| Azerbaijan | 1996 | 1473 | 0.467 | 0.130 | 0.198 | 0.205 | 0.000 | 0.122 |
| Azerbaijan | 1997 | 1549 | 0.431 | 0.116 | 0.248 | 0.205 | 0.000 | 0.165 |
| Azerbaijan | 1998 | 1710 | 0.423 | 0.111 | 0.267 | 0.199 | 0.000 | 0.165 |
| Azerbaijan | 1999 | 1838 | 0.423 | 0.112 | 0.235 | 0.231 | 0.000 | 0.154 |
| Azerbaijan | 2000 | 2042 | 0.423 | 0.112 | 0.235 | 0.230 | 0.000 | 0.140 |
| Belarus | 1989 | 6595 | 0.200 | 0.420 | 0.152 | 0.216 | 0.012 | 0.170 |
| Belarus | 1990 | 6379 | 0.196 | 0.420 | 0.154 | 0.219 | 0.012 | 0.174 |
| Belarus | 1991 | 6295 | 0.191 | 0.415 | 0.155 | 0.227 | 0.012 | 0.179 |
| Belarus | 1992 | 5667 | 0.207 | 0.399 | 0.160 | 0.224 | 0.010 | 0.170 |
| Belarus | 1993 | 5215 | 0.201 | 0.382 | 0.170 | 0.226 | 0.021 | 0.169 |
| Belarus | 1994 | 4558 | 0.195 | 0.369 | 0.179 | 0.236 | 0.021 | 0.181 |
| Belarus | 1995 | 4095 | 0.197 | 0.344 | 0.193 | 0.251 | 0.014 | 0.180 |
| Belarus | 1996 | 4222 | 0.180 | 0.347 | 0.193 | 0.266 | 0.014 | 0.194 |
| Belarus | 1997 | 4675 | 0.174 | 0.347 | 0.194 | 0.270 | 0.014 | 0.187 |
| Belarus | 1998 | 5066 | 0.164 | 0.351 | 0.199 | 0.271 | 0.014 | 0.184 |
| Belarus | 1999 | 5081 | 0.155 | 0.352 | 0.202 | 0.279 | 0.013 | 0.190 |
| Belarus | 2000 | 5376 | 0.148 | 0.347 | 0.210 | 0.286 | 0.010 | 0.185 |
| Georgia | 1990 | 5228 | 0.263 | 0.312 | 0.146 | 0.279 | 0.000 | 0.142 |
| Georgia | 1991 | 4148 | 0.277 | 0.296 | 0.143 | 0.285 | 0.000 | 0.156 |
| Georgia | 1992 | 2294 | 0.335 | 0.252 | 0.122 | 0.291 | 0.000 | 0.190 |
| Georgia | 1993 | 1716 | 0.318 | 0.243 | 0.135 | 0.304 | 0.000 | 0.230 |
| Georgia | 1994 | 1524 | 0.316 | 0.198 | 0.185 | 0.300 | 0.000 | 0.242 |
| Georgia | 1995 | 1563 | 0.439 | 0.153 | 0.169 | 0.238 | 0.000 | 0.119 |
| Georgia | 1996 | 1726 | 0.538 | 0.100 | 0.161 | 0.201 | 0.000 | 0.069 |
| Georgia | 1997 | 1914 | 0.514 | 0.101 | 0.172 | 0.213 | 0.000 | 0.076 |
| Georgia | 1998 | 1976 | 0.485 | 0.103 | 0.186 | 0.226 | 0.000 | 0.091 |
| Georgia | 1999 | 2062 | 0.522 | 0.094 | 0.170 | 0.212 | 0.000 | 0.089 |
| Georgia | 2000 | 2102 | 0.521 | 0.098 | 0.178 | 0.201 | 0.001 | 0.086 |
| Kazakhstan | 1990 | 5330 | 0.221 | 0.313 | 0.170 | 0.247 | 0.049 | 0.133 |
| Kazakhstan | 1991 | 4608 | 0.243 | 0.306 | 0.170 | 0.234 | 0.048 | 0.128 |
| Kazakhstan | 1992 | 4456 | 0.255 | 0.301 | 0.167 | 0.231 | 0.045 | 0.123 |
| Kazakhstan | 1993 | 4056 | 0.254 | 0.278 | 0.149 | 0.256 | 0.063 | 0.144 |
| Kazakhstan | 1994 | 3584 | 0.216 | 0.256 | 0.226 | 0.254 | 0.049 | 0.133 |
| Kazakhstan | 1995 | 3338 | 0.220 | 0.222 | 0.265 | 0.253 | 0.040 | 0.147 |
| Kazakhstan | 1996 | 3385 | 0.234 | 0.210 | 0.303 | 0.224 | 0.030 | 0.146 |
| Kazakhstan | 1997 | 3479 | 0.252 | 0.185 | 0.320 | 0.204 | 0.039 | 0.144 |
| Kazakhstan | 1998 | 3402 | 0.222 | 0.184 | 0.368 | 0.199 | 0.027 | 0.184 |

