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## The Impact of Structural Reforms on Employment Growth and Labour Productivity: Evidence from Bulgaria and Romania

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# LICOS

## Centre for Transition Economics

### LICOS Discussion Paper

Discussion Paper 132/2003

#### The Impact of Structural Reforms on Employment Growth and Labour Productivity: Evidence from Bulgaria and Romania

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# **The Impact of Structural Reforms on Employment Growth and Labour Productivity: Evidence from Bulgaria and Romania**

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**Abstract:**

Using firm-level data from Bulgaria and Romania, this paper addresses a lacuna in the transition literature, namely, the link of firm-level employment turnover with firm-level growth in labour productivity. The results suggest that while net job creation at the firm level was affected by privatization in Bulgaria, privatization in Romania did not have any effect on firm-level employment growth. Further, Olley-Pakes (1996) decomposition indicates that in Bulgaria, over time, resources moved from less productive firms to more productive firms in almost all industries, but that in Romania such a phenomenon was observed in less than half of the industries. At the same time, the Grilliches-Regev (1995) decomposition indicates that in both these countries mobility of labour across firms, i.e., the process of job creation and job destruction at the firm level, contributed more to productivity changes than did other firm-level characteristics and industry-level factors affecting productivity. Finally, we find that the rate of employment changes in Bulgarian firms has a significant impact on the country's firm-level productivity changes. Regressions using Romania data, however, do not provide any support for this observation.

## 1. Introduction

Since the outset of the transition, economists have been attracted to two interesting issues related to the reforming industrial sectors of the transition economies. On the one hand, they have explored the Schumpeterian process of *creative destruction*, and its impact on job flows, i.e., both job losses and creation of new jobs in general. The processes of job creation and job destruction are important at two different levels. If we make the reasonable assumption that efficiently run firms grow over time, and vice versa, labour, a key productive resource, moves from low productivity firms to high productivity firms over time, as the former downsize and exit, and the latter prosper and expand operations. At the same time, the *net* jobs created have an impact on the rate of unemployment which, in turn, has an impact on the rate of structural reforms itself. Specifically, as argued by Aghion and Blanchard (1994), if jobs created by the emerging, and presumably more efficient, private sector (in transition economies) are unable to absorb the labourers who lose their jobs in the declining state sector, the sharp rise in unemployment makes the process of further reforms more difficult, as the political consensus shifts against market-oriented structural reforms.

In the wake of the economic (and political) changes in Central and Eastern Europe (CEE) and the former Soviet republics, economists have closely scrutinized the phenomenon of simultaneous creation and destruction of jobs across industries in the transition economies (Konings, Lehmann and Schaffer, 1996; Bilsen and Konings, 1998; Konings and Walsh, 1999a, 1999b; Acquiste and Lehmann, 2000; Faggio and Konings, 2001; Haltiwanger and Vodopivec, 2002; Konings and Xavier, 2002; Konings, Kupets and

Lehmann, 2003). Not surprisingly, given the macroeconomic trends in the transition economies, these studies found that both state-owned and privatized firms destroy a significant number of jobs. However, the privatized firms are much better at simultaneously creating new job opportunities than their state-owned counterparts. These studies concur that most of the new job opportunities in these countries are created by the *de novo* firms. Further, size of firms and growth in terms of employment are found to be negatively related.<sup>1</sup> However, there is no consensus about the impact of competition on the nature on job flows; the relationship between competition and the extent of net job creation seems to vary across countries, sectors and time.

The second issue pertaining to industrial reforms in the transition economies that has attracted the attention of economists is the impact of restructuring, largely by way of changes in ownership of firms, greater competition and foreign direct investment, on firm- and industry-level productivity (Dewatripont and Roland, 1992; Roland, 2000; Estain *et al.*, 2001; Grosfeld and Tressel, 2001; Warzynski, 2001). These studies have concluded that better corporate governance, often by way of privatization, creation of *de novo* firms, and foreign ownership of enterprises, complement competition in enhancing firm- and industry-level productivity. However, studies linking firm-level job flows with firm-level productivity changes are largely absent, even though jobs flows (or labour turnover) manifest the extent to which firms respond to structural reforms within industries, and within the economy, in general. Indeed, the industry-level study of Warzynski (2003) is the only paper linking these two consequences of firm- and industry-

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<sup>1</sup> Konings and Xavier (2002) argue that the relationship between size and employment growth is non-linear, and, indeed, represents an inverted U relationship.

level structural changes, namely, labour turnover and productivity. It argues that competition spurs both employment and productivity growth.

However, Warzynski's (2003) study suffers from two shortcomings. First, it does not take into account the fact that competition can affect the behaviour of different types of firms differently. Specifically, while competition is likely to induce privately owned firms to focus more on productivity, and take steps that would augment their productivity, state-owned enterprises may not be affected in this way in the presence of soft budget constraints and political imperatives. Secondly, by undertaking an industry-level analysis, it bypasses the potentially rich within-industry variations across firms.

The aim of this paper is to address the lacunae in the broader literature and Warzynski's (2003) study with a detailed empirical study linking firm-level job flows and firm-level productivity changes in Bulgaria and Romania, two transition economies that have received scant attention from transition economists. The results suggest that while net job creation at the firm level was affected by privatization in Bulgaria, privatization in Romania did not have any effect on firm-level employment growth. In other words, during 1995-99, an average firm in Romania was at a more primitive state of transition than its counterpart in Bulgaria,<sup>2</sup> and hence less responsive to structural changes than the latter. Not surprisingly, therefore, Olley-Pakes (1996) decomposition indicates that in Bulgaria, over time, resources moved from less productive firms to more productive firms in almost all industries, but that in Romania such a phenomenon was observed in

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<sup>2</sup> The logic of this argument, explained later in some detail, owes its origin to Bilsen and Konings (1998) and Faggio (2001).

less than half the industries. At the same time, the Grilliches-Regev (1995) decomposition indicates that in both these countries mobility of labour across firms, i.e., the process of job creation and job destruction at the firm level, contributed more to productivity changes than other firm-level characteristics and industry-level factors affecting productivity. This result finds further support from regressions based on the Bulgarian data which suggest that rate of employment changes in Bulgarian firms have a significant impact on the country's firm-level productivity changes. Regressions using Romania data, however, do not provide any support for this observation.

The rest of the paper is structured as follows: The data are described and discussed in some detail in Section 2. Section 3 highlights the research methodology, and the regression specifications. The regression results are presented in Section 4. Section 5 concludes.

