

**Estonian Institute of Economics  
at Tallinn Technical University**

**INSTITUTIONAL DETERMINANTS OF  
CONVERGENCE: CONCEPTUAL FRAMEWORKS  
AND EMPIRICAL STUDIES OF ESTONIAN  
INSTITUTIONAL HARMONISATION AND SOCIO-  
ECONOMIC CONVERGENCE WITH THE EU**

**CERGE-EI GDN program project No. 34, 2002**

**Final Report**

**by Ülo Ennuste, Alar Kein and Teet Rajasalu**

**Tallinn, 2002**

# CONTENTS

Executive summary .....	3
<b>PART 1. Indicators of Economic Freedom and Economic Structure as Determinants of Growth and Convergence in Enlarging EU and Priorities for Estonia .....</b>	<b>6</b>
Teet Rajasalu	
1.1. Introduction.....	7
1.2. Institutional development in the EU convergence context .....	7
1.3. Impact of education, health, political and civil rights and economic freedom on economic growth in EU and candidate countries.....	9
1.3.1. Education and life expectancy as very weak worldwide determinants of economic growth.....	10
1.3.2. Political rights and civil liberties as growth regressors .....	12
1.3.3. Impact of economic freedom on growth.....	14
1.3.4. Augmented regression with some real economy indicators .....	17
1.4. Conclusions.....	19
Appendix 1.1. Estimation with all sub-indices of economic freedom.....	23
Appendix 1.2. Estimation result with selected indicators of economic freedom and additional structural indicators .....	23
Appendix 1.3. Final estimation with economic freedom and structural indicators .....	24
<b>PART 2. Estonian Institutional Harmonisation and Socio-Economic Convergence with the EU: the Aspects of Development, Credibility and Consistency of Estonian Capital Markets .....</b>	<b>25</b>
Alar Kein	
2.1. Introduction.....	25
2.2. Short overview of the Estonian securities market .....	26
2.2.1. General characteristics of the securities primary market .....	26
2.2.2. General characteristics of the securities secondary market .....	27
2.3. The design of the Estonian securities market: regulatory and supervisory aspects .....	29
2.3.1. Securities market supervision.....	30
2.4. Prospects of the Development of Securities Market in Estonia .....	33
2.4.1. The Role of Pension Reform on the Development of Securities Market in Estonia .....	33
2.4.2. The role of Estonia's EU accession on the development of securities market in Estonia .....	35
2.5. Conclusions.....	36
Appendix 2.1. Securities primary market in Estonia: Public Issues Registered at the Financial Supervisory Authority and essentially "Public" Issues of Securities .....	38
Appendix 2.2. Turnover of Securities Traded on the Tallinn Stock Exchange.....	38
Appendix 2.3. Number of transactions with Securities Traded on the Tallinn Stock Exchange.....	39
Appendix 2.4. Share of Economic Sectors in the Turnover and Number of Transaction in the Estonian Stock Market.....	39
Appendix 2.5. Dynamics of TALSE index during June 3 <sup>rd</sup> , 1996 – December 18, 2002.....	40
Appendix 2.6. Investments into securities traded on the Tallinn Stock Exchange by countries .....	40
<b>PART 3. A LP Analysis of Economic Sector Institutional Structure .....</b>	<b>41</b>
Ülo Ennuste	
3.1. Introduction and general methodology.....	42
3.2. Technical-methodological remarks .....	44
3.3. Set-up .....	45
3.4. Some solution and calibration notes .....	46
3.5. Illustrative specification example and discussions for Estonian case studies.....	47
3.6. Conclusions.....	49
<b>Appendices .....</b>	<b>53</b>
Appendix A. Indices of economic freedom (from The Heritage Foundation, adjusted to previous year)...	53
Appendix A.1. Overall index (acronym OVER).....	53
Appendix A.2. Trade policy (acronym TRAD_).....	53
Appendix A.3. Fiscal burden of government (acronym FISC_).....	54
Appendix A.4. Government intervention in the economy (acronym GOVE_).....	54
Appendix A.5. Monetary policy (acronym MONE_).....	55
Appendix A.6. Capital flows and foreign investment (acronym FORE_).....	55
Appendix A.7. Banking and Finance (acronym BANK_).....	56
Appendix A.8. Wages and prices (acronym WAGE_).....	56

Appendix A.9. Property rights (acronym PROP_)	57
Appendix A.10. Regulation (acronym REGU_)	57
Appendix A.11. Black market (acronym BLAC_)	58
Appendix B. Indices of political rights and civil liberties from ANNUAL FREEDOM IN THE WORLD COUNTRY SCORES 1972-73 TO 2000-2001	59
Appendix B.1. Index of political rights (acronym POLI_ followed by country acronym in regressions)	59
Appendix B.2. Index of civil liberties	60
Appendix C. .. Life expectancy and education indicators for 1999 from Human Development Report 2001. <a href="http://www.undp.org/hdr2001/">http://www.undp.org/hdr2001/</a>	61
Appendix D. .... Annual GDP growth rates, GDP per capita at PPP adjusted US dollars and structural indicators from World Bank databases ( <a href="http://devdata.worldbank.org/hnpstats/">http://devdata.worldbank.org/hnpstats/</a> ), ITU, OECD, UNO and other sources	63
Appendix D.1. Annual GDP growth rates (acronym GROW_)	63
Appendix D.2. GDP per capita at PPP (current US dollars, acronym GDP+year number)	64
Appendix D.3. Inflation, GDP deflator (annual index, acronym INFL)	65
Appendix D.4. Gross capital formation (% of GDP, acronym CAP)	65
Appendix D.5. Foreign direct investment, net inflows as % of GDP (acronym FDI)	66
Appendix D.6. Exports of goods and services (% of GDP, acronym EKSP)	66
Appendix D.7. High-technology exports (% of manufactured exports, acronym HIGH)	67
Appendix D.8. Personal computers (per 100 persons, acronym PC_)	67
Appendix D.9. Internet users (per 100 persons, acronym INT)	68
Appendix D.10. Telephone lines and cellular subscribers per 100 population (from ITU, acronym PHON)	68