| Country | Year | GDP at PPP | Agriculture | Industry | Market services | Non-market services | Residual | Distortion index |
|---|---|---|---|---|---|---|---|---|
| Kazakhstan | 1999 | 3384 | 0.220 | 0.183 | 0.375 | 0.165 | 0.057 | 0.189 |
| Kazakhstan | 2000 | 3709 | 0.314 | 0.174 | 0.298 | 0.214 | 0.000 | 0.102 |
| Kyrgyzstan | 1989 | 3959 | 0.332 | 0.252 | 0.102 | 0.240 | 0.074 | 0.111 |
| Kyrgyzstan | 1990 | 4016 | 0.327 | 0.279 | 0.126 | 0.253 | 0.015 | 0.119 |
| Kyrgyzstan | 1991 | 3766 | 0.359 | 0.260 | 0.123 | 0.245 | 0.013 | 0.099 |
| Kyrgyzstan | 1992 | 3023 | 0.382 | 0.225 | 0.128 | 0.256 | 0.009 | 0.098 |
| Kyrgyzstan | 1993 | 2545 | 0.390 | 0.214 | 0.134 | 0.254 | 0.008 | 0.105 |
| Kyrgyzstan | 1994 | 2041 | 0.420 | 0.193 | 0.145 | 0.235 | 0.007 | 0.093 |
| Kyrgyzstan | 1995 | 1913 | 0.473 | 0.165 | 0.130 | 0.226 | 0.006 | 0.075 |
| Kyrgyzstan | 1996 | 2021 | 0.471 | 0.146 | 0.165 | 0.211 | 0.006 | 0.058 |
| Kyrgyzstan | 1997 | 2203 | 0.483 | 0.135 | 0.174 | 0.203 | 0.005 | 0.052 |
| Kyrgyzstan | 1998 | 2250 | 0.491 | 0.128 | 0.174 | 0.202 | 0.005 | 0.063 |
| Kyrgyzstan | 1999 | 2348 | 0.525 | 0.117 | 0.156 | 0.198 | 0.004 | 0.100 |
| Kyrgyzstan | 2000 | 2468 | 0.533 | 0.109 | 0.156 | 0.198 | 0.004 | 0.116 |
| Moldova | 1989 | 4159 | 0.348 | 0.288 | 0.117 | 0.211 | 0.036 | 0.099 |
| Moldova | 1990 | 4048 | 0.338 | 0.290 | 0.125 | 0.214 | 0.033 | 0.099 |
| Moldova | 1991 | 3341 | 0.418 | 0.240 | 0.109 | 0.204 | 0.029 | 0.090 |
| Moldova | 1992 | 2374 | 0.400 | 0.258 | 0.108 | 0.206 | 0.028 | 0.120 |
| Moldova | 1993 | 2347 | 0.431 | 0.203 | 0.105 | 0.238 | 0.024 | 0.096 |
| Moldova | 1994 | 1615 | 0.455 | 0.186 | 0.108 | 0.229 | 0.023 | 0.118 |
| Moldova | 1995 | 1570 | 0.461 | 0.166 | 0.188 | 0.185 | 0.000 | 0.090 |
| Moldova | 1996 | 1449 | 0.428 | 0.151 | 0.231 | 0.190 | 0.000 | 0.142 |
| Moldova | 1997 | 1472 | 0.416 | 0.148 | 0.239 | 0.197 | 0.000 | 0.156 |
| Moldova | 1998 | 1350 | 0.457 | 0.146 | 0.202 | 0.195 | 0.000 | 0.128 |
| Moldova | 1999 | 1312 | 0.489 | 0.136 | 0.177 | 0.197 | 0.001 | 0.109 |
| Moldova | 2000 | 1337 | 0.509 | 0.139 | 0.175 | 0.177 | 0.000 | 0.084 |
| Russia | 1990 | 7039 | 0.132 | 0.423 | 0.167 | 0.253 | 0.024 | 0.208 |
| Russia | 1991 | 6672 | 0.135 | 0.418 | 0.166 | 0.258 | 0.023 | 0.213 |
| Russia | 1992 | 5702 | 0.143 | 0.405 | 0.171 | 0.255 | 0.025 | 0.214 |
| Russia | 1993 | 5212 | 0.146 | 0.394 | 0.186 | 0.257 | 0.017 | 0.211 |
| Russia | 1994 | 4556 | 0.154 | 0.370 | 0.193 | 0.265 | 0.017 | 0.210 |
| Russia | 1995 | 4375 | 0.151 | 0.352 | 0.202 | 0.276 | 0.020 | 0.208 |
| Russia | 1996 | 4233 | 0.144 | 0.337 | 0.204 | 0.291 | 0.023 | 0.214 |
| Russia | 1997 | 4280 | 0.137 | 0.318 | 0.239 | 0.293 | 0.014 | 0.193 |
| Russia | 1998 | 4096 | 0.141 | 0.301 | 0.246 | 0.298 | 0.014 | 0.198 |
| Russia | 1999 | 3982 | 0.137 | 0.303 | 0.248 | 0.297 | 0.015 | 0.207 |
