ON THE ONSET OF POST-COMMUNIST INDUSTRIAL DEVELOPMENT IN CENTRAL AND EAST EUROPEAN ECONOMIES

BURNETE Sorin
Lucian Blaga University of Sibiu, Romania

Abstract:

In the course of the last twenty odd years, Central and East-European economies have been striving to reform an inherited flawed trade structure, in an attempt to increase their industrial competitiveness and improve their position within the international division of labor. The respective countries have gone through an industrial metamorphosis that swept away the legacy of socialist autarky, making them better-equipped to deal with globalization challenges. The dismantling of the COMECON forced CEEs to institute severe constraints on public budgets; as a consequence, the price of physical capital edged up relative to the price of labor thereby making the respective economies relative abundant in labor. This prompted manufacturers throughout the economy to substitute labor for physical capital in production. Yet factor substitution does not occur identically because the elasticity of factor substitution varies among industries: in the labor-intensive sector, since manufacturers were able to substitute labor for physical capital in production more easily, legions of extra workers were employed and production rose. By contrast, in the physical capital-intensive sector, the ability to offset the rising price of physical capital by hiring extra labor is technologically limited; consequently, enterprises, though grappling with the obsolescence of old technology had no alternative but slash production or close down.

Key words: *comparative advantage, factor substitution, subcontracting, capital abundance, labor intensiveness*

1. Introduction: Central and Eastern Europe has been grappling with a flawed foreign trade structure

The demise of the COMECON in the early 1990s released Central and East-European countries (CEEs) from the constraints of central planning only to leave debacle in its wake: a lot of economic sectors were in an ailing state and most enterprises had lost their bearings. Since they could no longer count on each other's markets for their exports, newly liberated economies hopefully veered toward the west in order to fill the vacuum. The matter was critical: a decline in their exports earnings

would have pushed the respective economies deeper in the doldrums. During an initial transition stage (the 1990s), the respective economies' business dealings with the West most often took the form of subcontracting agreements, in which Eastern firms would perform but low skilled labor-intensive operations such as final assembly. Yet such relationships, however lopsided helped CEEs make it through the hard times that followed the loss COMECON markets, by keeping the engines of the economies humming, securing export revenues and more importantly, allowing for cross-border transfer of technological knowledge and skills.

Despite the widespread belief that commercial exchanges with the West had to be increased at all costs, trade policy options were sparse. What could Eastern Europe possibly offer in exchange for indispensible imports from the West? Certain scholars, considering economic complementarities presumably existing between the western and eastern part of the continent (which must nevertheless not be ignored) espoused the idea that CEEs had comparative advantage in labor-intensive goods. Neven (1994), for instance, while analyzing "the political economy of trade liberalization by the European Community towards Eastern nations in order to identify sectors that are both sensitive and politically effective" concluded that Eastern nations "might have a comparative advantage in industries that use capital and (relatively) unskilled labor intensively". In a more specific approach, Audretsch (1993) classifies goods, on the basis of certain fundamental economic characteristics, into five categories[1], suggesting that during the 1980s East European nations underwent "a shift in the trade structure", their comparative advantage gradually shifting from "Ricardo goods"[2] toward "high-concentration industries"[3], while Western countries show visible comparative disadvantage in this type of industries.

Even admitting CEEs had comparative advantage in "high-concentration industries", their international trade structure was seriously flawed in terms of competitiveness; it is no surprise that most CEEs' industries imploded at the first clash with foreign competition. Still, the new market economies possessed a valuable asset that could secure a competitive edge in the East-West trade: a well-trained and relatively cheaper workforce that could be turned to account through subcontracting. This turned out to be an efficient means for CEEs to keep the engines of their economies humming and maintain or even increase their export revenues. Deardorff & Djankov (2000) characterized it as a source of cross-border knowledge transfer and increased efficiency. Yet the belief that subcontracting helped CEEs to turn to account their alleged comparative advantage in labor-intensive goods is questionable: when subcontracting agreements are confined to a mere assembly of imported inputs, the value-added by the assemblers is trivial, which makes their comparative advantage elusive. In reality as in theory, comparative advantage results not from the money cost of producing a good but from its opportunity cost. When a firm in a poor country enters a manufacturing agreement with a foreign multinational, say for the assembly of a final good, it does it because it has no alternative, i.e. nothing else to give up, meaning the opportunity cost is virtually zero. (In fact, it is not literally zero because many workers employed in manufacturing had probably been lured from agriculture or household

activities; however, when the sacrificed domains are very poorly productive, one can admit the opportunity cost is practically, nil.)

