Central Europe:
From Central Command Economies to Free Markets

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Central Europe faces a decade of restructuring due to the move from centrally planned economies to free markets. Its economic evolution into the current structure of resource utilization and output composition is traced by using a dynamic model. Major production factors and their interaction are simulated to quantify the issues of the transition: these include the transformation of traditional industries and their re-orientation towards services, the parallel transfer of ownership of assets and financial intermediaries, restructuring the labor pool, demographic changes and energy efficiency.
A drop in economic output and living standards precedes the recovery from devastations caused by 40 years of central government planning. The time delays and cost of the transition lead to structural unemployment, changed participation in the labor force and migration in the short term. Active Western involvement in trade, technology transfer, retraining of human resources and investment is required for any economic assistance to be effective in generating growth and slowing migration.

Introduction

We are presenting a model to describe and understand the ongoing transition in Central Europe. Regions considered for this study include Poland, former East Germany, Czechoslovakia, Hungary, Rumania, Bulgaria and Yugoslavia. This heavily industrialized block with organizations of high concentration of power and central decision making has started the move to a market economy. Important steps in this transition are the privatization of state-owned enterprises, the reorganization of ministries, creation of a modern communications infrastructure and the introduction of financial intermediation and legal operating frameworks. It is handicapped by foreign debt, low labor and capital productivity, and a dependence on low cost supplies.

The traditional policy instruments (wage, price and credit controls) at first continued to be enforced in the newly deregulated environment. Monetary policies combined with fiscal stabilization measures are coming into play now that the first liberalization of price controls and tariffs have taken place. The success of these liberalization measures will determine the composition of the evolving mixed economy. New policies have come into effect in 1992: financial instruments have been introduced to provide credit and short term government financing. Investment funds for the privatization of state-owned enterprises are created while political reforms are still in progress. In Poland, Czechoslovakia and (East-) Germany, inflation has been put down to controllable levels. Unemployment figures skyrocketed in the eastern part of Germany but remained below the Western European average in Czechoslovakia, Hungary and Poland. The quality and education of the human resource is their biggest potential.

Despite these encouraging signs, the economic output continues to decline. Employment is threatened in the traditional industrial centers which were geared to produce for the soviet markets. The old economic trade block (CMEA Council for Mutual Economic Assistance) has collapsed and is not replaced by any comparable common market. As a result, flows of goods, people and investments need to be redirected for a more intensive exchange with the West. In the short run, exports of competitive products like steel, coal, textile and agricultural goods can mitigate this trade shock.

Economists in Czechoslovakia and Poland are using the system dynamics methodology to formulate policies for restructuring. It has been known in Eastern Europe since the 1970s, but was of little help in modeling central planning in the absence of meaningful feedback mechanisms. In the context of intense polarization of issues and struggle for power in the newly democratic system, a methodology based on objective observation and mathematical quantification is very much required. The

impact of policies on privatization, its scheduling and targeted final level is too important to let biased models, linear or dynamic, be used to support decision makers. System Thinking provides an opportunity to understand the transition in its entirety and to avoid misrepresenting the situation because of personal, political of national motivations.

Problem Statement

The implicit hope of Central European citizens to reach western living standards and the need for political freedom are the main motivation to switch to free a market system. The differences arise not from its geographic location but from two opposing political systems which dominated Europe over more than 40 years. While Western Europe achieved considerable progress, its eastwards neighbors struggled under communist central control. The resulting difference between the Western and Central European situation is expressed in terms of:

- difference in living standards (figure 1), level of output per capita,
- composition of national output by sector and owners,
- distribution of production factors between industry and services,
- importance of government in aggregate demand
- energy efficiency

As shown in table 1, the difference is very large and raises the questions of how to accomplish the switch?

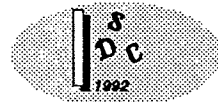|	Central Europe	Western Europe	Status	Notes

National Product / Capita:
        share of Industry & Services
        (measured in US $ of 1980)
	3616	8386	1989	[1]
				[3]
				[5]

Industrial Sector:
        Share of National Product
        Labor Force Participation
	64 %
	41 %
		34 %
		33 %
			1986	[2]
				[4]

Service Sector:
        Share of National Product
        Labor Force Participation
	24 %
	36 %
		63 %
		53 %
			1986	[2]
				[4]

Government Revenues: Share of National Output	67 %	34 %	1988	

Energy Efficiency:
        Tons of Oil equivalent per
        1000$ of National Output.
	0.95	0.32	1985	

Table 1.