## **2. Data**

The data for the analysis have largely been obtained from Amadeus, which provides us with information about firm-level employment, operating revenue, and ownership patterns. The Amadeus data were also used to generate Herfindahl indices for all NACE1 2-digit industries, these indices being proxy for the extent of competition in these industries. The data spans 5 years, namely, 1995 through 1999. The samples for Bulgaria and Romania include information on 1011 firms and 1402 firms respectively. The firms included in the sample account for more than 60 percent of sales and employment in the industrial sectors of these countries during each of the years.



Our final sample comprises only of firms that were in operation during all 5 years. We were not able to include the firms which did not report firm-level employment for each of these years because the nature of Amadeus data makes it difficult to distinguish between new firms entering the market, firms exiting the market, firms changing their names, and those simply not reporting the statistics. Evans (1987a, 1987b) and Konings and Xavier (2001) have demonstrated that the construction of the sample on the basis of continuing operation during all years under investigation does not lead to any bias in so far as estimation of regression models with employment growth as the dependent variable is concerned. Even though this does not eliminate the possibility of bias in so far as estimation of regression models with (labour) productivity as the dependent variable, in the absence of clear indication about the identity of entering and exiting firms, we shall proceed with this filter for the construction of the sample for our analysis.

The descriptive statistics obtained from the data are reported in Table 1. It can easily be seen that in Bulgaria there are clear hierarchies with respect to both employment stock and productivity, the latter being defined as operating revenue per labourer.<sup>3</sup> The foreign owned firms are the largest, followed by the private firms and firms with mixed ownership respectively, and the state-owned firms are the smallest. The hierarchy in terms of productivity is the same. The data also suggests that the average firm within each ownership group was downsizing across all years in Bulgaria. These observations

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<sup>3</sup> This measure of labour productivity is fairly stylized. See, for example, Griliches and Regev (1995) and Warzynski (2003).

are consistent with the literature linking productivity and firm-level restructuring with ownership patterns.

In Romania, however, there are no such clear patterns or hierarchies. The state-owned firms are the largest and also the least productive. Foreign-owned firms, not surprisingly, are most productive, and privately owned firms are more productive than the firms with mixed ownership. However, there is no significant difference between the state-owned firms and those with mixed ownership. In other words, while privatization, especially to foreign owners, seem to have worked, at least in so far as augmentation of productivity is concerned, firms with mixed ownerships continue to behave like state-owned firms, i.e., *any* government ownership in Romania renders a firm reluctant to restructure. Further, unlike in Bulgaria, Romanian state-owned firms did not downsize much during 1995-99, once again highlighting manifested political difficulties associated with privatization and restructuring in Romania.<sup>4</sup>

The data were used to decompose productivity changes in Bulgaria and Romania, and the results are reported in Tables 2 and 3 respectively.<sup>5</sup> The Olley-Pakes (1992) decomposition suggests that, in Bulgaria, productive resources were channeled towards more productive firms in almost all the industries.<sup>6</sup> In Romania, on the other hand, this

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<sup>4</sup> The differences in the privatization processes and structural reforms, in general, between Bulgaria and Romania, are outlined in Appendix I.

<sup>5</sup> We have used both the Olley-Pakes and Grilliches-Regev methods of decomposition. The logic and algebra of these decompositions have been highlighted in Appendix II.

<sup>6</sup> How can we interpret the Olley-Pakes decomposition results reported in Tables 2 and 3? Let us, for example, focus on the food and beverages industry in Bulgaria (Table 2). The weighted average productivity for this industry, for the 1995-99 period, is 10.25. The values for unweighted average productivity and cross productivity for the same period are 10.13 and 0.15 respectively. The fact that cross productivity is positive implies that, during 1995-99, resources were concentrated largely among the high-

efficiency-augmenting phenomenon was observed only in about 40 percent of the industries. This is consistent with our earlier observation that privatization was perhaps more effective, and structural reforms more complete in Bulgaria than in Romania.

The Grilliches-Regev (1995) decomposition suggests that in both these countries changes in productivity are driven largely by flow of labour across firms rather than by firm-characteristics like ownership.<sup>7</sup> This is in sharp contrast with findings from developed (or more industrialized) countries like Israel. In these countries, much of the changes in productivity can be accorded to firm-level characteristics. This difference is not surprising; in market economies like Israel, allocation of factors of production across the economy, or across firms within industries, is efficient by the very nature of the factor markets. Hence, any changes in productivity have to come about from changes in firm-level characteristics like managerial input and x-efficiency. However, in transition economies, firms and industries are in a state of disequilibrium in the short run, and allocative efficiency, therefore, becomes the main driver of productivity in these economies.

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productivity firms within the industry. By the same logic, resources within the tobacco industry in Bulgaria were largely concentrated among inefficient firms within the industry, a result intuitively consistent with the fact that the tobacco industry in Bulgaria was a state-owned monopoly in the form of Bulgartabac.

<sup>7</sup> As in footnote 7, let us now explain how to interpret the Grilliches-Regev decomposition results reported in Tables 2 and 3, and, once again, let us focus on the food and beverage industry in Bulgaria (Table 2). The average productivity change for the food and beverage industry in Bulgaria, during 1995-99, was 0.025. During the same period, the *between* component of productivity change was 0.033, while the *within* component of productivity change was -0.008. This implies that the overall increase in average productivity was driven largely by movement of labour from low productivity to higher productivity firms (*between* component being 0.033), and that this increase in average productivity at the industry level was offset by the decline in the average productivity of the firms themselves owing to non-labour related factors (*between* component being -0.008).

The descriptive statistics and the decompositions provide us with some priors, or testable hypotheses. First, in both Bulgaria and Romania, privately and foreign owned firms can be expected to be more active in altering the size of their labour force than the state-owned firms, and perhaps even the firms with mixed ownership. Second, private or foreign ownership are likely to be associated with greater productivity changes in both countries, as compared with state-owned firms and those with mixed ownership. Third, changes in the size of the labour force, a proxy for firm-level structural changes, is likely to be an important determinant of firm-level productivity changes. These priors or hypotheses will be examined in the subsequent sections.