2. An early shift in CEEs' comparative advantage: from high concentration industries to unskilled labor-intensive activities

Theory review

The comparative advantage issue was dealt with by McKenzie, Jones, Findlay, Dornbusch et al., Ethier, Bond…to mention just a few. McKenzie (1954) considers two variants: in the former, integrated production and absence of trade in intermediate products are presumed; in the latter, as trade in intermediate products is considered, new directions of efficient specialization appear. Jones (1957) expands on McKenzie's model with the aim to ascertain the necessary and sufficient conditions for efficient multilateral specialization, subject to the profit conditions of competitive equilibrium. Findlay (1970) develops a somewhat different type of model, comprising three goods instead of just two as in the classical Heckscher-Ohlin theorem, one good being a capital one. Dornbusch, Fischer and Samuelson (1977) tackle the comparative advantage issue from the broader perspective of a flow of goods, considering one factor only, labor. Ethier (1982) built a more comprehensive model (encompassing trade in intermediate goods too), aimed to highlight the existence of "international" returns to scale, stemming not from sheer plant size but from increased division of labor. Bond (2001) developed an outsourcing model, meant to illustrate the role of vertical specialization in a context when "the production process of firms is becoming increasingly "fragmented" internationally". Aside from that, Bond's model sheds some light on another interesting aspect of international trade in intermediate goods: it generates a bilateral monopoly problem and creates the premises for opportunistic behavior.

Various attempts to factor wages into the comparative advantage equation produced somewhat peculiar results. Kravis (1956) for example, analyzing labor costs in the United States' foreign trade flows found that export industries tended to pay higher wages than import-competing industries, particularly those considered vulnerable to import competition and therefore most intensely protected. Kravis's conclusion is contrary to what conventional theory suggests: as a rule, import protection enables producers to pay higher than normal wages. Balassa (1989) as another example, using export shares as proxies of export performance found a strong correlation between export shares and productivity but no significant correlation between export shares and wages. For all its paradoxical appearance, this result simply points to the fact that the link between wages and comparative advantage is not easily ascertainable. Finally, Lawrence et al. (1993), while investigating the widening discrepancy between wages of skilled and unskilled workers in the US manufacturing industry during the 1980s concluded this could not be explained through the Stolper-Samuelson (1941) theorem because prices of goods that use unskilled labor intensively had not declined during the mentioned period. Instead, they found a

"positive association between the growth of total factor productivity and the intensive use of non production labor". All these findings clearly show that globalization works against the interests of unskilled workers. The model in the second part (developed from a neoclassical perspective) makes use of the generalized production function, formulated by Arrow et al. (1961) to explain how CEEs lost their alleged comparative advantage in so-called "high concentration" goods.

The model

As emphasized earlier, in the aftermath of the COMECON's dismantling, industries in the CEEs had no alternative but to compete in cost, which in turn, could only be achieved by substituting cheap low skilled labor for expensive capital. Obviously, industries that used unskilled and semi-skilled labor intensively were in a position to take greatest advantage of this situation through heavy use of subcontracting, while the ones that used physical capital intensively shrank, pending forthcoming FDI. Following this line of reasoning, let us imagine two countries, *East* (*E*) and *West* (*W*) that belong to two different trade blocs: *East* is part of a closed bloc (such as the ex-COMECON), while *West* is part of an open bloc (such as the EU). Just for the sake of simplicity, suppose both countries produce two types of goods (*X* and *Y*), using two factors of production: labor (considered homogeneous) and physical capital, denoted by *L* and *K* respectively. Symbols *X* and *Y* are generic ones: *X* designates the whole class of labor-intensive goods; *Y* stands for the "high concentration" category of goods (in the sense attributed by Audretsch), using physical capital with relative intensiveness. In terms of factor endowment, *East* is assumed to be abundant in physical capital[4] and scarce in labor relative to *West* (endowment with other factors e.g. human capital is ignored for the moment). Finally, the two economies are assumed to differ in size: *East* is deemed small, *West* is deemed large.

