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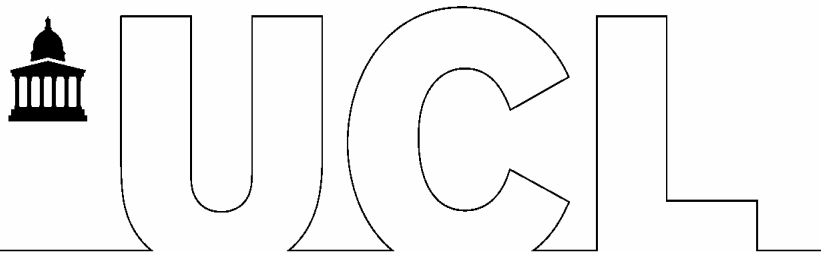

CENTRE FOR THE STUDY OF ECONOMIC & SOCIAL CHANGE IN EUROPE (CSESCE)

De-industrialisation and the Post-Communist Transition: Rowthorn and Wells' Model Revisited

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De-industrialisation and the Post-Communist Transition.

Rowthorn and Wells' Model Revisited

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Abstract

In this paper we present a simple three-sector model explaining the structural change in employment, which is a modified version of Rowthorn-Wells (1987). We supplement the theoretical analysis with simple econometric tests, which illustrate how the modified Rowthorn-Wells model can be used to (i) motivate empirical estimates of the link between the level of development and structures of employment, (ii) illustrate structural distortions under the command economies, and the structural adjustment that happened during the post-Communist transition. We demonstrate that in the case of these economies, the transition process leads to an adjustment to the employment structures predicted by the model.

Keywords: employment structures, de-industrialisation, agriculture, transition.

JEL classification numbers: O40, O41, O57, P20.

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1. Introduction

Traditionally, structural change in employment appears in the economic literature as one of the factors associated with the economic development (e.g., Baumol (1967), Matsumaya (1992), Oulton (2001)). However, few studies offer thorough analysis of the origins and the nature of the change in the employment structure itself. Rowthorn and Wells (1987, later denoted as R-W) argue, based on extensive empirical testing, that structural change is caused both by different productivity growth rates among sectors and by different income elasticities of demand for sectors' products. In order to focus on the impact of these two factors they abstract from prices, wages and, generally market adjustment mechanisms, and concentrate on characteristics of long-run market equilibrium outcomes instead. R-W introduce a three-sector dichotomy into their analysis, i.e., they divide the economy into agriculture, manufacturing and services, which also differentiates their model from other economic growth studies that typically use a less realistic, two-sector specification. For instance, Baumol (1967) and Oulton (2001) distinguish between services and industry, Matsumaya (1992) divides the economy into agriculture and manufacturing, and Temple (2001) talks about agriculture and non-agriculture.

In this paper, we built on R-W's specification but modify their model. In particular, even though R-W divide the economy into agriculture, industry and services, they do not fully exploit the benefits of such specification. This is because they assume that the change in productivity growth rate is the same in agriculture and industry. In other words, one of their main empirical findings, i.e., the driving force of different productivity growth rates across sectors, is not fully incorporated into the theoretical setting. In their model, the only distinction between the industry and agriculture sectors is done at the level of demand functions, i.e., income elasticities,

the other driving force of the structural change. However, here there is also some weakness. According to R-W's stylised model, the economy produces a fixed amount of food per head, and services are a constant proportion of the total output. The industrial sector produces the remainder. In other words, they assume that people first satisfy their need for food and services, and then for industrial products. The preference for services before industrial products is counterintuitive and has significant analytical consequences. In particular, an implication of the specification of the model is that the proportion of industrial output to total output increases over time, contrary to the empirical evidence.

In this study, following R-W, we define three sectors (i.e., agriculture, industry and services) but deviate from R-W is several keyways. First, we allow all three sectors to have different productivity growth rates. Second, we assume that because consumers first satisfy their demand for food, then industrial products and, finally, services, industrial output is proportional to total output whereas R-W assume that service output is proportional to total output. Third, we assume that sector's productivity is a function of accumulated human and physical capital per employee, not just a function of time.