Although the seven former East Block countries considered differ in their individual socio-economic make up, these differences are small in comparison with the overall difference with the West. Therefore an aggregate representation of the block is made by summing up the reference mode and taking average values across all seven countries.Planning scenarios, scheduling privatization and investment strategies and ranking different policies in social and demographic issues constitute the primary application of dynamic simulations to this problem.

Approach

The model proposed in this paper is made to analyze different modes of transition in terms of costs and benefits to Europe. It computes output and investments, population and migration, captures endogenously economic, demographic, technological and social variables over a time horizon of 60 years. The major assumption is that the Central European countries will try to emulate their peers in Western Europe. This is used in the estimation of parameters to trace the relations between industrial value added and the appropriate level of service activities.

But first, the main drivers of economic success are identified and a reference mode was established for all major variables. In general, data-sets were gathered from a single source at a time to insure consistency over time. In most cases estimates compiled by western research institutes are used as proxy for indicators of economic performance in former Eastern Europe. Second, after organizing

Sub-System Diagram: Organization of Major Concepts

Foreign
Investments

Western
Living Standards

International
Debt

International
Migration

Foreign Investments

Debt Service

Central Europe

Migration
Pressure

Emigration

Labor
Utilization

Living Standards &
Use of Output

Population

Investments
& Savings

National
Income

Potential
Labor

Investment
Allocation

National Output
& Privatization

Labor

Labor Force
Allocation &
Utilization

Technology
Acquisition

Energy Needs
& Expenditures

Factor
Expenditures

Utilization

Jobs
Labor
Participation

Technology
& Energy

Wage Expenses ,
Job Creation &
Labor Participation

Western
Technology

Internal
Migration

Exogenous Inputs:

- domestic fiscal policies: tax rates
- foreign investments
- western living standards
- ratio of assets/depreciation
- privatization rate

- investment fraction for technology transfers
- net exports, trade
- subsidies to agricultural sector
- labor migration from agriculture
- fertility and death rate of populations

Figure 1

concepts into sub-systems, the dominant relationships between economic and demographic variables are articulated in linear and differential equations. A more detailed description of model formulation is provided by Randers (1980). The model is assembled through stepwise integration of single micro-economic and behavioral concepts to form an aggregate representation of the problem. Emphasis is placed on modeling the transition problem, not its complexity. Thus simplifying assumptions and restraints of system boundaries are required as outlined in figure 1. Third, the structure is adapted to the problem by setting parameter values to represent the situation of Central Europe. Initialization and parametrization of the model require detailed data on the sectors and areas considered. A different set of countries requires another step of parameter tuning.

The system replicates two production factors: labor force and capital investment for two economic sectors: traditional industry and services [note 2]. The labor force is affected by population growth and job creation. Population migration is driven by effects of living standards and unemployment. Output is allocated to consumption and investments which in turn fuel the capital stocks. This feeds back into output, job creation, labor utilization and living standards. The effort required to develop new technology and infrastructure and reduce energy consumption is modeled separately. Wherever possible, simple macro economic concepts are used to formulate the relationship between variables.

Demographic developments are treated in enough detail to capture the most important components of the population and its driving factors. Age groups 17-24 and 25-40 which represent the core of the population are treated as separate variables to capture birth cycles (baby booms). Refer to Sterman-Wang (1985) for a more detailed representation of populations with stock variables. These age groups are further subject to the disturbance of international migration which periodically depletes the child-bearing core of the population. The model is built around the supply side of the economy to retrace the reference mode. Market mechanisms are gradually activated as central control features are phased out in order to reflect the transition. Net National Output is computed with a production function with decreasing marginal returns for both production factors. The mathematical formula is based on the Cobb-Douglas production function as described in Pyndick-Rubinfeld (1989).