### **3. Specification and Methodology**

As mentioned above, this paper explores two related phenomena, namely, the impact of firm and industry characteristics on firm-level labour turnover, as measured by employment growth,<sup>8</sup> and the impact of firm-level labour turnover on firm-level change in productivity. Following Konings (1997), Faggio (2001) and Konings, Kupets and Lehmann (2003), we postulate that employment growth at the firm level is determined by the size<sup>9</sup> of the firm, agency issues captured by the firm's ownership, industry-wide competition captured by the Herfindahl index and the import penetration index, and industry-specific effects captured by dummy variables. Further, we adapt the framework of Nickel (1996) and Estrin *et al.* (2001) to argue that firm-level labour productivity is a

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<sup>8</sup> Employment growth between periods  $t$  and  $t+1$  was measured as  $\ln L_{t+1} - \ln L_t$ , when  $L$  refers to the stock of labourers in a given time period. It is evident that the growth rate would encompass both job creation and job destruction, and can be interpreted as *net* job creation.

<sup>9</sup> Following Konings, Kupets and Lehman (2003) we define size in period  $t$  as the average of the employment stocks of firm  $I$  in periods  $t$  and  $t-1$ .

function of employment turnover (as measured by employment growth), ownership, competition, and industry-specific factors captured by dummy variables.

In other words, the specifications are given by the following:

$$\begin{aligned} (\text{growth in employment})_t = & \alpha_{0t} + \alpha_1(\text{size})_{t-1} + \sum_i \alpha_{2i}(\text{ownership})_i \\ & + \sum_j \alpha_{3j}(\text{competition})_j + \sum_k \alpha_{4k}(\text{industry})_k + u \quad [1] \end{aligned}$$

$$\begin{aligned} (\text{change in labour productivity})_{t+1} = & \beta_0 + \beta_1(\text{growth in employment})_t \\ & + \sum_i \beta_{2i}(\text{ownership})_i + \sum_j \beta_{3j}(\text{competition})_j \\ & + \sum_k \beta_{4k}(\text{industry})_k + v \quad [2] \end{aligned}$$

when  $i$  refers to the  $i$ -th form of ownership,  $j$  refers to the  $j$ -th form of competition, and  $k$  refers to the  $k$ -th industry. For both Bulgaria and Romania,  $i = 3$ , namely, domestic private, mixed ownership and foreign owned;<sup>10</sup>  $j = 2$ , namely, domestic competition as measured by the Herfindahl index, and foreign competition as measured by the import-penetration index; and  $k = 22$ .<sup>11</sup>

It is evident that the system is recursive, and can hence be estimated separately using OLS. Further, since lagged values of size in specification [1] and of employment growth in specification [2] are being used, neither of the individual specifications suffers from an endogeneity problem. In keeping with Konings (1997) and Brown and Earle (2002b), we

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<sup>10</sup> State-owned firms comprise the omitted category. Note again that the data does not allow us to identify *de novo* firms, and hence we were unable to distinguish between privatized privately-owned firms and *de novo* privately-owned firms.

<sup>11</sup> There are 23 industries at the 2-digit NACE1 level, and one of them is the omitted category.

have used the latest ownership status of the firms to create the ownership dummies, i.e., the ownership status of the firms are time invariant. Further, following Brown and Earle (2002), we use the average of the import penetration ratios of all the available years obtained by the countries' National Statistical Offices, to construct one index of foreign competition, such that this index too is time invariant. However, Herfindahl indices for each industry and for each year have been created using information provided by Amadeus, and are used for the estimation of the specifications.

As mentioned earlier, competition might have different impact on the job flows and labour productivity of firms with different types of ownership, and hence specifications [1] and [2] have been augmented by interacting the ownership dummies with both Herfindahl indices and the import penetration index. In other words, the specifications eventually estimated are as follows:

$$\begin{aligned}
 (\text{growth in employment})_t = & \alpha_{0t} + \alpha_1(\text{size})_{t-1} + \sum_i \alpha_{2i}(\text{ownership})_i \\
 & + \alpha_{3,1}(\text{Herfindahl index})_t + \alpha_{3,2}(\text{import penetration} \\
 & \text{index}) + \sum_k \alpha_{4k}(\text{industry})_k + \sum_i \alpha_{5i}(\text{ownership})_i \times \\
 & (\text{Herfindahl index})_t + \sum_i \alpha_{6i}(\text{ownership})_i \times (\text{import} \\
 & \text{penetration index}) + u \qquad \qquad \qquad [1a]
 \end{aligned}$$

$$\begin{aligned}
 (\text{change in labour productivity})_{t+1} = & \beta_0 + \beta_1(\text{growth in employment})_t \\
 & + \sum_i \beta_{2i}(\text{ownership})_i + \beta_{3,1}(\text{Herfindahl index})_t \\
 & + \beta_{3,2}(\text{import penetration index}) + \sum_k \beta_{4k}(\text{industry})_k \\
 & + \sum_i \beta_{5i}(\text{ownership})_i \times (\text{Herfindahl index})_t
 \end{aligned}$$

$$+ \sum_i \beta_{6i}(\text{ownership})_i \times (\text{import penetration index})$$
$$+ v \quad [2a]$$

Specifications [1a] and [2a] are estimated using pooled cross-section data for the 1995-99 time period. Since each of size, operating revenue and productivity are likely to be correlated across years, even as the independent variables are not significantly correlated among themselves, Huber-White robust estimators are used to estimate these specifications. The regression estimates are discussed in the forthcoming section of the paper.

#### **4. Regression Estimates**

The regression estimates are reported in Tables 4 through 7. Tables 4 and 5 report the regression coefficients for specification [1a], for Bulgaria and Romania respectively, while Tables 6 and 7 report the regression coefficients for specification [2a], for the two countries in the same order.

##### **4.1 Employment Growth**

The regression results in Tables 4 and 5 suggest that, in both Bulgaria and Romania, smaller firms experienced greater growth in the size of their labour force than the larger firms. This finding is consistent with the existing literature (Konings, 1996; Konings, 1997; Konings and Xavier, 2002). The difference between the two countries become apparent as soon as ownership is introduced to the specification (column 3). In Bulgaria, both privately owned firms and foreign firms experienced greater employment/labour

force growth than state-owned firms, and there was no significant difference between employment growth in state-owned firms and firms with mixed ownership. In Romania, on the other hand, privatization did not have any significant impact on firm-level employment growth; foreign firms in Romania experienced greater employment growth than state owned firms, while firms with mixed ownership experienced lower employment growth than state-owned firms. This suggests that there is a qualitative difference between the nature of privately owned firms and firms with mixed ownership in Bulgaria and Romania, and is consistent with the findings of Estrin *at al.* (2001).