We supplement the theoretical analysis with simple econometric tests, which illustrate how the modified Rowthorn-Wells model can be used to (i) motivate empirical estimates of the link between the level of development and structures of employment, (ii) illustrate structural distortions under the command economies, and the structural adjustment that happened during the post-Communist transition. We demonstrate that in the case of these economies, the transition process leads to an adjustment to the employment structures predicted by the model.

The rest of the paper is organised as follows. Section 2 presents the motivation for choosing a modified version of the Rowthorn and Wells' model for our analysis. Section 3 presents the model. Section 4 discusses our empirical findings. Finally, Section 5 closes the paper with conclusions.

2. Literature: the importance of three-sector models and the role of services

In contrast to R-W's approach, there is a large literature that explicitly focuses on prices and wages in sectors to model employment flows between sectors. For instance, Baumol (1967) assumes that, although sectors' productivities change at different pace, the wages in the two sectors (i.e., industry and services) are equal and grow with the productivity of the more progressive sector.[1] This leads to an increase in production costs in the less progressive sector and drives the results. In contrast, Temple (2001) approaches the problem of adjustment from a slightly different angle by assuming that workers are paid the value of sectors' marginal products (note: prices are fixed).

R-W's analysis is distinguished from other studies on structural adjustment of employment in that that it is based on the comparison of equilibrium points. More precisely, they contrast economic states where the implicit price and wage adjustment have already taken place. It is also one of the first theoretical models that highlights the positive role of the growing service sector. In contrast, Baumol (1967) drew an apocalyptic picture of the world in which a higher productivity growth sector, i.e., industry, is squeezed by a lower productivity sector, i.e., services, resulting in the unavoidable slow down of output growth in the long run. For many years this was a received wisdom. For example, Bluestone (1983) and Cohen and Zysman (1987),

blamed the outflow of the labour force from well-paid manufacturing to the not so well-paid service sector for the slowdown of the American economy.

However, more recent studies have rehabilitated the role of the service sector. For example, Krugman (1994, 1996) and Crafts (1996) argue against blaming services for the economic slowdown. Furthermore, the close link between the growth of the service sector and economic development is a theme of many empirical studies. For instance, Riddle (1987) in a comparison of 81 countries (excluding the Eastern European and Middle-East oil-exporting countries) presents a convincing argument that allocation of addition labour to the service sector gives better economic outcomes than allocation to the agricultural or manufacturing sectors. She argues that 'economic growth is closely linked to growth in the service sector'. Price and Blair (1989) in their study of the development of the UK service sector conclude that 'services are an important element of prosperity'. Broadberry (1993, 1998, 2000), comparing the development paths of the UK, the US and Germany, underlines the role of growth of the service sector. In other words, the empirical evidence seems to support R-W's argument, and their empirical findings, concerning the significance of the service sector. Finally, Oulton (2001) in his theoretical work shows that Baumol's (1967) conclusion of economic slowdown can be reversed if one assumes that the service sector produces intermediate products, a common situation nowadays.

An additional problem with the two-sector models is that they cannot simultaneously cover two different processes: (i) an early stage of development, where the key structural change relate to the outflow of the labour force from agriculture, and the build-up of both services and industry, (ii) the deindustrialisation

[1] Note that productivity growth changes are also exogenous to the system.

process in the advanced, high income economies. The R-W model captures the stylised characteristics of both.

3. Modelling the link between structures and development

Drawing from R-W's work we define a closed three-sector economy (agriculture, industry and services). We assume that there are no inter-sectoral externalities, and no restrictions on the free flow of labour among sectors. Because the impact of productivity growth, not the source of it, is our concern, we assume that changes in productivity growth rates are exogenous to the system. More formally, productivities in the three sectors are defined as

$$y_a = e^{\lambda_a k}, \qquad y_i = e^{\lambda_i k}, \qquad y_s = e^{k},$$

where subscripts *a, i* and *s* relate to agriculture, industry and services respectively. Parameters λ_a and λ_i (≥ 1) denote differences in productivity growth rates among sectors. Such specification is consistent with earlier studies; i.e. we assume that the productivities of the agricultural and the industrial sectors grow faster than the productivity of services.[2] Parameter k (≥ 0) refers to total accumulated human and physical capital per employee and can be interpreted as the coefficient of inter-sectoral productivity. The level of productivity at the beginning of the development path is normalised to one. This assumption does not have any impact on our results, but simplifies the notation.