## **Executive summary**

**CERGE-EI GDN program project No. 34, 2002**

### **Institutional Determinants of Convergence: Conceptual Frameworks and Empirical Studies of Estonian Institutional Harmonisation and Socio-Economic Convergence with the EU**

Our main policy implication findings in the three parts of the Project are as follows:

**Part One by Teet Rajasalu: Indicators of Economic Freedom and Economic Structure as Determinants of Growth and Convergence in Enlarging EU and priorities for Estonia** can be summarised as follows:

1. General indicators of institutional development like education, health of population and labour force, political rights and civil liberties cannot explain cross-country differences in growth rates within the enlarging EU well enough. Institutional determinants that have been proved to be statistically significant determinants of growth rates by many authors in worldwide sample countries or in various samples of transition economies do not perform so well in EU member states and candidate countries where the harmonisation process has induced a rather high similarity in general institutional development. More closely economy related indicators of economic freedom were better correlated with the growth differentials and convergence within the enlarging EU. The findings confirm Estonia's rather good prospects for further growth and convergence with the EU as its economic freedom ranking is high and initial income level low.
2. Besides economic freedom indices, some structural indicators of the economy deserve attention in the evaluation of economic growth and convergence prospects. It happened that regressions augmented by structural indicators explained growth rates better. However, these regressions failed to prove long run income convergence in enlarging EU.
3. Additionally to overall indicators of economic freedom and sub-indices of fiscal burden, foreign capital movement regulations and monetary stability, structural indicators like the percentage share of gross capital formation in GDP and share of high technology exports in total manufacturing exports deserve special attention. However, high shares of the aforementioned structural indicators can be also interpreted as results of advancements in building up institutions that promote high investment ratios and high technological level of exports. These policy relevant findings were helpful in targeting Estonia's institution design.

**Part Two by Alar Kein: Estonian Institutional Harmonisation and Socio-Economic Convergence with the EU: the Aspects of Development, Credibility and Consistency of Estonian Capital Markets**

1. The securities market development in Estonia has reached a new phase – international integration stage, which is characterised by the strengthening of links with foreign markets and market participants. Although this process should be viewed generally as a positive one from the point of view of securities market

development, there could be also several unwanted developments that might accompany this process. Our primary concern is that the strengthening of integration with foreign markets and market participants may also lead to increasing transmission of instability from foreign markets to the domestic market. Such potential danger calls for policies that are aimed at reduction of transmission of instability from international markets.

2. The transformation from a pay-as-you-go pension system to a funded pension system, which was launched in Estonia in 2001, opens up new prospects for the securities market development. With the expected annual flows of hundreds of millions of Estonian kroons into pension funds already in the near future it clearly enhances (triggers) the demand for securities and can potentially serve as a catalyst for securities market development. Given the current state and structure of primary market as well as the predominantly small-scale nature of the corporate sector (i.e. lack of qualified potential corporate issuers) there is great concern that this increase in demand would not be adequately met by the domestic supply of new securities. As a result, larger outflow of domestically accumulated funds than desirable from the point of view of domestic economy would occur. The supply constraints could be eased by privatisation of major large-scale state-owned infrastructure enterprises (such as Estonian Energy) or by issuing Government (or its agencies') securities (bonds). Other ways to alleviate the problem could be assets securitisation and financial innovation in general in the domestic market.
3. In 2002 the new Securities Markets Act, which strengthened the investor protection, became effective and unified supervision over financial sector began operating. As a result of these major changes the Estonian securities market has "potentially" undergone remarkable improvements from the point of view of its credibility and consistency with internationally recognised general principles. We emphasise "potentially" since such evaluation is conditional that supervisory authority will also enforce the principles laid down in the regulations and prove its effectiveness. At least the preconditions for this have been established by regulatory and organisational changes, although the increasing international integration with foreign markets and its participants calls also for more extensive co-operation with international supervisory authorities.
4. Considering the adjustment processes that have already occurred in the regulatory framework, the EU membership would affect the development of Estonian securities market primarily via its impact on the real economy. The prospects opened up (or closed) for the Estonian corporate sector by the EU membership are definitely another critical (underlying) factor that determines the development of Estonian securities market. Considering this, it is highly important to adopt or negotiate policies that increase the competitiveness of the Estonian corporate sector.

### **Part Three by Ülo Ennuste: A LP Analysis of Economic Sector Institutional Structure**

1. Many changes take place in institutional structures of economic sectors in the transition and accession countries. Contrary to the popular policy beliefs that these changes of separate institutions are not significantly interconnected and should not be carefully synchronised, the more rigorous modelling analysis of this problem verifies the economic importance of considering and co-ordinating the compatibility

and complementarity aspects of changes in the institutional structures. Surprisingly little research has been done in this field. What distinguishes our work here is that we consider a planner who is implementing an optimal institutional structure in the economic sector, which will in its turn design an optimal market allocation situation.

2. The linear planning model synthesised in the project for institutional design analyses of the national economic sector should help to arrange and systematise the lines of reasoning in this field and help to quantify the mysterious interconnection effects of institutional arrangements. The model may be a useful complementary tool in the design analysis of national industrial institutional structures.
3. Decomposition analysis of this type of institutional macro-models combined with the modern implementation theory will help to deduce micro-economic “political agents market games” or normative considerations for national mechanisms and rules for social institutional design implementations.

The rules of these games demonstrate that for the implementation of social institutional choices it is necessary A) to introduce the informational side-payments systems for the designing agents to induce their truth-telling and B) for co-ordination of agents policy choices to introduce some kind of national institutional shadow price system.

4. We give some Estonian case model specification illustrations mainly to demonstrate the broad spectre of issues that may be involved in this analysis. The results of this paper also suggest that for the quantification of the institutional design data the inelegant engineering like data calibration methods may come as most convenient.
5. With the help of the model we are now in the position to pursue several further directions in this field. One direction is to explore the use of this model in the case studies as a simple planning tool. In this case the experts have to submit the perspective institutional input-output data to the social institutional planner and institutional side-payments for the truth-telling should be applied.

There are several other directions. On the basis of decomposition analysis of the model it is fairly easy to show a shadow-price and side-payment co-ordination mechanism and rules for the decentralised solution of the model by individual institutional design agents and its application in the national economy.