Under the above-stated conditions (assuming identical tastes and ignoring transportation costs), the afore mentioned theories predict that *East* will produce good *Y* in a higher proportion relative to good *X*, as compared to *West*; in other words, *East*'s production ratio (expressed as output of *Y* over output of either *X*) is higher than *West*'s. By the same token, since *West* is labor abundant relative to *East*, its production ratio, expressed as output of *X* over output of *Y* must be higher than *East*'s. The process of employing increased amounts of labor in order to compensate for the high cost of physical capital is a natural consequence of the opening of closed, centrally-planned economies to international competition and basically is function of the supply of labor on the home market on the one hand, and the elasticity of factor substitution on the other hand. As mentioned above, the letter differs across industries: "technological alternatives are numerous and flexible in some sectors, limited in others; and uniform substitutability is most unlikely." (Arrow et al., 1961) Assuming the elasticity of factor substitution is constant (but not identical) in the two sectors of *East*'s economy, the two respective production functions may take, according to Arrow et al., the following form:

$$Q(K,L) = h[gK^{-\lambda} + (1-g)L^{-\lambda})^{-\frac{1}{\lambda}} \quad (1)$$

where:
h = efficiency parameter;
g = distribution parameter (determining the functional distribution of income);
λ = substitution parameter.

Denoting K/L by k and dividing (1) by L, we get:

$$\frac{Q(K,L)}{L} = \frac{h}{L^{\lambda\frac{1}{\lambda}}[gK^{-\lambda}+(1-g)L^{-\lambda}]^{\frac{1}{\lambda}}} = \frac{h}{[gk^{-\lambda}+(1-g)]^{\frac{1}{\lambda}}} = h(gk^{-\lambda}+1-g)^{-\frac{1}{\lambda}} \quad (2)$$

The output-ratio function, Ω can then be written as a function of k:

$$\Omega(k) = \frac{Q_x/L}{Q_y/L} = \frac{h_x(g_x k^{-\lambda_x}+1-g_x)^{-\frac{1}{\lambda_x}}}{h_y(g_y k^{-\lambda_y}+1-g_y)^{-\frac{1}{\lambda_y}}} \quad (3)$$

where:
h_x, g_x, λ_x = efficiency, distribution and substitution parameters in the production of X;
h_y, g_y, λ_y = efficiency, distribution and substitution parameters in the production of Y;
Q_x, Q_y = respective outputs of goods X and Y.

Denoting the elasticity of factor substitution by ε, it can also be written as follows:

$$\varepsilon = \frac{1}{1+\lambda} \quad (4)$$

Equation (4) shows that elasticity of factor substitution makes sense only for values of λ in the interval (-1; +∞), which are conducive to values of ε in the interval (0; +∞). However, as previously mentioned, the elasticity of factor substitution differs between the two sectors: it is much higher in the labor-intensive sector than in the "high concentration" sector, for reasons discussed above. On the other hand, according to Arrow et al., k depends on the rental-wage ratio (w/r) in a degree determined by ε, namely:

$$\frac{K}{L} = k = \left(\frac{g}{1-g}\frac{w}{r}\right)^{\varepsilon} \quad (5)$$

where g, $1-g$ denote the share of capital income and labor income respectively. Taking account of equation (4), it follows that:

$$\frac{w}{r} = \frac{1-g}{g}\left(\frac{K}{L}\right)^{\frac{1}{\varepsilon}} = \frac{1-g}{g}k^{1+\lambda} \quad (6)$$

Equation (6) is equivalent to:

$$\frac{g}{1-g} = \frac{r}{w}k^{1+\lambda} \quad (7)$$

By plugging (7) into (3), we get:

$$\Omega(k) = \frac{h_x(1-g_x)^{-\frac{1}{\lambda_x}}\left(\frac{r}{w}k^{1+\lambda_x}k^{-\lambda_x+1}\right)^{-\frac{1}{\lambda_x}}}{h_y(1-g_y)^{-\frac{1}{\lambda_y}}\left(\frac{r}{w}k^{1+\lambda_y}k^{-\lambda_y+1}\right)^{-\frac{1}{\lambda_y}}} = \xi\left(\frac{r}{w}k+1\right)^{-\frac{1}{\lambda_x}+\frac{1}{\lambda_y}} \quad (8)$$

where: $\xi = \frac{h_x}{h_y}(1-g_x)^{-\frac{1}{\lambda_x}}(1-g_y)^{\frac{1}{\lambda_y}}$