Aggregate employment, L, is defined as proportional to total population N, that is

$$L = fN, \tag{1}$$

[2] The assumption of the lowest growth rate of the service sector is common (for example, Millward (1988), Rowthorn and Wells (1987), Oulton (2001) and, of course, Baumol (1967)).

where $f \in (0,1)$ denotes the employment rate interpreted as a percentage of the total population. By treating aggregate employment as an exogenous variable we abstract from labour market issues. Our intention is to demonstrate that a purely structural approach offers a suitable tool to explain changes in employment structures.

It is commonly accepted in the economic literature that the income elasticity for food is low at the margin. Therefore, following R-W, we assume that it is equal to zero. Thus we define output in agriculture as proportional to the size of the population. Then, agricultural output and employment are correspondingly given by:

$$Z_a = \gamma N, \tag{2a}$$

$$L_a = Z_a / y_a, \tag{2b}$$

where, $\gamma (>0)$ is a coefficient of demand.

Demand for industrial goods defines the size of employment and output of the sector. We assume that the industrial output, Z_i, (equivalent to real demand) is a constant fraction of total output, that is $Z_i = \mu Z$, where $\mu \in (0,1)$. Following that, more formally, employment and output of the industrial sector can be expressed correspondingly as:

$$L_i = \frac{\mu(L_a y_a + L y_s - L_a y_s)}{y_i + \mu y_s - \mu y_i}, \tag{3a}$$

$$Z_i = L_i y_i. \tag{3b}$$

Finally, employment and output in services are determined according to the equations:

$$L_s = L - L_a - L_i, \tag{4a}$$

$$Z_s = L_s y_s. \tag{4b}$$

The above specification reflects the highly stylised fact that people first of all satisfy their demand for food, then for industrial products and finally services. It is also consistent with the assumption that income elasticities of demand differ across sectors. In our setting the income elasticity of demand for agricultural products (food) is zero, for industrial products is 1 and for services is $[1+\gamma N/((1-\mu)Z-\gamma N)] >1$.

It follows directly from the model specification that aggregate output Z is:

$$Z(\lambda_a, \lambda_i, \gamma, \mu, k, f) = Z_a + Z_s + Z_i = Ne^{\lambda_i k} \frac{\gamma + fe^{k} - \gamma e^{-(\lambda_a - 1)k}}{(1-\mu)e^{\lambda_i k} + \mu e^{k}}. \quad (5)$$

It is important to note that the three-sector specification makes sense when the conditions are such that all three sectors exist, that is, when there is positive demand for products from each of them. In other words, the economy must be 'developed' enough that people can afford to buy food, industrial products as well as pay for services. More formally, this requires

$$Z > \gamma N + \mu Z.$$

This is a very weak restriction to impose on model's parameters. This is equivalent to assuming that

$$e^{k} > \frac{1}{1-\mu} \cdot \frac{\gamma}{f}. \quad (6)$$

Given that k must be positive, inequality (6) implies that the threshold level for the accumulated human and physical capital per employee, k, must be

$$k^* = \max(0, \ln(\gamma / f) - \ln(1-\mu)). \quad (7)$$

Sector productivities depend on the level of accumulated human and physical capital per employee in the following way:

$$\frac{\partial l_a}{\partial k} = -\frac{\gamma\lambda_a}{f} e^{-\lambda_a k}, \tag{8a}$$

$$\frac{\partial l_i}{\partial k} = \frac{\mu}{f((1-\mu)e^{\lambda_i k} + \mu e^k)^2}(\mu\gamma e^k(\lambda_a e^{-(\lambda_a-1)k} - 1) + \\ + (1-\mu)e^{\lambda_i k}(f(1-\lambda_i)e^k + \gamma(\lambda_a - 1)e^{-(\lambda_a-1)k} + \gamma\lambda_i(e^{-(\lambda_a-1)k} - 1))) \tag{8b}$$

and

$$\frac{\partial l_s}{\partial k} = -\frac{\partial l_a}{\partial k} - \frac{\partial l_i}{\partial k}. \tag{8c}$$