## **PART 1. Indicators of Economic Freedom and Economic Structure as Determinants of Growth and Convergence in Enlarging EU and Priorities for Estonia**

**Teet Rajasalu**

*Estonian Institute of Economics at Tallinn Technical University,  
7 Estonia Ave., Tallinn 10143, Estonia, fax: 372 6998851,  
e-mail: [rajasalu@hotmail.ee](mailto:rajasalu@hotmail.ee)*

---

### **Abstract**

Estonia and many other candidate countries will join the European Union with remarkably lower income levels. They will face a rather long-lasting catching-up process that is expected to be driven by convergence. The paper studies some more general indicators of institutional development as determinants of conditional beta-convergence in the European Union and candidate countries including some indicators of education and health, political rights and civil liberties. Indicators of economic freedom are studied more thoroughly. To reach better approximation of growth rates, panel estimates of economic freedom indicators are complemented with some structural indicators of economy. Estonia's prospects for catching-up and convergence with the European economies are assessed using most relevant institutional development and structural indicators.

*Journal of Economic Literature (JEL)* Classification numbers: C2, E6, F02, F15, O17, O52

*Keywords:* Candidate countries, convergence, cross-sectional data, economic growth, econometric analysis, European Union, institutional development.

### **Acknowledgements**

I would like to thank Professor Ülo Ennuste for comments and useful suggestions given in the elaboration process of this paper. The comments on the preliminary version of the paper made by Gary MacMahon and Sergey Slobodyan during August 2002 Prague meeting of GDN Program of CERGE-EI were of great help also. This research was supported by a grant from the CERGE-EI Foundation under a programme of the Global Development Network (Project No. 34, 2002). Additional funding from the Estonian Ministry of Education (project No. 0341765s01) and from the Estonian Science Foundation (Grant No. 4794) is also gratefully acknowledged. I still remain responsible for all possible mistakes and errors in the paper.

## 1.1. Introduction

Estonia's GDP per capita at purchasing power parity (PPP) is much lower than in the European Union member states. The fact makes catching up and real convergence with the EU income levels one of the most urgent tasks of Estonia's economic policy. According to the European Commission (2001, p. 19) estimations it will take 19 years before Estonia may reach 75% of the EU-15 GDP per capita level at purchasing power standards (PPS). Building of efficient and credible institutions is thought to be one of the factors that can accelerate catching up and pave the way to real beta-convergence. Institutional development in candidate countries is also to increase coherence in the integrating Europe and reduce idiosyncrasies in responses to European monetary and fiscal policies.

The current study tries to estimate contribution of some aggregate institutions to economic growth within the traditional conditional beta-convergence approach. Various indicators that are treated as proxies of institutional development are fitted into conditional convergence equations to find out which of them are topical in the EU enlargement context. We also try to assess Estonia's prospects considering institutional development indicators that prove to be best determinants of real convergence.

As there are many methodological differences in national statistical data we used information provided by international organisations assuming that necessary amendments to make national data comparable have already been made in these data. We also tried to concentrate on 15 European Union and 13 candidate countries to find out institutional determinants within this sample. Thus we neglected possible impacts of institutional developments that may be topical outside Europe or that cease to be of great importance after reaching some critical threshold level.

## 1.2. Institutional development in the EU convergence context

There are different views expressed about convergence of per capita incomes. Actual GDP per capita developments don't confirm the expectations about overall absolute beta-convergence. Additional difficulties are faced when convergence of the transition economies and European Union candidate countries is assessed.

It is rather broadly assumed that one reason why simple absolute beta-convergence tends to fail is related to the fact that development of institutions and their role in economic advancement as well as implications on the economic growth are often overlooked. North (1990, 1994) defined institutions as humanly *designed formal and informal rules of the game*. He showed how institutional development contributes to formation of effective markets. New Institutional Economists (NIE) criticised neo-classical economists for not paying enough attention to infrastructure and proper foundation of economics. Institutional development is a learning process in which shared individual beliefs form collective attitudes and turn into a kind of culture (in a very broad sense). In order to structure these collective attitudes and their interactions, human beings develop institutions. Economic implications of collective values and behavioural norms as well as public institutions are studied by many authors. For instance, Kaufmann, Kraay and Zoido-Lobato (1999, 2002) demonstrated direct impact of governance on incomes. Maximum productivity is related to an efficient co-



operative system of industrial relations by Leibenstein's (1966, 1978, 1987) and Altman's (1996, 2001) x-efficiency theory.

Discussing the growth regression compilation, Durlauf and Quah (1998) cited on approximately 100 indicators used by researchers in growth equations. Many of these indicators may also be interpreted as proxies of some indicators of institutional development - health, inequality, politics (including civil liberties, political rights, instability), price distortions, religion, rule of law, trade and trade policy (openness, import penetration, outward orientation), etc. However, it is not easy to select most appropriate conditioning variables from this amount to use them as determinants of economic growth. Large number of possible regressors and their inclusion into estimations by groupings makes it difficult to identify the robust or most significant ones and urges to implement rather complicated approaches (Doppelhoffer, Miller, Sala-i-Martin, 2000). It should be also borne in mind that many country-specific data specialities complicate simple cross-section estimations and insist on the need to make adjustments also in data included in international databases (De la Fuente, Donénech, 2000).

Besides the studies that related economic growth to initial level of income there are also studies that augment traditional production functions with some indicators of institutional development. Human capital that is often included in production functions (for instance, the afore-mentioned study by De la Fuente, Donénech) can be treated as an indicator of institutional development as well. A similar approach to human capital is often used in modelling implications of the 'New Economy' (Pohjola, 2002). In a broad sense, human capital may consider implications of education and culture, better legislation, quality of governance, well structured and efficiently performing procedures for interaction between businesses, state and individuals, etc.

Rodrik, Subramanian and Trebbi (2002) proved that institutions are really important from global aspect. However, it should not be forgotten that in global context many other factors can affect economy through institutions (Easterly and Levine, 2002) and often institutions are to smooth impacts of adverse shocks. The broader the geographical scope of the study is and the greater the differences between the countries included in the study are, the more growth seems to depend on institutions.