The impact of competition on employment/labour force growth also differs between these two countries (column 4). In Bulgaria, an increase in domestic competition, captured by (a decline in) the Herfindahl index, leads to higher employment growth, while an increase in foreign competition, captured by (an increase in) the index for import penetration, results in a decline in employment growth. The negative impact of import penetration on employment growth is easy to explain. Greater import penetration, in the absence of increasing export markets for Bulgarian firms (Yackimova, Bhaumik and Shivarov, 2001), imply that there is a fall in the demand facing an average Bulgarian firm. This demand shock would translate into a decline in employment growth. The positive impact of domestic competition, captured by a decline in the Herfindahl index, on employment growth possibly manifests a state of the (transition) economy that is somewhat advanced towards the steady state of zero (net) employment growth (Bilsen and Konings, 1998).<sup>12</sup>

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<sup>12</sup> According to Bilsen and Konings (1998), early stages of transition are marked by rapid job destruction, as firms face competition and hard budget constraints for the first time. This is followed by increase in job creation as the surviving firms adjust to the new economic conditions, and in many cases the number of jobs created more than compensate for the number of jobs destroyed, leading to positive net employment



Interestingly, in Romania, import penetration does not have any impact on the employment growth of an average firm. This absence of an impact of a *de facto* demand shock on a key aspect for firm-level adjustment to shocks implies that either Romanian firms compensated for the increasing import penetration into Romanian markets by establishing toeholds in global export markets or, more probably, the Romanian firms were not behaving in a manner that is consistent with the neo-classical principle of cost minimization/profit maximization. Further, it is evident that, in Romania, an increase in domestic competition leads to a decline in employment growth, which, in the light of the Bilsen and Konings (1998) argument, suggests that during the 1995-99 period, the transition process in Romania was less advanced than the transition process in Bulgaria.

The introduction of the interaction between ownership and domestic and foreign competition into the specification (column 5) indicates that competition has an impact only on the privately owned firms in Bulgaria. However, while the significance of the coefficient for the interaction between the private ownership dummy and the Herfindahl index remains robust to the introduction of industry dummies in the specification (column 6), the introduction of the industry dummies results in the coefficient of the Herfindahl index regaining its significance. If the specification in column (6) is chosen as the best fit for the data, given that its R-square is (sometimes only marginally) higher than all other specifications presented in Table 4, the results imply that while competition affects all firms, it affects privately owned firms much more than other firms.

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growth. Finally, towards the end to the process of transition, as the economy enters a condition of steady state, the number of jobs created equals the number of jobs destroyed, such that the net employment growth approximates zero.

As reported in Table 5, in Romania, on the other hand, introduction of the interaction terms (column 5) suggests that while employment growth in an average Romanian firm was negatively related to the extent of domestic competition, this negative relationship was much weaker for the privately owned firms. In other words, while even privately owned firms remained immune to foreign competition, they were possibly more evolved than the firms with other forms of ownership in so far as the transition path is concerned.

It is evident that the results reported in Tables 4 and 5 suggest that, given that changes in the size of the labour force is a reaction to changes in firm-level or industry-level conditions, the behaviour of Bulgarian firms is consistent with the postulates of stylized theory. On the other hand, Romanian firms did not seem to have reacted to changes in ownership and degrees of competition, whether domestic or from abroad. Indeed, these firms seem to have reacted only to industry-specific factors unrelated to competition. Irrespective of whether these factors were economic or political in nature, to the extent that structural changes are supposed to induce firms to react to changes in ownership and the extent of competition, structural changes in Bulgaria seem to have been more successful until 1999 than structural changes in Romania.

#### **4.2 Changes in Labour Productivity**

Further evidence of the relatively more successful structural reforms in Bulgaria than in Romania can be found in the coefficient estimates reported in Tables 6 and 7. The coefficient estimates reported in Table 6 suggest that, in Bulgaria, firms that experienced

greater labour turnover also experienced greater growth rates in labour productivity (columns 1 and 2). This is consistent with our prior about the relationship between labour turnover and labour productivity at the firm-level. This result is robust with respect to introduction of ownership and competition controls, as well as industry-specific controls into the specification (columns 3 through 6).

Also, in Bulgaria, all non-state-owned firms have higher labour productivity relative to the state-owned firms, and there is a hierarchy among these firms, namely, foreign-owned firms are the most productive, followed by privately owned firms, and, finally, by firms with mixed ownership (column 3). This hierarchy is consistent with the literature (Estrin *et al.*, 2001; Brown and Earle, 2000) and with our priors about the relative productivity of firms with different types of ownership. With the exception of the coefficient for firms with mixed ownership, these results remain robust across specifications (columns 4 through 6).

The impact of competition on labour productivity in Bulgaria, however, is difficult to interpret, especially given the different impact of domestic and foreign competition on productivity. While a decrease in the Herfindahl index, i.e., an increase in domestic competition, does not significantly affect labour productivity of an average firm, a decrease in foreign competition leads to a decrease in labour productivity (column 4). Once interaction between ownership and competition are introduced into the specification (column 5), the impact of domestic competition on labour productivity becomes significant; (an increase in) competition is seen to have contributed to *decline* in labour

productivity. The introduction of industry-specific controls into the specification (column 6), however, renders competition *per se* insignificant, and (domestic) competition is seen to have an impact only on privately owned firms. Specifically, the results suggest that, during 1995-99, domestic competition contributed to growth of labour productivity among privately owned firms in Bulgaria. If, as before, we accept this specification as the best-fit on the basis of the R-square value, the impact of competition on labour productivity in Bulgaria is consistent with our prior; labour productivity increases with a decline in the Herfindahl index, i.e., with an increase in the extent of competition, albeit only for privately owned firms.

As highlighted in Table 7, in Romania, as before, economic characteristics like labour turnover and competition do not seem to matter, in so far as determination of inter-firm variation in growth of labour productivity is concerned. Indeed, only ownership matters, albeit weakly. Once industry-specific controls are introduced into the specification, only foreign ownership seems to have had a significant and, as expected, positive impact on growth of labour productivity, relative to state-owned firms. Once again, privatization seems to have had no effect, in this case, on the productivity of firms.

## **5. Concluding Remarks**

By all economic measures, Bulgaria and Romania are laggards among the transition economies of CEE. This is manifested by the fact that neither of them will join the expanded European Union in 2004. Interestingly, while the records of both countries with respect to domestic competition are roughly the same, the two countries have followed

very different paths of transition with respect to privatization and trade liberalization. Specifically, largely on account of the crisis of 1996-97, Bulgaria emerged a more open economy, and rapidly privatized most state-owned enterprises soon after the crisis.