National accounts are simplified and aggregated based on western accounting rules. National output (net of depreciation) is split into national income, government revenues (indirect and direct) and adjusted for transfers. The resulting personal income and personal disposable income are used to determine consumption and private savings. Public and prioritized investment policies are exogenous as well as taxation. Government consumption and transfer payments are determined by total revenues. Computations are made dimensionless (fractions of NNP Net National Product). For aggregate representation of macro-economic accounts, refer to Dornbush- Fisher (1987) and Low (1980). Investments are allocated between sectors using different priorities after an adjustment for subsidies to other sectors (agriculture). After 1990, new investments diverted to the acquisition of technology (research facilities and licenses) and to the private sector are prioritized. Before the transition, state-owned industries get the bulk of investments: as the output from that sector grows, investments in services gradually increase. This relationship is designed to trace the historical fact the traditional industries preceded the expansion of services. Investments are accumulated in capital asset stocks for each sector. Depreciation is computed by taking the average life time of investment goods in a manufacturing or service firm and the value of fixed assets. For macro-economic accounting purposes a formulation derived from Lyneis (1980) uses a third order delay to model capital asset installation, operation and depreciation.

The model focuses on a limited number of concepts and groups interacting variables into elements called subsystems. Variables which are modeled endogenously are contained within the system boundaries (refer to figure 1, sub-system diagram). Exogenous variables are set before running the simulation and are not affected by the reaction of the system. Additional building blocks can be added to capture the behavior of a specific sector of the economy. For equations listing, refer to the technical documentation, Chevalley (1992).

One factor not considered is inflation. Payroll expenses are aggregated and used to determine job creation. Numbers are derived from income and labor force size and only represent an index of labor costs.

Results

Simulation results describe only the economic constraints imposed on the transition. Political constraints, nationalistic strife and disintegration may result from the economic crisis. Results

are not meant to be interpreted as a forecast, but rather as a visualization of the qualitative effects of different strategies.

For this paper I chose to present one simple investment and aid policy from the West in the form of loans, commercial credits and venture capital. Different scenarios might include higher loan guaranties, faster privatization, subsidized job creation, more trade and technology transfer or revised productivity assumptions. In the present case (base case), a special effort is devoted to the development of new infrastructure from 1991 to 2001. The time delays for adjustments in the labor participation are long. Job creation is assumed to become rapidly more expensive. On the demographic side, the assumption is made that the population will mature and achieve zero growth due to a decline in fertility.

First we look at Gross National Product, the primary measure of economic performance, Central Europe does overcome its economic inefficiency only after a delay of more than 10 years.
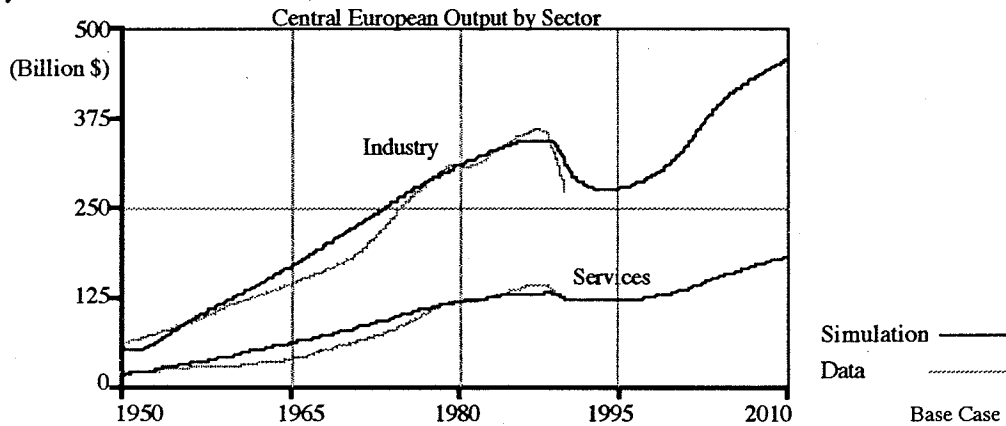
Figure 2