Although the world-wide impact of institutions on long-term economic development seems to be confirmed by many outstanding economists it is still not very obvious whether these findings are valid for candidate countries' relatively short-term and rapid institutional and economic development. Therefore, it is worth checking whether the afore-mentioned expectations of conditional convergence and contribution of institutional changes on economic development hold within a smaller and more homogenous sample of states that includes EU member states and candidate countries during a time-span of about ten years. As many candidate countries are supposed to join EU soon, the processes in the European Union specific framework are of our primary interest instead of world-wide developments or in a rather broad transition context. At the same time, European Union has been one of the 'convergence clubs' where real convergence has taken place although the process has been uneven in recent years (Rajasalu, 2001). Nevertheless, convergence in the EU offers some hopes for catching-up to new member states with much lower income levels.

If empirical data confirm real convergence within this period then we will try to assess Estonia's performance within the process and compare actual developments with convergence potential derived from the EU and candidate countries empirics.

Targeting of our research at institutional development in the EU and candidate countries insists that some specific aspects are to be considered. Institutional changes tend to be rather slow in general (changes in governance may be one rare exception, perhaps). It takes quite a long time before implications caused by rather slow changes in education, culture, social networks, health, etc can be detected in real economy. Therefore, long time series have to be used to achieve more or less relevant results.

However, in the case of transition economies and EU candidate countries the need for long time series makes this rather complicated. The transition processes of EU candidate countries have lasted about 10 years only; the harmonisation process with the EU economies after applying for the EU membership is even shorter. There are no long enough time series available and, even if available; these may include information that is irrelevant in the EU accession context. The developments before the 1990s were too fuzzy to draw clear-cut conclusions; information from this period often needs critical revision and processes of this period can hardly be extrapolated on the after-accession period.

Even within this time, starting from the 1990s, distinction between two sub-periods can be made. The content of the first sub-period was the shift from planned to market economy in many CEE countries. Problems of privatisation, economic liberalisation, reduction of government intervention or participation in economic activities were of major importance in the first half of the 1990s. This was also a period of rather radical institutional reforms. However, in this period transition countries tolerated also more or less serious recessions related to transition shocks. The second sub-period (second half of the 1990s) was characterised by harmonisation with the *acquis communautaire*; building up of institutions based on shared values and approved behavioural norms. The data on economic growth in this second sub-period should reveal also the results of the reforms carried out during the first sub-period. Thus, we will have to draw conclusions on a broad set of issues based on growth data within a rather short time period. Moreover, even this period was affected by external shocks caused by Asian crisis in 1997 and Russian default in 1998.

### **1.3. Impact of education, health, political and civil rights and economic freedom on economic growth in EU and candidate countries**

To quantify implications of institutional development as well as changes in political rights and changes in economic freedom on economic development we run 4 series on statistical estimations. First, we looked the impact of education and quality of life on the level human development and economic growth worldwide and in the European Union and candidate countries. Second, we tried to evaluate political rights and civil liberties as determinants of economic growth in EU and candidate countries. Third, we studied economic freedom indices and sub-indices as economic growth determinants. Fourth, we complemented economic freedom indicators with some structural indicators to assess also implications of technological advance and investment intensity on growth. To follow the traditions of conditional beta convergence we tried to insert initial levels into regressions as well. It enabled to estimate whether we can expect beta convergence of income levels.

### 1.3.1. Education and life expectancy as very weak worldwide determinants of economic growth

Many studies attribute economic growth to the level of education or human capital that is measured with educational level of the labour force or population. However, information used in these studies, time periods covered or sample of countries included make it difficult to implement reached findings in evaluation of Estonia's prospects as we link Estonia's further development to enlarging EU.

For instance, impact of knowledge and human capital on growth in OECD countries is thoroughly studied by Bassanini, Scarpetta and others (Bassanini, Scarpetta, Visco 2000; Bassanini, Scarpetta 2001; Bassanini, Scarpetta, Hemmings 2001; Bassanini, Scarpetta 2002). But we don't know to what extent the findings are appropriate for the EU environment or whether these conclusions can be expanded to the Baltic States or Estonia. The problem is complicated by the fact that even in the case of OECD there are problems in data quality. There may be many compatibility problems in nominal data about the education in EU candidate countries.

There are also studies on implications of education and human capital on economic growth in transition economies. Some of them address also possible income convergence with the EU levels in CEE countries. However, these studies often neglect the Baltic States and sometimes the data used go back to the years before radical political and structural reforms. One may doubt whether conclusions drawn from these data are applicable within the EU context after EU eastern enlargement.

For instance, Barbone and Zalduendo (1996) studied income convergence problems in 5 CEE countries (Czech Republic, Hungary, Poland, Slovakia, Slovenia) using Penn World Tables Mark 5.6 data for 1965-1989. They found that quality of human capital is essential for economic growth but it must be accompanied by appropriate policy, regulatory and legal framework. Monetary and fiscal policies, rule of law as well as openness to trade were also found to be key determinants of economic growth. However, one may suspect that radical policy reforms, harmonisation with the *acquis communautaire* and expected accession to the EU may have changed and will change the economic environment in CEE countries so that the factors which determined rather fuzzy pre-transition growth (within CMEA) until 1989 may not be appropriate today and in the near future within EU framework.

It is rather broadly expected within the New Growth Theory that human capital is very important for growth. As many transition economies inherited from the pre-transition period high (nominal) human capital relative to GDP per capita, they are expected to have good prospects for economic growth. However, Spagat (2002) found that human capital of transition economies might also deteriorate. Educational standards and traditions take long time to build up but may be lost relatively quickly. Due to the 'poverty trap' human capital may decline to meet low living standards. He points out two parallel processes – those transition economies which are doing well and will join EU soon, can preserve and enhance their human capital potential and it will promote economic growth. However, for some transition countries and perhaps even in some regions of otherwise successful countries public spending on education or financial resources of parents may be insufficient, enrolments' decline and human capital deterioration seems very real. It draws our attention to the fact that the processes in the EU candidate countries may differ from those in less successful transition economies.