These differences seem to have opened up fundamental differences between behaviour of Bulgarian and Romanian firms. While the employment growth and growth of labour productivity of Bulgarian firms are driven by economic factors like size, ownership and competition, the inter-firm variation in employment and labour productivity growth in Romania is largely explained by industry-specific factors that are unrelated to domestic and foreign competition. Indeed, in Bulgaria, factors like size, ownership and competition affect employment growth in period  $t$ , and this job turnover in period  $t$  affects growth in labour productivity in period  $t+1$ , thereby completing an intuitively reasonable chain of events over time. In Romania, on the other hand, ownership and competition did not have any impact on employment growth (in period  $t$ ) during 1995-99, nor did employment growth and competition have any impact on growth of labour productivity (in period  $t+1$ ).

Although this paper makes a significant contribution to the transition literature, by way of addressing the lacuna concerning the link between firm-level (labour) productivity growth and firm-level employment turnover in transition economies of CEE, it is not devoid of shortcomings. The most important shortcoming of the study is its inability to include in the sample exiting and entering firms that are an important part of the Schumpeterian dynamics, and its impact on productivity. Indeed, the absence of entering

and exiting firms in the sample may have contributed to a bias in our results concerning labour productivity. Given the stylized result that continuing firms are more productive than both entering and exiting firms (Olley and Pakes, 1996), our results are perhaps skewed in favour of firms that had better adapted to structural reforms. While this weakens the argument that an average Bulgarian firm had adapted significantly to the structural reforms during 1995-99, it strengthens the argument that Romanian firms had, on average, not evolved significantly in the process of transition.

The second shortcoming of the paper lies in our inability to distinguish between privatized and *de novo* firms. Given that our sample constitutes of continuing firms during the 1995-99 period, we have eliminated from the sample the “young” *de novo* firms, once again skewing the results in favour of firms that had better adjusted to the structural reforms and the prevailing economic conditions.

These shortcomings, which can be addressed as better quality data become available, however, do not bring into question the basic result of the paper, namely, that the structural reforms in Bulgaria, especially its privatization process, were perhaps more successful in transforming an average Bulgarian firm into a cost minimizing/profit maximizing economic agent than an average firm in Romania. Further, while the bias may have weakened the results *per se*, these results provide *prima facie* evidence that there exists a recursive relationship between job turnover and growth of labour productivity at the firm level.

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**Table 1**  
**Descriptive Statistics**

	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>
<b>BULGARIA</b>					
<i>All Firms</i>					
Productivity	23786	24183	18382	18681	183681
Employment	452	430	403	385	335
<i>Private Firms</i>					
Productivity	26692	27045	20840	21538	19430
Employment	494	474	448	435	396
<i>Foreign Firms</i>					
Productivity	49055	53649	41828	51849	66601
Employment	859	819	736	720	577
<i>Firms with Mixed Ownership</i>					
Productivity	20159	20122	14181	13774	13121
Employment	429	412	389	354	304
<i>State- Owned Firms</i>					
Productivity	14161	15562	12254	10334	8184
Employment	358	331	308	293	241
<b>ROMANIA</b>					
<i>All Firms</i>					
Productivity	206512	202288	209721	304601	182816
Employment	909	875	831	734	637
<i>Private Firms</i>					
Productivity	207281	188591	157380	365079	170153
Employment	685	643	617	561	497
<i>Foreign Firms</i>					
Productivity	294388	343875	553605	295093	313269
Employment	987	992	961	837	737
<i>Firms with Mixed Ownership</i>					
Productivity	134158	149508	135485	135201	145392
Employment	907	887	838	703	589
<i>State- Owned Firms</i>					
Productivity	153429	151465	138667	138590	124928
Employment	2042	1993	1841	1576	1321

**Table 2**  
**Decomposition of Productivity**  
**Bulgarian Industries**

Industry	Olley-Pakes			Griliches-Regev		
	Weighted Average Productivity	Unweighted Average Productivity	Cross Productivity	Average Productivity Change	Between Component	Within Component
Food & Beverages	10.25699	10.13441	0.15322	0.02557	0.03366	- 0.00809
Tobacco	10.58057	10.65871	- 0.09767	0.00273	0.00609	- 0.00336
Textiles	9.14968	8.94743	0.25281	- 0.00810	- 0.00125	- 0.00684
Wearing Apparel	8.79023	8.61866	0.21446	0.03070	0.04523	- 0.01453
Leather	8.78941	8.73280	0.07076	- 0.00295	0.00191	- 0.00486
Wood	9.64318	9.39999	0.30398	- 0.00339	- 0.00318	- 0.00021
Pulp & Paper	9.70837	9.46625	0.30265	0.00093	0.00305	- 0.00211
Publishing and Printing	12.01738	11.23185	0.98191	- 0.00472	- 0.00292	- 0.00180
Coke & Petroleum	12.01738	9.96356	0.00094	0.01400	0.01660	- 0.00260
Chemicals	10.49584	10.07683	0.52376	- 0.00771	- 0.01218	0.00447
Rubber & Plastic	9.58403	9.31762	0.33301	- 0.00020	0.00114	- 0.00135
Non-Metallic/ Mineral Products	9.84632	9.62774	0.27322	- 0.02116	- 0.01494	- 0.00622
Basic Metals	10.31830	9.50693	1.01420	- 0.00697	0.00054	- 0.00752
Fabricated Metals	9.31238	9.17404	0.17292	- 0.00044	0.00036	- 0.00081
Machinery & Equipment	9.25026	9.06671	0.22943	- 0.03255	- 0.02682	- 0.00572
Office Machinery & Computers	9.17835	8.94322	0.29390	- 0.00490	- 0.00513	0.00022
Electrical Machinery	9.54078	9.44164	0.12391	- 0.01111	- 0.00964	- 0.00147
Radio and TV	9.16737	9.08025	0.10889	- 0.00189	- 0.00171	- 0.00017
Medical/ Optical Instruments	9.17722	9.23354	- 0.07040	- 0.00303	- 0.00239	- 0.00064
Motor Vehicles	9.24492	9.16723	0.09712	- 0.01079	- 0.00858	- 0.00221
Other Transport	10.05854	9.83681	0.27715	- 0.01107	- 0.00924	- 0.00183
Furniture	8.77054	8.64230	0.16030	- 0.00249	0.00021	- 0.00270
Recycling	9.38577	9.45502	- 0.08656	- 0.00022	- 0.00003	- 0.00018