GNP is measured with an index (US$ of 1980) and adjusted for inflation. The historical growth is explained by the mobilization of existing production factors and resources through centrally planned industrialization. Saturation and diminishing grows start in 1980. The economy enters a recession in 1989 which takes it to a trough by 1995. Service output remains at a lower level compared to the industrial output. The industrial sector retains its dominant position due to the high degree of vertical integration of companies and a lack of transfers of functional activities to service firms. Steady economic growth follows for more than a decade after 1995.
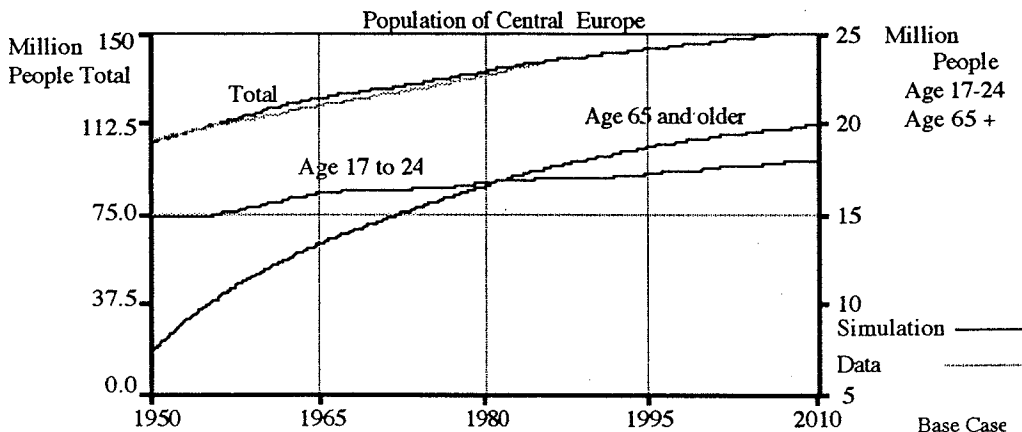

Figure 3

Population continues to increase at a diminishing rate before reaching next to zero growth by 2030. Average life expectancy as estimated through an abridged life table is 67 years at birth for men and 72.6 years at birth for women. Both figures are lower then in Western European nations. The aging of the entire population is reflected by the number of retired people exceeding the core of young people who determine birth and growth rates. This places an increasing burden on social security systems and retirement funds. Taxes and contributions are likely to increases to make up for the shortfall of contributing members of the population relative to recipients and beneficiaries.

Income per capita declines during the recession and recovers by 1998. The free market system replaces the old system but leaves the industrial sector in its dominant position.
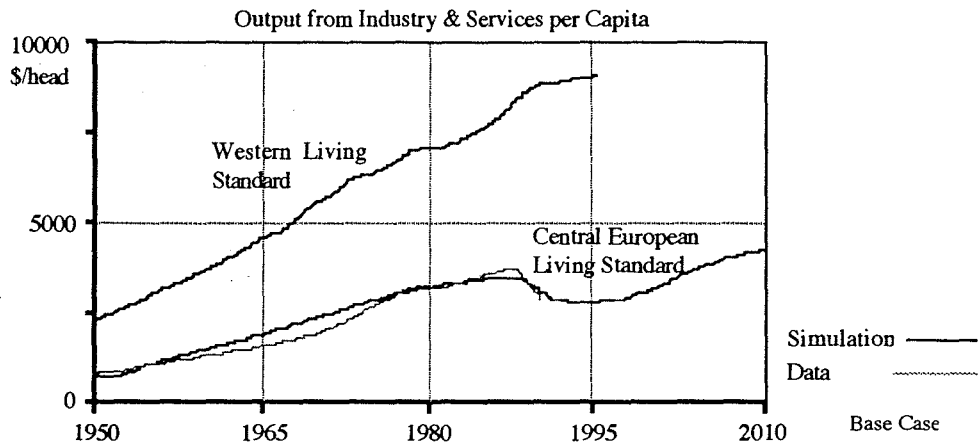
Output from Industry & Services per Capita