To start with the simplest cross-country evaluation of education as determinant of economic growth we first looked data that are brought by UNDP in Human Development Report (HDR 2001). We took education indices (abbreviation *EDU\_IND*) and combined primary, secondary and tertiary gross enrolment ratios (in %, *ENROLM*) as proxies for education as well as life expectancy indices (*LIFE\_IND*) and life expectancies at birth (in years, *LIFE\_EXP*) as proxies for the health of nations. We defined *GROWTH* as index of per capita GDP at PPP in 1999 compared to 1993 level. We also tried to include 1993 GDP per capita at PPP as the initial level (*LEVEL93*) into traditional conditional convergence equation.

Correlation matrices brought in Tables 1 and 2 show that education and life expectancy indicators are better correlated with levels of GDP per capita than GDP growth rates. Positive correlation between education and life expectancy indicators is slightly higher in the European Union member states and candidate countries (sample of 28 countries) than in the world-wide sample of 154 countries. Against the beta-convergence hypothesis, there was a weak positive correlation of growth rates of GDP per capita in 1993.

**Table 1. Correlation matrix for 154 countries**

	<i>GROWTH</i>	<i>LEVEL93</i>	<i>EDU_IND</i>	<i>ENROLM</i>	<i>LIFE_IND</i>	<i>LIFE_EXP</i>
<i>GROWTH</i>	1.000000					
<i>LEVEL93</i>	0.028174	1.000000				
<i>EDU_IND</i>	0.097410	0.626839	1.000000			
<i>ENROLM</i>	0.119698	0.668463	0.913289	1.000000		
<i>LIFE_IND</i>	0.054654	0.685778	0.790962	0.753296	1.000000	
<i>LIFE_EXP</i>	0.054656	0.685902	0.791006	0.753539	0.999891	1.000000

**Table 2. Correlation matrix for EU15 and CC13**

	<i>GROWTH</i>	<i>LEVEL93</i>	<i>EDU_IND</i>	<i>ENROLM</i>	<i>LIFE_IND</i>	<i>LIFE_EXP</i>
<i>GROWTH</i>	1.000000					
<i>LEVEL93</i>	0.089502	1.000000				
<i>EDU_IND</i>	0.127943	0.517711	1.000000			
<i>ENROLM</i>	0.064437	0.537096	0.901221	1.000000		
<i>LIFE_IND</i>	0.125441	0.825981	0.539582	0.571923	1.000000	
<i>LIFE_EXP</i>	0.118208	0.828122	0.538597	0.575739	0.998813	1.000000

The best cross-country regression for world-wide data (sample of 154 countries, with values of t-statistic in parenthesis) was

$$GROWTH = 1.0597 - 0.0041*LEVEL93 + 0.0026*ENROLM. \quad (1)$$

(11.91) (0.865) (1.683)

However, the regression gave as low adjusted  $R^2$  value as 0.006 only. The initial level of GDP in 1993 entered into regression with the theoretically correct sign but remained statistically insignificant. The combined level of primary, secondary and tertiary enrolment occurred to be significant with 90% level only while the GDP per capita growth in 1993-1996 was strongly determined by the intercept. Health indicators did not enter into regression. Only slightly better (with adjusted  $R^2$  value of 0.02) was regression of logarithms of growth rates on logarithms of enrolment.

For the European Union member states and candidate countries it was impossible to quantify any regression with positive adjusted  $R^2$  value with these indicators.

Thus, although the education and life expectancy sub-indices together with the GDP per capita index work perfectly in the formation of general Human Development Index and also can quite well predict GDP per capita level at PPP in 1999, these indicators failed to explain economic growth. Our failure in this estimation should not be a surprise if to consider A. de la Fuente and R. Donénech (2000) who showed that even in OECD countries human capital stock may be measured with errors and data deficiencies may be partially responsible for poor empirical performance of human capital in growth equations. Only after thorough revision of national education data they reached theoretically plausible results that survived robustness check. In our case it should be born in mind also that the enrolment indicator might be misleading for smaller countries as many students continue their tertiary education abroad<sup>1</sup>. Enrolment ratio as well as length of schooling may not describe content of the education. There may also be mismatches in the quality and professional structures in labour demand and supply etc.

Our very simple exercise with HDI data revealed that general education and life expectancy indices could hardly be treated as determinants of economic growth or convergence. Even if there is some very weak positive correlation in world-wide data, the indicators fail to explain growth rate differences within the enlarging EU.

### *1.3.2. Political rights and civil liberties as growth regressors*

Besides education and cultural level of population, which may describe potential of a nation in the process of economic development it is important to consider political rights and civil liberties that express opportunities to use this potential. Many studies link various freedom indicators to economic growth. Political rights and civil liberties were included into cross-country growth and convergence regressions for instance by Barro and Lee (1994), by Sala-i-Martin (1997) and de Melo *et al.* (1997).

Studying the role of institutions in transition (their sample included CEEC countries and descendants of the former Soviet Union) Havrylyshyn and van Roden (2000) suggested distinguishing two categories of institutions that are separately measurable and may have separate effects on economic performance:

- Political and civic freedom, which includes democratic process, freedom of assembly and speech, equal treatment of political and judicial bodies etc;
- Legal framework for economic activity that includes legislation for free economic activity, contract law, rule of law and transparency, security of property rights etc.

Here we used Freedom House indicators (FH 2001) of political rights and civil liberties as the first category of institutions that concern more general values. We also restricted our sample to the enlarging EU that included 15 member states and 13 candidate countries. Although the information in Freedom House database goes back to 1972, data about some candidate countries is available since the beginning of 1990s only. To have our sample less biased and not too dominated by the information available about EU member states only we used in our study the information since

---

<sup>1</sup> Therefore the enrolment ratio for Luxembourg was as low as 72%, for instance. Simultaneously, the enrolment ratios for countries that teach many foreign students may be a little higher. However, within the economic growth context well-known universities with lots of foreign students are also centres of intellectual potential that promote development.

1980. In FH country ratings the indices between 1 and 2.5 are given to countries that are considered to be “free”; indices between 3 and 5.5 indicate “partly free” countries, while indices between 5.5 and 7 describe countries that are “not free”. Those indices were interpreted as proxies for institutional development – the smaller the value of index and the more freedom a country enjoys, the more developed its institutions should be.