**Table 3**  
**Decomposition of Productivity**  
**Romanian Industries**

Industry	Olley-Pakes			Griliches-Regev		
	Weighted Average Productivity	Unweighted Average Productivity	Cross Productivity	Average Productivity Change	Between Component	Within Component
Food & Beverages	12.18085	12.23176	- 0.05090	0.02242	0.02266	- 0.00023
Tobacco	N/A	N/A	N/A	N/A	N/A	N/A
Textiles	11.13663	11.12861	0.00801	0.00372	- 0.00062	0.00434
Wearing Apparel	10.86508	10.96952	- 0.10443	0.10535	0.10303	0.00232
Leather	10.73916	10.86836	- 0.12920	0.00438	0.00365	0.00072
Wood	11.41247	11.71248	- 0.30000	0.00732	0.00722	0.00009
Pulp & Paper	11.92455	11.80048	0.12406	- 0.01123	- 0.01132	0.00009
Publishing and Printing	12.28532	12.29357	- 0.00825	0.00238	0.00327	- 0.00088
Coke & Petroleum	13.10391	13.32601	- 0.22209	- 0.00751	- 0.00758	0.00007
Chemicals	12.35088	12.21124	0.13963	- 0.01166	- 0.00784	- 0.00382
Rubber & Plastic	11.67002	11.71688	- 0.04685	- 0.00529	- 0.00608	0.00079
Non-Metallic/ Mineral Products	11.60583	11.65941	- 0.05358	- 0.00283	- 0.01273	0.00989
Basic Metals	12.17471	11.89083	0.28387	- 0.01872	- 0.01575	- 0.00297
Fabricated Metals	11.39908	11.43695	- 0.03787	0.00488	0.00490	- 0.00002
Machinery & Equipment	11.51483	11.47344	0.04138	- 0.06855	- 0.05854	- 0.01001
Office Machinery & Computers	N/A	N/A	N/A	N/A	N/A	N/A
Electrical Machinery	11.64457	11.67793	- 0.03335	- 0.00572	- 0.00693	0.00120
Radio and TV	11.43071	12.16431	- 0.73360	0.00034	- 0.00180	0.00215
Medical/ Optical Instruments	11.10215	11.18249	- 0.08033	- 0.00279	- 0.00322	0.00043
Motor Vehicles	11.90955	11.64193	0.26762	- 0.01765	- 0.02034	0.00269
Other Transport	11.96773	11.91066	0.05706	0.00612	0.00578	0.00034
Furniture	11.25389	11.18149	0.07239	0.02248	0.01858	0.00390
Recycling	N/A	N/A	N/A	N/A	N/A	N/A

**Table 4**  
**Determinants of Employment Growth in Bulgaria**

<b>Employment Growth</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Constant</b>	0.1928* (0.0388)	0.2120* (0.0395)	0.2214* (0.0399)	0.2386* (0.0401)	0.2239* (0.0448)	0.2258* (0.0505)
<b>Log Size (lagged 1 period)</b>	- 0.0444* (0.0068)	- 0.0446* (0.0068)	- 0.0499* (0.0068)	- 0.0482* (0.0069)	- 0.0478* (0.0069)	- 0.0486* (0.0072)
<b>Dummy Private</b>			0.0526* (0.0114)	0.05539* (0.0114)	0.0856* (0.0285)	0.0959* (0.0304)
<b>Dummy Foreign</b>			0.0688* (0.0184)	0.0713* (0.0186)	0.0942** (0.0489)	0.1240* (0.0463)
<b>Dummy Mixed Ownership</b>			- 0.0102 (0.0101)	- 0.0058 (0.0102)	- 0.0037 (0.0273)	0.0119 (0.0290)
<b>Herfindahl Index</b>				- 0.0664*** (0.0393)	- 0.0196 (0.0576)	- 0.2219** (0.0895)
<b>Import Penetration</b>				- 0.0644** (0.0288)	- 0.0367 (0.0607)	- 0.0709 (0.0887)
<b>Private*Herfindahl</b>					- 0.1469*** (0.0807)	- 0.1789** (0.0886)
<b>Foreign*Herfindahl</b>					0.1029 (0.1335)	0.0496 (0.1619)
<b>Mixed Ownership* Herfindahl</b>					- 0.0275 (0.0953)	- 0.0749 (0.0906)
<b>Private*Import Penetration</b>					- 0.0529 (0.0788)	- 0.0590 (0.0824)
<b>Foreign*Import Penetration</b>					- 0.1056 (0.1264)	- 0.1506 (0.1345)
<b>Mixed Ownership* Import Penetration</b>					- 0.0052 (0.0728)	- 0.0130 (0.0758)
<b>Year Dummies</b>	No	Yes*	Yes*	Yes*	Yes*	Yes*
<b>Industry Dummies</b>	No	No	No	No	No	Yes**
<b>F test</b>	42.57	27.18	10.52	17.13	11.00	5.57
<b>R<sup>2</sup></b>	0.0188	0.0353	0.0473	0.0510	0.0526	0.0601
<b>No. of Observations</b>	4031	4031	4031	4019	4019	4019

Note: Values within parentheses are standard errors. \*, \*\* and \*\*\* indicate significance at 1%, 5% and 10% levels respectively.