Figure 4

The gap in living standards with Western Europe persists. Slow growth continues to be the main characteristic of Central Europe as long as the service productivity stays low. For the longer term analysis the model is limited by its assumptions.
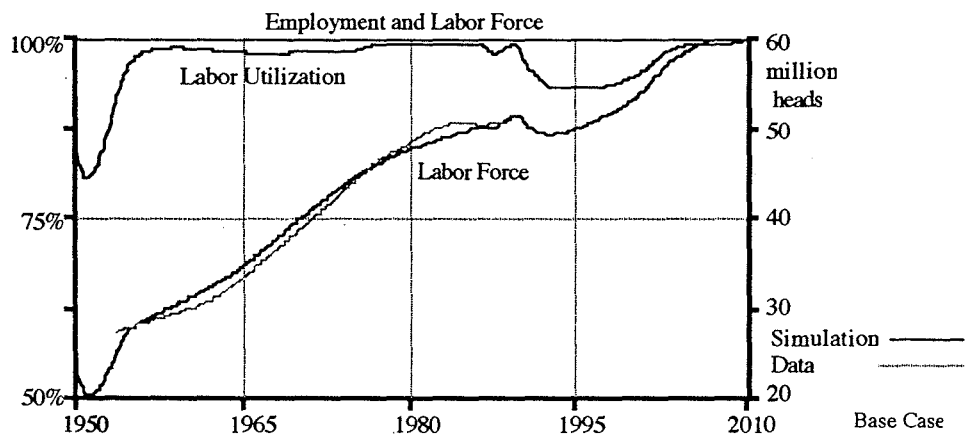
Employment and Labor Force

Figure 5

Unemployment rises as labor utilization declines rapidly after 1989. For more than a decade the potential labor force is not fully utilized. This is due to delays in investment, job creation, training and implementation of new technology. Despite a halt in growth of labor participation and unemployment, the labor force increases due to growing population in working age. The potential work-force is computed

using the age groups 17-64 and the labor participation fraction derived from average wage levels.
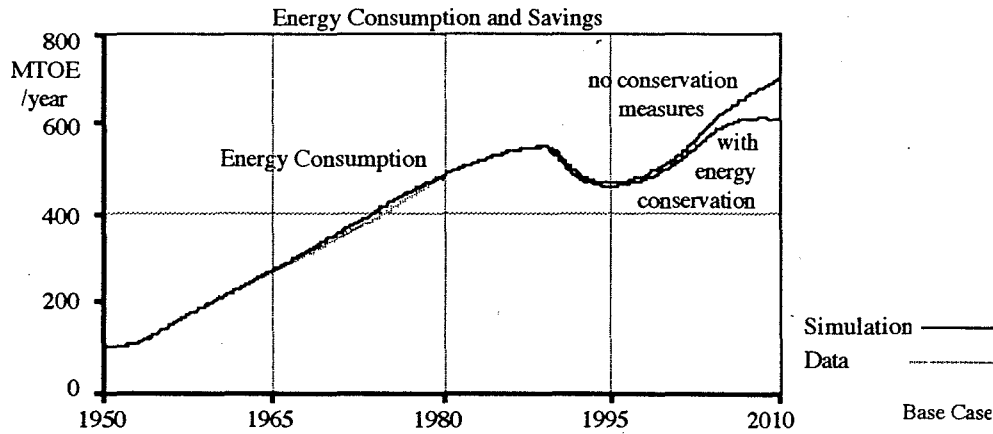
Energy Consumption and Savings

Figure 6.

Energy consumption is computed in four sectors: Industry, Transport, Residential, Services (note [6]). Estimates of elasticities to changes in national output and population are used to determine energy consumption. Energy conservation measures are implemented once new technology is acquired. Savings potential by sector is estimated based on differences in energy efficiency between central and western Europe.
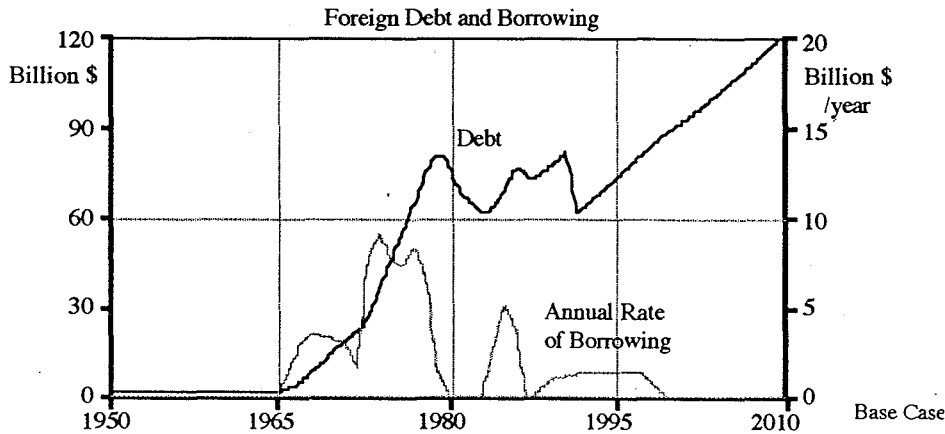
Foreign Debt and Borrowing