| Russia | 2000 | 4313 | 0.134 | 0.304 | 0.251 | 0.295 | 0.017 | 0.193 |
| Tajikistan | 1990 | 2993 | 0.430 | 0.217 | 0.109 | 0.227 | 0.017 | 0.086 |
| Tajikistan | 1991 | 2698 | 0.447 | 0.205 | 0.107 | 0.227 | 0.015 | 0.080 |
| Tajikistan | 1992 | 1879 | 0.467 | 0.200 | 0.102 | 0.219 | 0.012 | 0.097 |
| Tajikistan | 1993 | 1652 | 0.512 | 0.181 | 0.093 | 0.201 | 0.013 | 0.078 |
| Tajikistan | 1994 | 1315 | 0.540 | 0.170 | 0.089 | 0.190 | 0.012 | 0.085 |
| Tajikistan | 1995 | 1135 | 0.591 | 0.143 | 0.085 | 0.176 | 0.006 | 0.062 |
| Tajikistan | 1996 | 1068 | 0.592 | 0.144 | 0.077 | 0.179 | 0.008 | 0.076 |
| Tajikistan | 1997 | 1068 | 0.640 | 0.120 | 0.059 | 0.174 | 0.008 | 0.050 |
| Tajikistan | 1998 | 1115 | 0.601 | 0.111 | 0.100 | 0.179 | 0.008 | 0.053 |
| Tajikistan | 1999 | 1175 | 0.643 | 0.101 | 0.069 | 0.176 | 0.010 | 0.075 |
| Tajikistan | 2000 | 1272 | 0.650 | 0.090 | 0.069 | 0.183 | 0.007 | 0.102 |
| Turkmenistan | 1990 | 4495 | 0.419 | 0.208 | 0.128 | 0.228 | 0.016 | 0.133 |
| Turkmenistan | 1991 | 4177 | 0.424 | 0.208 | 0.125 | 0.225 | 0.018 | 0.124 |
| Turkmenistan | 1992 | 3690 | 0.442 | 0.202 | 0.120 | 0.206 | 0.030 | 0.110 |
| Turkmenistan | 1993 | 3108 | 0.438 | 0.207 | 0.122 | 0.216 | 0.016 | 0.083 |
| Turkmenistan | 1994 | 2468 | 0.439 | 0.201 | 0.125 | 0.216 | 0.019 | 0.064 |
| Turkmenistan | 1995 | 2214 | 0.442 | 0.193 | 0.125 | 0.221 | 0.019 | 0.074 |
| Turkmenistan | 1996 | 1997 | 0.464 | 0.185 | 0.113 | 0.220 | 0.019 | 0.078 |
| Turkmenistan | 1997 | 1458 | 0.489 | 0.180 | 0.108 | 0.217 | 0.007 | 0.106 |
| Turkmenistan | 1998 | 1525 | 0.505 | 0.178 | 0.107 | 0.196 | 0.014 | 0.081 |
| Turkmenistan | 1999 | 1873 | 0.496 | 0.180 | 0.119 | 0.192 | 0.014 | 0.051 |

| Country | Year | GDP at PPP | Agriculture | Industry | Market services | Non-market services | Residual | Distortion index |
|---|---|---|---|---|---|---|---|---|
| Ukraine | 1990 | 5427 | 0.198 | 0.403 | 0.147 | 0.233 | 0.019 | 0.192 |
| Ukraine | 1991 | 4788 | 0.193 | 0.402 | 0.148 | 0.240 | 0.018 | 0.210 |
| Ukraine | 1992 | 4120 | 0.204 | 0.380 | 0.140 | 0.238 | 0.039 | 0.214 |
| Ukraine | 1993 | 3533 | 0.207 | 0.367 | 0.142 | 0.245 | 0.039 | 0.226 |
| Ukraine | 1994 | 2734 | 0.210 | 0.349 | 0.140 | 0.247 | 0.054 | 0.248 |
| Ukraine | 1995 | 2419 | 0.234 | 0.321 | 0.138 | 0.250 | 0.058 | 0.239 |
| Ukraine | 1996 | 2194 | 0.235 | 0.311 | 0.146 | 0.249 | 0.059 | 0.241 |
| Ukraine | 1997 | 2142 | 0.242 | 0.297 | 0.149 | 0.251 | 0.061 | 0.234 |
| Ukraine | 1998 | 2112 | 0.251 | 0.291 | 0.147 | 0.251 | 0.061 | 0.228 |
| Ukraine | 1999 | 2086 | 0.254 | 0.278 | 0.152 | 0.253 | 0.063 | 0.221 |
| Ukraine | 2000 | 2207 | 0.265 | 0.260 | 0.143 | 0.266 | 0.066 | 0.210 |
| Uzbekistan | 1990 | 3258 | 0.393 | 0.241 | 0.113 | 0.237 | 0.016 | 0.090 |