It is obvious that the sign of equation (8a) is negative. However, equation (8b) can be either positive or negative. If the level of accumulated human and physical capital per employee is below some threshold level $\bar{k}$ then the increase in *k* causes the increase of the employment share of the industrial sector, i.e., $\partial l_i / \partial k > 0$. If $k > \bar{k}$, then $\partial l_i / \partial k < 0$. Whether $\bar{k}$ is greater than k* defined by (7) depends on values of the other parameters, and in particular, on the relationship between λ_a and λ_i.[3] For example, low values of μ (i.e., $\mu < 0.5$) and λ_i (i.e., $\lambda_i < \lambda_a$) guarantee that $k^* < \bar{k}$. Combining (8a) and (8b), it is also easy to show that (8c) is always positive.

In other words, the country's development, as represented by the increase in *k*, is characterised, first, by an increase in the industrial sector's employment share, and then by a wave of de-industrialisation. The labour outflow from the agricultural sector is first absorbed by industry and services. Then, after attaining by the country some level of economic welfare, the service sector grows further supplied by contracting industry and agriculture.

To complete the analysis we look at the impact of changes in *k* on the total output:

[3] Details of the calculations can be obtained from the authors.

$$\frac{\partial Z}{\partial k} = \frac{N}{((1-\mu)e^{\lambda_i k} + \mu e^{k})^2}(\mu e^{k}(\gamma(\lambda_i - 1)e^{\lambda_i k} + \lambda_i f e^{(\lambda_i+1)k} + \gamma(\lambda_a - \lambda_i)e^{(1+\lambda_i-\lambda_a)k}) +$$
$$+ (1-\mu)e^{\lambda_i k}(f e^{(\lambda_i+1)k} + \gamma(\lambda_a - 1)e^{(1+\lambda_i-\lambda_a)k})).$$

In this formula all terms are positive with the exception of the term containing (λ_a - λ_i) if $\lambda_a < \lambda_i$. However even in this case the derivative $\frac{\partial Z}{\partial k}$ remains positive. This is because the expression in brackets multiplied by μe^{k} is always positive. Namely,

$$\begin{aligned}
&\gamma(\lambda_i - 1)e^{\lambda_i k} + \lambda_i f e^{(\lambda_i+1)k} + \gamma(\lambda_a - \lambda_i)e^{(1+\lambda_i-\lambda_a)k} \\
&> \gamma(\lambda_i - 1)e^{\lambda_i k} + \lambda_i f e^{(\lambda_i+1)k} - \gamma(\lambda_i - \lambda_a)e^{\lambda_i k} \\
&= \gamma(\lambda_a - 1)e^{\lambda_i k} + \lambda_i f e^{(\lambda_i+1)k} > 0.
\end{aligned}$$

The results are consistent with our expectations, that is, the higher the level of accumulated human and physical capital per worker, the higher the level of total output. Since one single aggregate measure of capital endowment is difficult to construct, the level of output per capita can be used as its proxy in empirical work.

4. Hypotheses and empirical tests

Hypotheses, specifications, and measurement issues

It is not difficult to test the basic predictions of the model.

First, as we just established, we expect:

- a reverse-U-shaped relation between the accumulated volume of (human and physical) capital and the industry share in employment,

- a monotonic and positive relation between the accumulated capital and the share of services in employment,

- a monotonic and negative relation between the accumulated capital and the share of agriculture in employment.

Second, the model implicitly assumes market equilibria (driven jointly by sectoral productivities and sectoral demands). However, the industrial composition of employment and production may not always result from market equilibria. In the non-market case, the structural outcomes will differ from the model predictions. Our empirical counterpart of this situation relates to the command economies, in which, following the Marxist ideology, a deliberate attempt was made to maximise the share of industry in output.