Further denoting the exponent by u and differentiating with respect to k, we have:

$$\frac{d\Omega}{dk} = \xi u \frac{r}{w}\left(\frac{r}{w}k+1\right)^{u-1} \quad (9)$$

Because factors $(1-g_x)$, $(1-g_y)$ are positive, ξ is also positive. Since $\left(\frac{r}{w}k+1\right) > 0$ and $\frac{r}{w} > 0$, the sign of the first derivative depends on the sign of u ($u = \frac{\lambda_x-\lambda_y}{\lambda_x\lambda_y}$), which further depends on the substitution parameters in the two industries. The elasticity of substituting labor for capital is, as mentioned above, assumed to be greater than unity in the labor-intensive sector ($\varepsilon_x > 1$) but less than unity in the physical capital-intensive sector ($\varepsilon_y < 1$). For these conditions to hold, λ_x must, according to equation (4), take values between minus one and zero, while λ_y must be greater than zero. If this is the case, u is positive (both the numerator and the denominator are negative), meaning the $\Omega(k)$ function is increasing.

Because the elasticity of factor substitution differs between the two sectors, they will respond differently to changes in k: as the ratio of capital to labor decreases to zero, $k^{-\lambda_x}$ will also tend to zero, causing output in the labor-intensive sector to increase asymptotically toward an upper limit. In the physical capital-intensive sector, since $\lambda_y > 0$, as k approaches zero $k^{-\lambda_y}$ will tend to infinity, causing output to decrease all the way to zero. (The results are summarized in table 1.) Thus ruling out the possibility of factor intensity reversals, the decrease in the capital-labor ratio will make *East*'s production ratio (expressed as output of *Y* over output of *X*), dwindle; at a certain point it becomes inferior to *West*'s production ratio, which means that *East*'s comparative advantage shifted from "high-concentration" goods to labor-intensive goods.

An important observation must be made: the model above was developed assuming λ was fixed and k was variable. Still, elasticity of factor substitution, though constant, is not immutable: it is a function of economic conditions. Should *East* remain in a state of economic funk (with a flawed trade structure and in need of foreign investment), both sectors will be doomed; even in the labor-intensive sector growth will be eventually stunted. Examining the data in table 1, one can notice that, to the limit (as k approaches zero) Q_x is a decreasing function of λ_x. In an extreme case, as λ_x approaches zero, even though the elasticity of factor substitution in the respective sector equals unity ($\lambda_x \nearrow 0, \varepsilon_x \searrow 1$) – implying that the production function takes the particular Cobb-Douglas form – output (Q_x) will ultimately decline to zero.

Table 1: Changes in output as response to changes in the capital-labor ratio in *East*

	The labor-intensive sector	The physical capital-intensive sector
$\lambda_x \in (-1; 0)$ $\lambda_y \in (0; +\infty)$	$\lim_{k\to 0} k^{-\lambda_x} = 0$ $\lim_{k\to 0} Q_x = Lh_x(1-g_x)^{-1/\lambda_x}$	$\lim_{k\to 0} k^{-\lambda_y} = \infty$ $\lim_{k\to 0} Q_y = 0$

3. Conclusions

CEEs' industrial development path has its own idiosyncrasies, stemming essentially from the respective countries' COMECON-related inheritance. During the age of center planning, resources had been channeled into industries whose chief economic characteristic was market concentration, requiring sizable capital investments and employing legions of unskilled and semi-skilled workers. Being left with such a burden, the freshly liberated economies had no (short-run) option but to capitalize on a readily available asset: plentiful labor. Technically, this entailed a generalized tendency to substitute labor for capital, at least by those industries that were able to continue to churn out goods; commercially, the widespread formula was subcontracting of labor-intensive operations, mostly final assembly of inputs delivered by western importers. For all its inconveniences, subcontracting not only helped CEEs to turn vast pools of labor to pretty good account but also enabled enterprises thereof to employ idle capacities and bring in vital export revenues. Yet it was but an intermediary stage, a way-out from the economic mire that ensued after the COMECON crumbled.