Figure 7

The dip in total debt during the early 1980s is due to a lending stop and distortions introduced by using US$ to measure it (note [7]). The drop after 1991 is due to the government debt forgiving measures initiated by the "Paris Club" in March 1991. With the assumption that all interest payments are re-scheduled, total debt increases back to its level of 1989 within 10 years. Rate of Borrowing is an exogenous variable representing loans and external government debt; historical numbers are used up to 1989, a hypothesis is made for the ensuing period. Venture capital and foreign equity investments are modeled separately.

Investments are treated separately for each sector. As an illustration let us look at the situation for traditional industries: investments grow steadily until economic reforms allow for a bigger share to be directed towards services. due to the collapse of the Eastern European trading block in 1990 and the sharp drop in national output, investments fall by 30%.

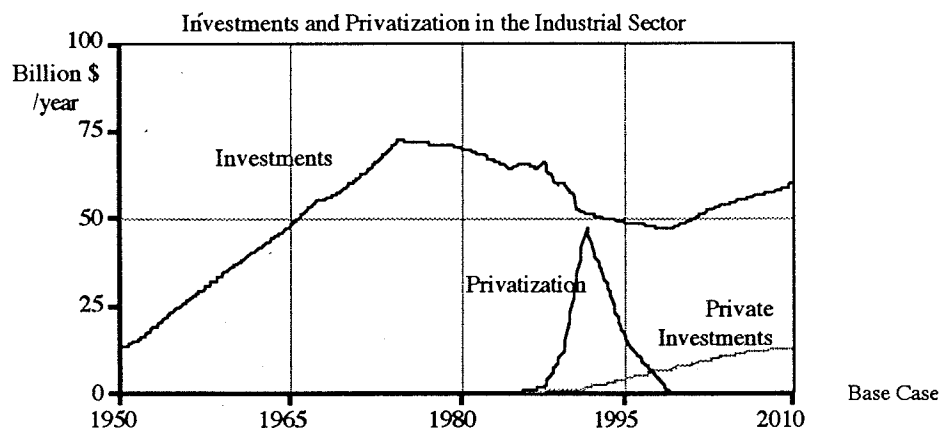Investments and Privatization in the Industrial Sector

Figure 8

A wave of privatizations is assumed to transfer assets out of the state-owned sector into private ownership. However due to the inherited structure of capital expenditures, private investments are insufficient to let privatized companies overtake their state-owned competitors. An accelerated rate of depreciation of older assets occurs during the transition as most companies turn out to have equipment that is obsolete by western standards.

Remember that this is only one scenario of policy analysis. No claim that the actual development will follow this path is made or justified. The observations need to be interpreted with caution and revised as more information becomes available.

Analysis

As presented in this scenario, Western creditors are generous in terms of debt forgiving and freeze debt service during the transition. New loans extended for the re-development lead to a higher debt load. Given that low productivity is assumed to persist in state sectors, especially in the service sector, output is not able to generate sufficient income to cover consumption and domestic investments. The transition takes 10 years before living standards return to a level comparable to 1989. Costs take the form of labor migration between sectors (industry to services, public sector to private entities), changes in labor participation due to unemployment, high investments and restructuring expenses. Central Europe is dependent on foreign assistance during this period to get its economy growing again. Transfer of technology permits Central Europe to compete on world markets only after a decade long learning process.

Debt service force the countries to trim their other expenditures. New job creation reduces the pressure on emigration and constitutes a short term measure to ease tensions. A shakeout of low productivity businesses is accompanied by rationalization in larger companies. The unemployment problem is distributed over a longer time period. A variation in policy to subsidize employment opportunities in the service sector is beneficial in the short run, but fails to produce significant improvements in the longer run.