The first model ((9) and corresponding specification (i) in Table 1) is intended to offer a test for our general model of structural change. To test for the non-monotonicity of the share of industry in employment as a function of economic development, we use the following model specification:

$$emp\_ind_{i,t} = \alpha_0 + \alpha_i + \alpha_t + \alpha_1 \ln(y)_{i,t} + \alpha_2 [\ln(y)_{i,t}]^2 + \alpha_3 ex\_man_{i,t} + \alpha_4 ex\_fuel_{i,t} + \alpha_5 unempl + \varepsilon_{i,t} \quad (9)$$

Where:

- *emp_ind* denotes the share of industry in employment taken as dependent variable,

- *y* denotes the GDP per capita that proxies for the accumulated human and physical capital.

In addition, we control for the features, which are not directly included in our model, but may have significant impact on employment structure. Namely:

- *ex_man* refers to the share of manufacturing in exports,
- *ex_fuel* denotes the share of fuel in exports, and
- - *unemploy* is the rate of unemployment.

We replicate the same model for the two other sectors (services and industry), expecting monotonic relationship, in contrast with industry (positive coefficients for services, negative for agriculture) (specifications (ii) and (iii) in Table 1 below).

In model (9), using both logarithm and logarithm squared of the GDP per capita should allow us to test for the reversed U-shape, i.e. the non-monotonic functional relationship between the economic development and the industrial share in employment. Whether a country is on an increasing or decreasing slope depends on the size of the accumulated human and physical capital (see our discussion of equation 8b). Therefore, if the model prediction is correct, we should observe a positive sign of the a_1 coefficient and the negative sign of the a_2 coefficient.

As any model is by necessity a simplified representation of reality, it is fairly standard to include some control variables that represent omissions in the model in empirical specifications. Firstly, the share of manufacturing in exports and the share of fuel in exports may both affect the share of industry in employment positively due to specialisation (and, by the same token, the shares of other sectors may be affected negatively). Secondly, unemployment rate accounts for cyclical variation in the share of employment of industry around some equilibrium path represented by our structural model. In particular, it is expected that low level of economic activity

results in both higher unemployment and the relative loss of employment in industry, as the latter sector may be more sensitive to cyclical variation in demand. Correspondingly, either both (subsistence) agriculture and low-paid services may accommodate some of employment shocks experienced by industry, or they may experience weaker cyclical shocks. Both effects will result in procyclical adjustment in the industrial share in employment. Thus, we expect the negative relationship between unemployment and the share of industry in employment. We do not have strong priors related to the two other sectors in this respect, as we are uncertain about the strength of relative effects in these two cases.

Finally, the model includes the full set of individual country fixed effects and time fixed effects.

Our second set of hypotheses relate to the difference between the market driven outcomes (to which our model applies) and distorted outcomes, which should be observed in command economies. Correspondingly, we test the following two models:

$$emp\_ind_{i,t} = \alpha_0 + \alpha_i + \alpha_t + \alpha_1 \ln(y)_{i,t} + \alpha_2 [\ln(y)_{i,t}]^2 + \alpha_3 ex\_man_{i,t} + \alpha_4 ex\_fuel_{i,t} + \alpha_5 unempl + CE + \varepsilon_{i,t} \quad (10)$$

$$emp\_ind_{i,t} = \alpha_0 + \alpha_i + \alpha_t + \alpha_1 \ln(y)_{i,t} + \alpha_2 [\ln(y)_{i,t}]^2 + \alpha_3 ex\_man_{i,t} + \alpha_4 ex\_fuel_{i,t} + \alpha_5 unempl + CE + \alpha_6 \{CE * \ln(y)_{i,t}\} + \alpha_7 \{CE * [\ln(y)_{i,t}]^2\} + \varepsilon_{i,t} \quad (11)$$

In model (10) (equivalent to specification (ii) in Table 1 below)) we simply add a dummy variable representing a command economy as our test of structural distortion. We expect positive sign, representing the structural distortion (overindustrialisation)

resulting from the priorities imposed by the central planner.[4] Next we investigate, if the magnitude of distortion under command economy was related to the level of development. For this purpose, we interact the dummy variable representing the command economy with the two terms representing income per capita (in both linear and quadratic component) (equation (11) and correspondingly equation (iii) in Table 1 below).