The GDP annual growth indices (acronym *GROW*) as well as GDP per capita levels at PPP (in thousand current US dollars, acronym *GDP* followed by two digit year number) were taken from the World Bank database using data query and also from the World Bank NHP (Nutrition, Health, and Population) database. For filling in some missing observations we used also data from Eurostat, OECD, UN and other statistical sources.

We started with a simple estimation of cross-section regression that included GDP annual growth indices (as dependent variables), GDP per capita at PPP in 1992 (the first year with data that covered all selected countries)<sup>2</sup> and indices of political rights and civil liberties as conditioning independent variables of countries. The data were organised as a panel of 1980-2001 data pooled across 28 countries (15 EU member states and 13 candidate countries). As for many candidate countries (and for re-united Germany) the time series were shorter we used an unbalanced sample in our estimations.

The panel data estimation with common coefficients and intercept produced the following result (t-Statistics in parenthesis):

$$GROW = 1.0575 - 0.000986 * GDP92 - 0.00876 * POLI(-4), \quad (2)$$

$$(160.04) \quad (-2.896) \quad (-6.938)$$

where *GROW* is annual growth index, *GDP92* is the value of GDP per capita in thousands of PPP adjusted USD and *POLI(-4)* is index of political rights<sup>3</sup> for the country four years earlier. Civil rights indicators were less important (with all tested leads), and so were political rights indicators with other leads. Thus, the maximum impact of changes in political rights on economic growth occurs after 4 years being less significant earlier and later.

However, although the coefficients for GDP per capita level and political rights had correct signs in conditional beta convergence context (the higher the GDP per capita and the less political rights the country enjoys, the lower the annual GDP growth index is) and were statistically significant, the adjusted  $R^2$  value remained as low as 0.106 only. Due to this regression, the growth rate is mainly determined by intercept while differences in income levels and political rights make only minor corrections to it. As time series were short (especially for candidate countries), the panel regression result was driven mainly by cross-country differences and possible non-stationarity of time series was of minor importance.

We also checked the regression for a shorter period (1992-2001) to be sure that equation (2) is not too dominated by longer time series of EU member states (or states

---

<sup>2</sup> Thus, since earlier data were not available we used the level in the middle of the period instead of the traditional initial income level.

<sup>3</sup> The smaller the value of political rights indicator is, the more political rights the country enjoys, thus decline of index from 7 (“not free”) towards 1 (“free”) contributes to the growth rate.

that were not yet EU members then). This check gave almost the same results as equation (2) although with a little lower adjusted  $R^2$  value (0.085).

While trying to estimate the same function with country-specific coefficients for political rights indices, these coefficients turned statistically insignificant or obtained a “wrong” sign. Only for Bulgaria, Czech Republic, Hungary, Ireland and Romania the regression remained statistically significant while for other countries in the sample the coefficient for political rights remained statistically insignificant.

Considering the fact that political and civil rights indices were equal and constant for almost all EU member states it was quite expectable that their growth differentials have to be determined by other factors. Thus, the member states participated in the panel estimation mainly in the form of cross-country regression while there were almost no political rights’ or civil liberties’ changes.

Thus, although the equation (2) gives some explanation to growth rate differences in enlarging EU in general, one must be careful in drawing any conclusions on separate countries. As the country-specific estimation failed for Estonia, the regression does not confirm that Estonia’s very high political and civil rights’ indices were reliable determinants of further economic growth and convergence to the EU.

### *1.3.3. Impact of economic freedom on growth*

As broad indicators of institutional development did not provide a good explanation of differences in economic growth, we turned to indicators that are more closely linked to economic activity and can be treated as the second category of economy-related institutions in the afore-mentioned distinction made by Havrylyshyn and van Roden (2000). Many aspects of economic freedom have found to be significant determinants of economic growth (usually in broader samples of countries). For instance, property rights as determinants of economic growth were discussed by Knack and Keefer (1995), Voigt and Engerer (2002). Kaufmann, Kraay and Lobatón (1999, 2002) studied the role of governance. Murrell (1992, 1996) studied sequencing of liberalisation and institutional development for the transition process. Piazzolo (1999) found that economic growth in 25 transition economies was positively correlated with the advancement of institutional change (assessed by EBRD in nine different areas) and with increase in the capital stock in transition economies. There are also many studies of corruption, rule of law etc.

The indices of economic freedom (and their sub-indices) published by the Heritage Foundation (2000) may serve as proxies for institutions concerning economic freedom. At least by definition these indices and sub-indices describe development of important institutional issues. We assumed that an index of economic freedom represents to a certain degree development of responsible institutions in a country. The index of economic freedom is published in the beginning of a year based on the information available before July in the previous year, thus the index for 2002 is based on developments from July 2000 to the end of June 2001. Thus, available indices from 1995 to 2002 actually describe how countries scored in 1994-2001. The list of 50 independent variables is divided into 10 broad factors (or sub-indices) of economic freedom. The higher the score of a factor, the greater the level of government interference in the economy and the less economic freedom a country enjoys (index 1 describes the freest economies while a score of 5 signifies a set of institutions and policies that are least conducive to growth). The sub-indexes include:

- Fiscal burden of government (measured by tax rates, government expenditures, methods of financing expenditures, etc. to capture the true cost of government to

- society) – acronym *FISC* followed in country-specific estimates by a country acronym (for instance, *FISCAUS* denotes a set of fiscal burden indices for Austria in 1994-2001, *FISCUK* the same indices for United Kingdom etc);
- Trade policy (measured by such impediments to trade as tariffs and duties, quotas, licensing requirements, corruption within customs service etc.) – acronym *TRAD*;
  - Government intervention in the economy (government consumption as a percentage of economy, government ownership of businesses and industries, economic output produced by the government etc) - acronym *GOVE*;
  - Monetary policy (the main criterion is inflation that confiscates wealth and distorts pricing, misallocates resources and undermines a free society) - acronym *MONE*;
  - Capital flows and foreign investment (restrictions on foreign investment and inflow of foreign capital in foreign investment code, restrictions on foreign ownership, unequal treatment of foreign and domestic investors, restrictions on repatriation of earnings etc.) – acronym *FORE*;
  - Banking and finance (evaluated through government ownership in banks and government influence over allocation of credit, restrictions to foreign banks, restrictions to offer financial services like transactions with securities and insurance activities) – acronym *BANK*;
  - Wages and prices (extent of government wage and price controls that distort allocation of resources to their highest use or market value, government subsidies to businesses) – acronym *WAGE*;
  - Property rights (legally granted and protected private property, commercial code defining contracts, government expropriation of property, government influence on judicial system, delays in receiving judicial decisions, corruption within judiciary) – acronym *PROP*;
  - Regulation (licensing requirements to run businesses, ease of obtaining licenses, environmental and labour regulations including paid vacations and parental leave, corruption and uniform appliance of regulations) – acronym *REGU*;
  - Black market (as a reaction to government intervention and restrictions but also as smuggling, piracy of intellectual property, production of goods and services for black market) – acronym *BLAC*.