The scenario has a very comprehensive perspective of the main components of the flows of goods, currency and production factors in the economy. The capital, investment and output estimates provide a basis for the valuation of Central European industries. Discrepancies between countries considered are likely to get bigger. Investment and aid is far from being evenly spread among Central European nations. Germany is bailing out the newly merged federal states. This head-start will permit them to succeed earlier and attract even more business as their domestic market grows. Yugoslavia
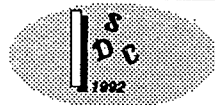
or its remaining independent republics are engaged in a war which destroys its biggest advantage, the tourism and service sector. The resulting chaos will not provide a trustworthy basis for any kind of business activity which could lead to economic recovery. Based on the current development, one may say that Yugoslavia already missed its transition to a democratic and free economy.

The context of economic reform is determined by political and ethnic rivalries. The trade shock due to the collapse of the CMEA together with the drop observed in domestic investments have accentuated the obsolescence of the current industrial production base. The privatization process is far from being complete or comprehensive. Privatization means a transition for three major factors: 1. the establishment of a clear structure of ownership and control achieved through reorganization, 2. retraining employees to perform under new incentive systems, 3. decentralize the accounts and cash-flows of firms by creating banks and allowing efficient financial intermediation.

The south-eastern countries of Bulgaria and Rumania have taken the attitude of followers in the transition. They expect to learn from the east German, Hungarian and Czech experience and to avoid the mistakes made by the first movers. Bulgaria is relying on its agricultural sector to survive the trade shock: its biggest market for industrial products, the former Soviet Union, is in dismay. Hardship is avoided thanks to a still functioning agriculture. Rumania, on the other hand, is in its worst state since the revolution of 1989. Industrial activity has collapsed, the situation on energy and food supplies was in an emergency situation during the winter 1991/92. The political reform process is slowed down while very little progress was achieved in terms of economic reforms. The severe economic contraction is hampering the reorganization of government and political structures.

Conclusion

Integrating various micro-economic, demographic and business concepts in one model provides the possibility to describe the transition process on Central Europe and sort out the success factors. The main issues are the coordination of investments to follow the privatization of state-owned enterprises, trade with Western Europe in a more open market, equity investments and technology transfers along with the restructuring of companies and their operations, re-training of employees and managers. All this requires efficient financial intermediation within a working legal framework for entrepreneurs and investors to take advantage of the resources in Central Europe.

These remarks are based on a model and its assumption as well as the currently available information. As the situation evolves, more parameters will have to be considered. Of course, we realize that the scope of this paper does not allow for all variables used in the model to be presented. A more complete description of the model will be published at a later date.

Notes

[1]   NNP Net National Product: Gross National Product net of depreciation. The model captures the output of the industrial and service sector which together account for 87% of the total.
All figures are derived from growth rates adjusted for inflation. Output and population are computed separately for each country, summed up and divided to get the ratio.
Countries included in "Central Europe": Poland, former East Germany, Czechoslovakia, Hungary, Rumania, Bulgaria and Yugoslavia.
Countries included in "Western Europe": European Economic Community.

[2]   The economy is divided into three sectors: a) Agriculture b) Industry c) Services.
Services include communication, transportation, wholesale & retail, health care, tourism.
Industry includes manufacturing, mining and construction.

[3]   Numerator for currency. the reference mode for all output variables was derived from growth rates in each sector and every country. The index is anchored in 1980 and translated in Billion US $ of 1980 (1,000,000,000 $).

[4]   Labor Participation: fraction of population in working age which is economically active in a particular sector (employed or self-employed).

[5]   Population is derived from demographic indicators for each country. To aggregate the figures an
      abridged life table was derived from available mortality and fertility figures. Since these figures
      were reported under communist regimes, a great deal of caution is required as far as the accuracy
      is concerned.

[6]   Energy consumption is measured in Million Tons of Oil Equivalent MTOE.

[7]   Debt is owed in Western European currency (DM, FF, £). Measuring this debt in US $
      introduces a distortion due to exchange rate fluctuations between the dollar and the other
      currencies.

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A complete list of data sources can be found in Chevalley (1991) and in the technical documentation.