Our empirical definition of the command economy relates to the group of twenty seven countries in Central Eastern Europe and Central Asia in the Communist period (this group of countries is considered by the European Bank of Reconstruction and Development (see: EBRD 1995-2004)), plus China, Cuba, Mongolia, North Korea and Vietnam, where we assume that the command economy did not finish yet.

The main empirical difficulty relates to the choice of the definition of the time point of exit from the command economy, for the group of twenty seven Euro-Asian countries, which are now referred to as 'transition economies'. The timing of transition plays important role in our estimations, due to the fact that we include individual fixed country effects, which implies that we test is the impact of exit from the command economy on structures of employment. If the model is correctly specified, then liberalisation should be positively correlated with the process of returning to the structural (market equilibrium) outcomes (i.e., deindustrialisation should occur after the command economy is dismantled).

[4] For a recent concise discussion of the command economy and its economic priorities, see for instance Gros and Steinherr (2004), Chapters 1-2.

We opt for the empirical simplification, where we define the exit from the command economy as equivalent to the time point where radical set of market reforms was introduced for the first time. This bias our empirical tests against our hypotheses, namely, the structural adjustment caused by reforms was not instantaneous, therefore, the difference between structural outcomes driven by market choices and these resulting from the administrative command is empirically weakened.

Our motivation to follow the simple empirical distinction between the 'old' command economies and the liberalised market economies is motivated by the economics of transition literature. In methodology, if not in all details of measurement, our definition of transition from the command to the market economy (being equivalent to the introduction of the basic set of liberalisation measures) follows the research tradition established in the economics of transition field, both in theoretical approach (Blanchard 1997; Roland 2000) and in empirical work. Early example of dating of the transition process based on EBRD indicators can be found in De Melo and Gelb (1997). In addition, the transition date defined by the basic set of liberalisation measures (similar to what we apply) is commonly used in recent empirical work on economic growth in transition countries, which reorder the time dimension according to the 'time of transition' counted, again, from the time point when the basic set of liberalisation measures was introduced (De Melo *et al.* (2001); Falcetti *et al*. (2002); Merlevede (2003)). Following this, we similarly define the introduction of market economy as empirically equivalent to time point, when the average of the three main EBRD indicators of liberalisation ((i) price liberalisation, (ii) external liberalisation and (iii) freedom of entry & privatisation of small enterprises) take the value of 3 or higher. By this definition, the first country to exit from the command economy system was Poland in 1990, followed by Croatia, Czech Republic, Macedonia, Slovakia and

Slovenia in 1991. Hungary, which adopted a more gradualist approach to liberalisation, exited from the command economy in 1992. The same year applies to Mongolia[5], and in 1993, it was Albania, Estonia, Latvia, Lithuania and last but not least Russia. In 1994, it was the turn of Bulgaria, Romania and Kyrgyzstan, followed by Kazachstan and Moldova in 1995, and Armenia, Georgia and Ukraine in 1996. War-torn Bosnia and Azerbaijan joined the market economies club only in 1998, Tajikistan in 2000, and Serbia in 2001. Interestingly, by this definition, in three post-Soviet countries – Belarus, Turkmenistan and Uzbekistan, the command economy is not yet dismantled at time of writing.[6]

All macro data is drawn from the World Bank, *World Development Indicators 2004* (CD ROM). We use all available data points for the 1980-2002 time window frame. GDP per capita is measured in constant 1995 international dollars.

Estimation results

Results of our estimations are presented in Table 1 below. First three specifications (columns (i)-(iii)) are based on equations (9)-(11) respectively, with the share of industry in employment taken as dependent variable. The next four specifications (columns (iv)-(vi)) relate to share of services and share of agriculture correspondingly.