**Table 5**  
**Determinants of Employment Growth in Romania**

<b>Employment Growth</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Constant</b>	0.8212* (0.0572)	0.8857* (0.0585)	0.8729* (0.0683)	0.8784* (0.0677)	0.8639* (0.0688)	0.8439* (0.0709)
<b>Log Size (lagged one period)</b>	- 0.1418* (0.0091)	- 0.1412* (0.0089)	- 0.1398* (0.0094)	- 0.1434* (0.0098)	- 0.1430* (0.0099)	- 0.1432* (0.0104)
<b>Dummy Private</b>			- 0.0026 (0.0176)	0.0031 (0.0175)	0.0284 (0.0279)	0.0055 (0.0270)
<b>Dummy Foreign</b>			0.0661* (0.0213)	0.0681* (0.0214)	0.0477 (0.0369)	0.0188 (0.0363)
<b>Dummy Mixed Ownership</b>			- 0.0407*** (0.0206)	- 0.0347*** (0.0208)	- 0.0239 (0.0351)	- 0.0151 (0.0355)
<b>Herfindahl Index</b>				0.2561** (0.1026)	0.5266** (0.2369)	0.4822 (1.714)
<b>Import Penetration</b>				5.91e-06 (0.0001)	- 0.0001 (0.0002)	- 0.0001 (0.0005)
<b>Private*Herfindahl</b>					- 0.4779*** (0.2598)	- 0.2924 (0.2464)
<b>Foreign*Herfindahl</b>					- 0.0616 (0.3297)	0.0764 (0.3069)
<b>Mixed*Herfindahl</b>					- 0.3122 (0.4112)	- 0.3447 (0.4014)
<b>Private*Import Penetration</b>					0.0000 (0.0002)	0.0000 (0.0002)
<b>Foreign*Import Penetration</b>					0.0003 (0.0003)	0.0003 (0.0003)
<b>Mixed Ownership* Import Penetration</b>					0.0001 (0.0003)	- 0.0000 (0.0003)
<b>Year Dummies</b>	No	Yes*	Yes*	Yes*	Yes*	Yes*
<b>Industry Dummies</b>	No	No	No	No	No	Yes*
<b>F test</b>	242.3	96.02	57.77	44.27	26.93	17.72
<b>R<sup>2</sup></b>	0.1434	0.1557	0.1592	0.1606	0.1616	0.1778
<b>No. of Observations</b>	4206	4206	4206	4152	4152	4152

Note: Values within parentheses are standard errors. \*, \*\* and \*\*\* indicate significance at 1%, 5% and 10% levels respectively.



**Table 6**  
**Determinants of Growth in Labour Productivity in Bulgaria**

<b>Labour Productivity</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Constant</b>	- 0.0877* (0.0072)	- 0.1383* (0.0130)	- 0.1794* (0.0159)	- 0.2174* (0.0241)	- 0.2489* (0.0349)	- 0.2005* (0.0427)
<b>Net Employment Growth (lagged 1 pd)</b>	0.0704*** (0.0359)	0.0636*** (0.0359)	0.0676*** (0.0359)	0.0726** (0.0359)	0.0739** (0.0359)	0.0799** (0.0361)
<b>Dummy Private</b>			0.0589* (0.0163)	0.0551* (0.0162)	0.0805*** (0.0446)	0.0801*** (0.0465)
<b>Dummy Foreign</b>			0.1215* (0.0344)	0.1164* (0.0349)	0.2736* (0.0969)	0.2525** (0.0995)
<b>Dummy Mixed Ownership</b>			0.0401*** (0.0179)	0.0338*** (0.0176)	0.0609 (0.0496)	0.0261 (0.0499)
<b>Herfindahl Index</b>				0.1089 (0.0764)	0.2296** (0.1036)	0.1303 (0.5758)
<b>Import Penetration</b>				0.0904*** (0.0516)	0.1587*** (0.0927)	0.0818 (0.1558)
<b>Private*Herfindahl</b>					- 0.2174 (0.1355)	- 0.3201** (0.1556)
<b>Foreign*Herfindahl</b>					- 0.1271 (0.2938)	- 0.0292 (0.2916)
<b>Mixed Ownership* Herfindahl</b>					- 0.0202 (0.2213)	- 0.0485 (0.1682)
<b>Private*Import Penetration</b>					- 0.0282 (0.1174)	- 0.0349 (0.1191)
<b>Foreign*Import Penetration</b>					- 0.4264 (0.3181)	- 0.4100 (0.3248)
<b>Mixed Ownership* Import Penetration</b>					- 0.0790 (0.1251)	- 0.0178 (0.1259)
<b>Year Dummies</b>	No	Yes*	Yes*	Yes*	Yes*	Yes*
<b>Industry Dummies</b>	No	No	No	No	No	Yes*
<b>F test</b>	3.85	20.91	13.76	10.72	7.61	4.29
<b>R<sup>2</sup></b>	0.0014	0.0216	0.0255	0.0272	0.0288	0.0365
<b>N Observations</b>	3166	3166	3166	3166	3166	3166

Note: Values within parentheses are standard errors. \*, \*\* and \*\*\* indicate significance at 1%, 5% and 10% levels respectively.

**Table 7**  
**Determinants of Labour Productivity in Romania**

<b>Labour Productivity</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Constant</b>	0.0079 (0.0058)	0.0141 (0.0101)	- 0.0346** (0.0140)	- 0.0379** (0.0179)	- 0.0266 (0.0253)	- 0.0214 (0.0293)
<b>Net Employment Growth (lagged 1 pd)</b>	0.0156 (0.0157)	0.0172 (0.0155)	0.0150 (0.0155)	0.0152 (0.0156)	0.0167 (0.0159)	0.0132 (0.0159)
<b>Dummy Private</b>			0.0577* (0.0148)	0.0578* (0.0153)	0.0364 (0.0284)	0.0241 (0.0289)
<b>Dummy Foreign</b>			0.0617** (0.0244)	0.0615** (0.0243)	0.1073** (0.0435)	0.0993** (0.0435)
<b>Dummy Mixed Ownership</b>			0.0408** (0.0244)	0.0399** (0.0178)	- 0.0071 (0.0333)	- 0.0216 (0.0325)
<b>Herfindahl Index</b>				0.0050 (0.1234)	0.0949 (0.1683)	- 1.505 (1.979)
<b>Import Penetration</b>				0.0000 (0.0000)	- 0.0002 (0.0002)	0.0003 (0.0005)
<b>Private*Herfindahl</b>					- 0.0381 (0.2647)	0.2597 (0.2701)
<b>Foreign*Herfindahl</b>					- 0.4019 (0.2787)	- 0.2298 (0.2852)
<b>Mixed*Herfindahl</b>					- 0.1825 (0.3102)	0.1756 (0.3144)
<b>Private*Import Penetration</b>					0.0003 (0.0002)	0.0001 (0.0002)
<b>Foreign*Import Penetration</b>					- 0.0003 (0.0004)	- 0.0004 (0.0003)
<b>Mixed Ownership* Import Penetration</b>					0.0006** (0.0002)	0.0004 (0.0002)
<b>Year Dummies</b>	No	Yes*	Yes*	Yes*	Yes*	Yes*
<b>Industry Dummies</b>	No	No	No	No	No	Yes*
<b>F test</b>	0.99	8.33	7.11	5.44	4.33	5.25
<b>R<sup>2</sup></b>	0.3195	0.0096	0.0112	0.0113	0.0126	0.0246
<b>No. of Observations</b>	4236	4236	4236	4236	4236	4236

Note: Values within parentheses are standard errors. \*, \*\* and \*\*\* indicate significance at 1%, 5% and 10% levels respectively.