Exposure to stiff global competition compelled CEEs' industries to gradually abandon low value-added activities such as assembly of imported inputs and embark on skilled labor and knowledge-intensive ones. The ostensible comparative advantage in labor-intensive goods – much advocated during the 1990s, when the imperative of the day was to keep the respective economies on an even keel – is now forgone under the combined forces of Europe's single market and competitors from outside the Union. During the last twenty odd years, their industries successively shifted from "high concentration" goods to low skilled labor-intensive activities to products and services that use skilled labor and knowledge intensively. In fact, European integration has been acting as a steady catalyst for change; on the other hand, since the EU as a whole is engaged in a competitiveness contest at a global scale, new member countries would by no means accept to be a cog in the machine.

Notes:

[1] The five categories are: "Ricardo goods", "product-cycle goods", "high-advertising goods", "R&D-intensive goods" and "high-concentration goods".
[2] Products that fall into the "Ricardo goods" category are generally "high in natural resource content and serve as key inputs into producing processed and semi-processed goods".
[3] This group includes industries such as "tobacco, petroleum products, edible oils, tubes, office machines, telecommunications and domestic electrical equipment, motor vehicles, railway vehicles and aircraft sectors".
[4] This hypothesis is plausible enough: communist regimes were notoriously lavish in respect of public spending; the "soft budget constraint syndrome" (Kornai, 1986) made investments in physical capital seem cheaper than they actually were.
[5] Measuring skill level is cumbersome, both in theory and practice. Theoretically, as Lawrence et al. (1993) remarked, a worker's skill level probably grows with some combination of education, on-the-job training, and work experience. In empirical work, according to the same authors, pinpointing a worker's skill level requires a broad range of data, which, unfortunately, most data sets do not contain.

4. References

Arrow, K. J. et al., (1961), *Capital-Labor Substitution and Economic Efficiency*, The Review of Economics and Statistics, Vol. 43, No. 3, pp. 225-250

Audretsch D. (1993): *European Competitiveness*, Cambridge University Press, pp.259-285

Balassa B., (1989): *Comparative Advantage, Trade Policy and Economic Development*. New York University Press, pp.3-15

Bond E. W., (2001) *Commercial Policy in a "Fragmented" World*, The American Economic Review. Vol. 91, No. 2, pp. 358-362

Deardorff A., Djankov S., (2000) *Knowledge Transfer under Subcontracting: Evidence from Czech Firms,* Research Seminar in International Economics, Discussion Paper, No.454, pp.2-24

Dornbusch R., Fischer S., Samuelson P.A., (1977) *Comparative Advantage, Trade, and Payment. A Ricardian Model with a Continuum of Goods*, The American Economic Review, Vol.67, nr.5, pp. 823-839

Ethier W. J., (1982) *National and International Returns to Scale in the Modern Theory of International Trade,* The American Economic Review, Vol. 72, No. 3, pp. 489-405

Findlay R., (1970) *Factor Proportions and Comparative Advantage in the Long Run*, The Journal of Political Economy, Vol. 78, No. 1, pp. 27-34

Jones R. W. (1957) *Factor Proportions and the Heckscher-Ohlin Theorem*, The Review of Economic Studies, Vol. 24, No. 1, pp. 1-10

Kornai, J. (1986) The Soft Budget Constraint, *Kyklos*, vol.39. part.1, Kyklos-Verlag

Kravis I. B. (1956) *Wages and Foreign Trade*, The Review of Economics and Statistics, vol.38, nr.1, pp.14-30

Lawrence R. Z. et al., (1993) *International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup?,* Brookings Papers on Economic Activity. Microeconomics, vol. 1993, nr.2, pp.161-226

Mckenzie, L., (1954) *Specialisation and Efficiency in World Production*, The Review of Economic Studies, Vol. 21, No. 3, pp. 165-180

Neven D. J., (1994) *Trade liberalization with Eastern nations. How sensitive?* CEPR Discussion Papers Series nr.1000, 1994

Stolper, W.F., Samuelson, P.A., (1941) *Protection and Real Wages*, The Review of Economic Studies, Vol. 9, No. 1, pp. 58-73