[5] EBRD does not provide reform indicators for Mongolia. The chosen exit date follows from our own assessment of the reform process in Mongolia based on Boone *et al.* (1997).
[6] It is also worth noting three earlier empirical contributions that consider structural outcomes in the context of the economic transition: Dohrn and Heilemann (1993; 1996); Lanesmann (2000).

The results can be interpreted as follows.

First, our control variables have all expected signs and are mostly significant.

Export specialisation in both manufacturing and extracting industries (fuel) result in higher share of industry in employment, as expected (equations (i)-(iii)). The parallel effect is that the share of manufacturing in exports has negative impact on the share of services and the share of agriculture in employment (albeit the second effect is insignificant). The impact of extracting industry exports (fuel) is highly insignificant and the corresponding variable is omitted in reported specifications for services and agriculture.[7]

Spans of unemployment are associated with depressed employment in industry, which is consistent with our expectations, i.e. the share of industry in employment is pro-cyclical. Interestingly, the share of agricultural in employment is also pro-cyclical, albeit the corresponding effect is weaker, if still significant. On the other hand, the share of services in employment is countercyclical. The latter result may interpreted in two ways. One is consistent with stylised labour market characteristics, where aggregate shocks in services may be absorbed more by wages than by employment, due to higher flexibility of the former. Parallel effect may be that services absorb some of the employment released by the industry in a period of low economic activity (including self-employment). We do not investigate these effects closer in the paper, as they remain outside our main focus.

[7] Those results and other including the full set of variables are available on request from the authors.

More importantly, the regression results are consistent with the theoretical model presented in section 3. We detect the reverse-U-shaped relationship of industry share in employment with the level of economic development, with a turning point being likely to be located somewhere around $8,000 per capita (1995 prices; specification (iii)). The results on the other two sectors are equally consistent with the model predictions. We detect a positive monotonic relationship between the share of services in employment and the level of GDP per capita and a negative monotonic relationship for the share of agriculture in employment. In both cases, when the quadratic terms were added to the corresponding specifications, those turned out being highly insignificant (not reported).

Third, our conjecture on the interpretation of the model as a series of market equilibria is also consistent with the empirical evidence on the command economies. The latter group come across as characterised by high shares of industry in employment, above those implied for their market (or 'mixed') counterparts (specification (ii)). Economic transition results in return of these economies to the equilibria implied by market based organisation.

To investigate the distortions caused by the command economy further, we interact the *CE* dummy with the GDP per capita. Interestingly, while the basic effect, represented by the shift parameter (*CE*), remains positive and significant, its magnitude is now much higher. The explanation for this is that the introduction of the interactive terms matches the characteristics of the command economy structural policies more closely. Namely, we have a negative interactive term with the linear component of GDP per capita and positive interactive term with the quadratic component of GDP per capita. All effects taken together imply that the structural

distortions were strongest in the group of command economies that should be expected to de-industrialise as a result of achieving a relatively high level of income per capita, but did not. While at the final period of Communism (late 1980s), most of the command economies were located below the structural turning point in terms of income per capita, some Central European economies - Slovenia, the Czech and Slovak Republics (or rather Czechoslovakia at time of the regime switch), Hungary, and Poland - where either already beyond the hypothetical turning point of deindustrialisation or close to it. That is, the structural distortions caused by the command economy had most serious effects for these countries. This may shed additional light on the characteristics of the systemic crisis in the final period of the command economy.

Parallel to that effect, we can see a complex logic of structural distortion under the command economy for services (equation (v)). The shift effect (*CE*) and interactive effect with GDP per capita have opposite signs: the former positive and the latter negative. Taken together they imply that in the early phase of development the command economy system may actually result in the larger size of the service sector. However, the opposite is true for command economies characterised by the higher levels of GDP per capita. In these, service sector does not expand adequately. The latter effect mirrors what we found for industry, where the opposite is true. Again, the results reiterates our conclusion that the structural distortions were of most serious nature for command economies characterised by the highest level of income per capita (i.e. in the higher middle income group).