| Uzbekistan | 1991 | 3173 | 0.427 | 0.227 | 0.110 | 0.220 | 0.016 | 0.091 |
| Uzbekistan | 1992 | 2756 | 0.441 | 0.216 | 0.104 | 0.222 | 0.016 | 0.084 |
| Uzbekistan | 1993 | 2632 | 0.445 | 0.215 | 0.108 | 0.217 | 0.015 | 0.077 |
| Uzbekistan | 1994 | 2473 | 0.432 | 0.189 | 0.113 | 0.219 | 0.047 | 0.076 |
| Uzbekistan | 1995 | 2407 | 0.413 | 0.193 | 0.132 | 0.219 | 0.042 | 0.076 |
| Uzbekistan | 1996 | 2399 | 0.409 | 0.192 | 0.132 | 0.220 | 0.046 | 0.079 |
| Uzbekistan | 1997 | 2411 | 0.407 | 0.191 | 0.129 | 0.221 | 0.052 | 0.082 |
| Uzbekistan | 1998 | 2467 | 0.394 | 0.192 | 0.128 | 0.218 | 0.068 | 0.086 |
| Uzbekistan | 1999 | 2550 | 0.362 | 0.199 | 0.130 | 0.224 | 0.085 | 0.099 |
| Uzbekistan | 2000 | 2652 | 0.344 | 0.203 | 0.132 | 0.237 | 0.084 | 0.110 |

# IZA Discussion Papers

| No. | Author(s) | Title | Area | Date |
|---|---|---|---|---|
| 713 | I. Gang<br>J. Landon-Lane<br>M. S. Yun | Does the Glass Ceiling Exist? A Cross-National Perspective on Gender Income Mobility | 2 | 02/03 |
| 714 | M. Fertig | Educational Production, Endogenous Peer Group Formation and Class Composition – Evidence From the PISA 2000 Study | 6 | 02/03 |
| 715 | E. Fehr<br>U. Fischbacher<br>B. von Rosenbladt<br>J. Schupp<br>G. G. Wagner | A Nation-Wide Laboratory Examining Trust and Trustworthiness by Integrating Behavioral Experiments into Representative Surveys | 7 | 02/03 |
| 716 | M. Rosholm<br>L. Skipper | Is Labour Market Training a Curse for the Unemployed? Evidence from a Social Experiment | 6 | 02/03 |
| 717 | A. Hijzen<br>H. Görg<br>R. C. Hine | International Fragmentation and Relative Wages in the UK | 2 | 02/03 |
| 718 | E. Schlicht | Consistency in Organization | 1 | 02/03 |
| 719 | J. Albrecht<br>P. Gautier<br>S. Vroman | Equilibrium Directed Search with Multiple Applications | 3 | 02/03 |
| 720 | T. Palokangas | Labour Market Regulation, Productivity-Improving R&D and Endogenous Growth | 3 | 02/03 |
| 721 | H. Battu<br>M. Mwale<br>Y. Zenou | Do Oppositional Identities Reduce Employment for Ethnic Minorities? | 1 | 02/03 |
| 722 | C. K. Spiess<br>F. Büchel<br>G. G. Wagner | Children's School Placement in Germany: Does Kindergarten Attendance Matter? | 6 | 02/03 |
| 723 | M. Coles<br>B. Petrongolo | A Test between Unemployment Theories Using Matching Data | 3 | 02/03 |
| 724 | J. T. Addison<br>R. Bailey<br>W. S. Siebert | The Impact of Deunionisation on Earnings Dispersion Revisited | 2 | 02/03 |
| 725 | S. Habermalz | An Examination of Sheepskin Effects Over Time | 1 | 02/03 |
| 726 | S. Habermalz | Job Matching and the Returns to Educational Signals | 1 | 02/03 |
| 727 | M. Raiser<br>M. Schaffer<br>J. Schuchardt | Benchmarking Structural Change in Transition | 4 | 02/03 |

An updated list of IZA Discussion Papers is available on the center‘s homepage www.iza.org.