The economic freedom in a country in general is assessed by overall index (acronym *OVER*). Four broad categories are distinguished on the basis of overall index: countries with score under 1.95 – free, with score between 2 to 2.95 – mostly free, with score between 3 and 3.95 – mostly unfree and countries with score of 4 or higher – repressed.

In order to quantify possible implications of economic freedom for growth in EU member states and candidate countries we first estimated regression between growth, overall index of economic freedom and initial income level. Panel estimation of cross-country data for the period 1994-2001 gave the result:

$$GROW = 1.0918 - 0.0009802 * GDP93 - 0.01823 * OVER \quad (3)$$

$$(55.33) \quad (-2.1531) \quad (-3.1212)$$

where *GDP93* was the value of GDP per capita in thousands of PPP adjusted USD in 1993 as indicator of initial income levels and *OVER* was overall index of economic freedom. Initial income level and overall index of economic freedom had theoretically



“correct” signs (higher initial income level and less free or more repressed economy tended to reduce growth rates) and were statistically significant. Negative dependence on initial income level insists that convergence can be expected in the long run. However, adjusted  $R^2$  of this estimation was as low as 0.035.

Estimation of the regression with all 10 sub-indices revealed (Appendix 1.1) that only three of them were statistically significant (and had correct sign). Thus, after stepwise exclusion of insignificant indicators we reached an equation:

$$\begin{aligned}
 GROW = & 1.13598 + 0.006019*BANK - 0.016402*FISC - 0.0100816*FORE - \\
 & (64.34) \quad (2.0224) \quad (-4.2657) \quad (-2.5232) \\
 & -0.00261486*MONE - 0.0075387*REGU \quad (4) \\
 & (-2.0416) \quad (-2.0295)
 \end{aligned}$$

However, indices on banking and finance that considered government ownership in banks, government influence over allocation of credit and restrictions to activities of foreign banks occurred to be positively correlated to growth. The coefficient for *BANK* indices has a clearly unacceptable ‘wrong’ sign that does not comply with theory based expectations. Adjusted  $R^2$  value of this regression reached 0.142.

After exclusion of *BANK* variable, the *REGU* variable that considered licensing requirements, environmental and labour regulations, was insignificant as well. Thus, the final regression equation with economic freedom sub-indices was:

$$\begin{aligned}
 GROW = & 1.1354 - 0.018709*FISC - 0.0081808*FORE - 0.0027814*MONE \quad (5) \\
 & (63.83) \quad (-5.185) \quad (-2.1639) \quad (-2.3479)
 \end{aligned}$$

Regression (5) gives a little higher adjusted  $R^2$  value (0.127) than equation (3), however, initial income levels failed to enter as statistically significant determinants of growth. Thus, the combination of sub-indices explains growth rates but does not confirm convergence towards the steady state growth rates.

From economic freedom sub-indices the contribution of fiscal burden is the highest. Improvement of fiscal sub-index by 1 unit (from 3 to 2, for instance) results in a 1.87 percentage point higher annual growth rate. Equal improvements of sub-indices that described regulations of foreign capital movement or monetary policy yielded smaller growth accelerations. If a country reaches the highest possible ratings for the afore-mentioned sub-indices (all of them equal to 1) then based on equation (5) about 10.7 per cent annual growth rate can be expected. The indices usually shared by many EU member states are *FISC* – 4.5, *FORE* – 2; *MONE* – 1, which predict 3.2% annual GDP growth (actual growth in EU15 was 3.4% in 2000 and 1.5% in 2001). Estonia’s corresponding indices in 2001 (3.5; 1 and 2) predict 5.6% growth rate (instead of actual 7.1% in 2000 and 5.0% in 2001).

Nevertheless, the afore-mentioned sub-indices of economic freedom should not be treated as strong determinants of growth as the value of adjusted  $R^2$  was still quite low. Many sub-indices of economic freedom which in economic context should be of great importance (impact of black market, overregulated labour market with wage rigidities, trade policies etc) did not enter into growth regression. It does not mean that these institutional indicators are not important at all. The indicators that entered into regression equations were simply more significant. With some loss in prediction power these may be replaced by other indicators.

#### 1.3.4. Augmented regression with some real economy indicators

Next we tried to insert into regression some indicators of the real economy that may complement institutional or other determinants of economic growth and give some additional, more detailed information. Thus, besides sub-index *TRAD* that was related to restrictions in trade we tried to insert into regressions actual ratios of exports of goods and services to GDP (acronym *EKSP*). We also included actual inflation rate (measured as GDP deflator, acronym *INFL*) to detail *MONE* sub-index that also concerned inflation. Besides the *FORE* sub-index that concerned regulations on foreign capital movement we tried to insert actual net inflow of direct investment as ratio to GDP (acronym *FDI*) and actual gross capital formation as ratio to GDP (acronym *CAP*). In order to consider also impact of the ‘New Economy’ and ICT penetration we added the share of high-technology exports (as per cent of manufactured exports, acronym *HIGH*), number of personal computers per 100 inhabitants (*PC*), also number of internet users per 100 persons, (*INT*) and number of telephone lines and mobile phone subscribers per 100 population (acronym *PHON*). These data were retrieved from the World Bank, UNO and ITU databases.

Initially we made panel estimation with all sub-indices of economic freedom and all additional structural and ICT indicators. The panel estimation results (Appendix 1.2) included many statistically insignificant variables and also some significant variables with a ‘wrong’ sign.