**APPENDIX I**  
**Structural Changes in Bulgaria and Romania**

<b>BULGARIA</b>	<b>ROMANIA</b>
<b><i>Privatisation</i></b>	
<p>The first law governing privatization in Bulgaria was enacted in 1992, laying down a framework for denationalization via open tenders, auctions, direct negotiations and MEBO's. While political stalemate obstructed real progress till the mid-1995s, moderate preferences given to employees resulted in insignificant insider ownership amounting to less than 20% of the privatizable property. Impetus to privatization was given after the financial crisis of 1996-1997, by introducing mass privatization (allowing for launch of privatization funds in a competitive way), and simultaneously initiating fast sell-off of shares of state-owned enterprises for cash. By the end of 1999 the extent of privatization of the chemical, food, metallurgical, electrical, machine building and construction industries were 83.2 percent, 92 percent, 89 percent, 70 percent, 50 percent and 61.9 percent, respectively.</p>	<p>The legal basis for commercialization of state owned enterprises in Romania was given by Law 58 of 1991 which entrusted 70 percent of the privatizable property to State Ownership Fund acting as a trustee and negotiator with potential investors; and the remaining 30% to five private funds (POF) having the status of joint-stock companies meant to serve as a mutual fund operating on commercial basis. Previously, <i>regies autonomes</i>, or non-privatisable companies were excluded of the list of companies subject to privatization. Little progress in denationalization- apart from a substantial amount of property going to MEBO- was made till the start up of mass privatization in 1995, when 4000 of the 63000 commercial companies still in state hands, and constituting the 30% property belonging to POFs were included in the mass privatization program. While according to Earle and Telegdi (1998) mass privatization achieved little in denationalizing the Romanian economy, impetus was given to sell off of enterprises for cash, especially in the post 1996 period. However, by 2000 less than 60% of the state owned property in Romania was privatized (European Commission, 2000, IMF, 2000).</p>
<b><i>Competition Policy</i></b>	
<p>The first law on Protection of Competition in Bulgaria was adopted in 1991 and was significantly revised in 1998 to make it compatible with the EU legislation. Indeed, while prior to 1995 most of the cases dealt with involved enforcement of private contracts and property rights, later amendments addressed hard-core anti-trust issues such as block exemption of vertical agreements and horizontal</p>	<p>The Law on Protection of Competition was enacted in Romania in 1997 and was drafted along the requirements of the <i>acquis communautaire</i> of the EU. By the end of 1998 Romania's anti-trust legislation was largely in line with that of the EU, however secondary legislation still needs to be adopted to take into account EUs new vertical restraints policy and its policy on horizontal agreements. While</p>

<p>cooperation agreements. However, while antitrust legislation is deemed developing in a satisfactory manner by the EU, monitoring and control of state aid is deemed as unsatisfactory and in need of improvement.</p>	<p>existing legislation covers the basic principles of state aid control, a lot need to be done in its monitoring and implementation.</p>
<p><b><i>Trade Liberalisation</i></b></p>	
<p>During its transition, Bulgaria has achieved a a high degree of trade liberalization by international standards. In 1991 itself it liberalized most prices, removed import controls and adopted a unified exchange rate, while maintaining export control on essential inputs. While it partially reversed liberalization in 1994-96 and in the crisis year 1996 in introduced a temporary import surcharge, overall it emerged as top 20% among IMF members in terms of openness, with a present IMF rating of 2. However, while lots of progress has been made in the elimination of non-tariff barriers, and Bulgaria's MFN tariff is around the world's average, it remains higher than that in many of its neighbours and the EU. Agricultural goods continue to benefit from higher tariff protection than the rest of the economy, and among EU candidates only Poland and Romania have higher MFN tariffs than Bulgaria.</p>	<p>Compared to other CEE economies, Romania followed a more gradual regime with respect to trade liberalization. It unified its exchange rate in 1997 and reduced tariffs and price controls, achieving full current account liberalization only in 1998. By IMF standards, together with Poland, Romania is classified as one of the less open economies in CEE with an average rating of 4.</p>

## APPENDIX II

One of the main questions that this paper aims to answer is the question of whether the massive job reallocation during Bulgaria's and Romania's transitions contributed to productivity growth, or whether, on the contrary, it led to the elimination of the more productive jobs. We try to answer this question by Olley-Pakes decomposition, which looks at the distribution of labour and productivity across firms in each industry at a point in time, and by Griliches- Regev decomposition, which looks at the separate role of job reallocation and firm level productivity increases or decreases on overall productivity dynamics of firms in 2-digit industrial sectors. We then take the average of those decompositions for the 1995-1999 period and report them in Tables 2 and 3.

### A. Olley-Pakes Decomposition

Olley and Pakes (1996) conduct cross sectional decomposition of labour productivity in the following manner:

$$P_{it} = \bar{P}_i + \sum_i (S_{et} - \bar{S}_i)(P_{et} - \bar{P}_i)$$

where  $P_{it}$  is the industrial weighted productivity for each time period,  $P_i$  is the average industrial unweighted productivity and  $\sum_i (S_{et} - \bar{S}_i)(P_{et} - \bar{P}_i)$  is the sum of the productivity markups of each firm over the average industrial productivity, weighted by the difference of firm-level employment shares and the average employment share of the industry. A positive cross- term  $\left[ \sum_i (S_{et} - \bar{S}_i)(P_{et} - \bar{P}_i) \right]$  means that activity is

disproportionately allocated in high productive firms, while a negative cross-term means that activity is disproportionately allocated in low productivity firms.

### **B. Griliches-Regev Decomposition**

Griliches and Regev (1995) decompose the change in firm's contribution in terms of productivity, weighted by employment, to the total in the following manner:

$$S_t P_t - S_{t-1} P_{t-1} = \bar{S} . dP + dS . \bar{P}$$

where  $dP = P_t - P_{t-1}$  and  $dS = S_t - S_{t-1}$  and  $S$  is, as in the Olley- Pakes decomposition, the share of firm's employment in the employment of the respective industry. The first term in the above decomposition (a within- firm productivity growth) shows the contribution of non- employment based factors on industrial productivity growth. The second term (between firm productivity growth), shows the employment reallocation contribution to industrial productivity growth.