The structural effects of the command economy are less complicated for agriculture. We found the interactive effect highly insignificant and the simple shift effect

significant. Thus, adoption of the command economy results in lower share of agriculture regardless of income level.

Finally, we may notice that when the link between structural change and development is tested without taking proper account of the fact that the command economies remain off the equilibrium path of structural evolutions, the resulting estimates of structural turning points are biased downwards. It can be easily seen from the comparison of the estimated turning points in equation (iii) and (i). The former (which we take as more appropriate) indicates the turning point to be higher by about $1,000 than the latter.

5. Conclusions

In this paper we concentrate on explaining the structures of employment by the level of economic development and the type of economic system adopted (command versus market based). We demonstrate that a version of the Rowthorn-Wells model can be use to explain both the general link between structures and development, and the adjustment towards structural equilibria after the transition from the command to the market economy. One of the more interesting empirical effects we found is that the structural distortions in the command economies were most acute for these countries that were already on the higher level of development. Seen from this perspective, paradoxically, the Communist system had sown the seeds of its own defeat: economic development along the ideologically prescribed trail had led to the amplification of structural distortions, moving these economies further away from the efficient path. The corollary of this is that the command system may be sustainable only is a country, where the economy is relatively stagnant, as exemplified by North

Korea or possibly Cuba. For countries like Vietnam and China, at some stage, high growth (which is already fuelled by partial market reforms) may become unsustainable once the higher level of development and income per capita is reached, as the continuation of fast growth may become conditional on the switch to a fully fledged market system.

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Table 1. Testing the implications of the model of structural change

Dependent variable	**Share of industry in employment**			**Share of services in employment**		**Share of agriculture in employment**	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Ln of GDP p.c.	64.96*** (5.85)	66.60*** (5.86)	81.52*** (6.54)	19.60*** (1.76)	21.27*** (1.83)	-12.15*** (1.86)	-12.30*** (1.85)
Ln of GDP p.c. squared	-3.65*** (0.33)	-3.75*** (0.33)	-4.52*** (0.36)				
Share of manufacturing in exports	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	-0.11*** (0.02)	-0.11*** (0.02)	-0.01 (0.02)	-0.00 (0.02)
Share of fuel in exports	0.04† (0.02)	0.05* (0.02)	0.02 (0.02)				
Unemployment rate	-0.37*** (0.03)	-0.37*** (0.03)	-0.36*** (0.03)	0.67*** (0.08)	0.70*** (0.08)	-0.21* (0.08)	-0.21* (0.08)
Command Economy (CE) dummy		3.54** (1.25)	1399.22*** (244.44)		92.82*** (28.96)		-10.05*** (3.06)
CE x (Ln of GDP p.c.)			-355.14*** (62.87)		-11.38*** (3.54)		
CE x (Ln of GDP p.c. sq)			22.48*** (4.02)				
Constant	-256.93*** (26.00)	-264.30*** (26.04)	-334.60*** (29.47)	-124.88*** (15.70)	-139.94*** (16.33)	129.28*** (16.54)	130.60*** (16.47)
F statistics	28.33***	27.79***	28.06***	26.76***	25.36***	6.79***	7.01***
R squared	0.25	0.23	0.32	0.49	0.47	0.13	0.47
N of observations	1142	1142	1142	1178	1178	1178	1178
No of countries	95	95	95	96	96	96	96
Turning point	$7264	$7282	$8215	n.a.	n.a.	n.a.	n.a.

Notes:

(1) Fixed country effects and fixed time effects (annual dummies) included but not reported;

(2) *** significant at 0.001; ** significant at 0.01; * significant at 0.05; † significant at 0.1.

(3) Data source: World Bank, World Development Indicators, 2004. When using this dataset, one should note that some entries for employment shares are incorrectly given as zeros (all three sectors in a given year). We transformed these few cases into missing values, which the zeros stand for.

(4) *Command economy dummy*: see discussion in the main text.

(5) *GDP per capita:* in constant 1995 US dollars.

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