The best approximation of economic growth reached after exclusion of insignificant and ‘wrongly’ performing variables is depicted in equation (6) and Appendix 1.3.

$$\begin{aligned}
 GROW = & 1.1136 - 0.0156*OVER - 0.0186*FISC + 0.00173*CAP - 0.00715*INFL + \\
 & (37.27) \quad (-2.756) \quad (-4.090) \quad (3.292) \quad (-2.484) \\
 & + 0.00040*HIGH \quad (2.449)
 \end{aligned} \tag{6}$$

This panel estimation gave the adjusted  $R^2$  value of 0.37 and approximates growth rates clearly better than equation (5), which included only economic freedom indicators.

Equation (6) reveals that most important determinants of annual growth indices within the sample of 28 EU member states and candidate countries are overall economic freedom indices, fiscal burden sub-indices, cross capital formation ratio in GDP (in per cent), inflation (measured as GDP deflator index) and share of high technology exports in manufactured exports (in per cent). Initial income level failed to be statistically significant in explaining growth rates. Thus, the regression gives more or less satisfactory approximation of growth rate differences but does not confirm long run convergence (faster growth or catching-up of initially low-income economies).

This very simple augmentation of economic freedom data with some structural indicators showed that within the sample of European Union member states and candidate countries institutional indicators alone (or together with initial income levels) do not predict growth rates of economies well enough. Institutional development indicators seem to describe rather preconditions of economic development than perform as determinants of exact economic growth. Inclusion of some structural indicators together with institutional indicators into regressions can remarkably improve the quality of economic growth predictions.

Nevertheless, a comment is to be added here. Equation (6) concerns the whole sample of 28 countries. For individual countries the best selections of growth

determinants may be different. For instance, the same panel estimation with country-specific estimates of intercepts raised the adjusted  $R^2$  value to 0.58 but made all other variables besides *CAP* statistically insignificant. It means that only fine-tuning of intercepts for each country leads to a different set of statistically significant independent variables. However, our purpose here was just to identify most important determinants for the enlarging EU and not for individual countries. If for some candidate countries the set of most important growth determinants has been different until now, it does not mean that this country-specific set will be that important after accession into EU. On the other hand, the European Union itself will also be a little different after enlargement and the determinants that guided development of relatively well-doing countries may lose some of their importance for some time. Therefore we found it essential to evaluate these possible growth determinants for the whole sample.

Although the discussed indicators failed to be strong and exhaustive determinants of economic growth within the EU framework, these can still explain approximately one-third of the economic growth variances. Evaluation of Estonia's prospects in the light of indicators that proved to be most important for the enlarging EU in general confirms positive expectations of the future.

First, the Heritage Foundation ranked Estonia among the freest countries in the world. By overall index of economic freedom Estonia occupied the fourth place in 2002 (with overall index score 1.8) and the sixth place in 2003 with the same score<sup>4</sup>. Thus, by overall index Estonia is ahead of other European Union candidate countries and many current member states (just behind Luxembourg, Ireland and Denmark).

Second, by fiscal burden Estonia scored in 2002 with the index 3.5 on the same level with Ireland, Cyprus, Latvia and Lithuania and ahead of other EU member states and candidate countries. For 2003, Estonia's scoring remained the same and was shared with Lithuania and Cyprus while Ireland moved ahead to 3.0 and Latvia fell to 4.0. Nevertheless, Estonia's position among EU member states and candidate countries is rather promising. It should be also mentioned that lower fiscal burden is often shared by economies that otherwise tend to be under-regulated, have remarkable shares of black market and do not occupy high positions by overall index. Opportunities for radical reduction of fiscal burden index within the EU environment are scanty.

Third, the share of gross capital formation in Estonia's GDP was rather high also. The average for 1994-2001 reached 27.7%, being still higher in Slovak Republic, Czech Republic and Hungary. Capital formation ratios in EU member states tended to be lower.

Fourth, although the inflation rate was very high initially it has declined remarkably in recent years. Estonia had right after Lithuania, Latvia and Malta the fourth lowest harmonised consumer price index among candidate countries in 2000. Price dynamics will be further kept under control also by aspiration to join the ERM 2 mechanism right after accession and the need to comply with the price stability requirements in Maastricht criteria.

Fifth, the average share of high-technology exports in total manufacturing exports (14.5%) during 1996-2000 placed Estonia ahead of many candidate countries and some EU member states. Although in 2000 Estonia scored the fifth place in our 28-country sample with 29.8%, it still remained quite far from 72% in Malta, 47% in Ireland, 35%

---

<sup>4</sup> Here we used years as published by The Heritage Foundation. As it was mentioned before, evaluations are based on the data of the previous year, thus the index for 2003 actually describes the situation from July 2001 to June 2002.

in Netherlands and 32% in the United Kingdom. However, it is appropriate to mention that volatile volumes of subcontracting to Nordic countries raised the share of high technology exports to exclusively high level in 2000 and it may be difficult to maintain this level in the circumstances of worldwide ICT sector recession.

Nevertheless, these five most significant economic growth determinants insist that Estonia's prospects may be rather good. If to fit recent available Estonian data into the equation (6), then it results in more than 7% annual growth rates. It proves that the growth rates reached in recent years (7.1% in 2000, 5.0 in 2001 and 5.7% during three quarters of 2002) are close to what might have been expected. However, one must not forget that the afore-mentioned factors explained only one-third of the economic growth variances in EU and candidate countries. Growth rates depend on many other factors as well.

#### **1.4. Conclusions**

There are many studies about beta convergence of cross-country incomes. Nevertheless, empirical data do not confirm the general convergence hypothesis and income divergences seem to prevail instead of catching-up. There are ideas that growth theories may fail due to the fact that the role of institutions and institutional development is often overlooked. Numerous studies relate economic growth to institutional development; however, these studies are based on worldwide cross-country samples and often cover rather long time series. One cannot deduct from these studies that institutions and variances in their development play the same role within the smaller sample of European Union member states and candidate countries. The problem is aggravated by the fact that for many candidate countries the data before 1990s belong to rather different "pre-transition" era and as many of them will be accessed to the EU soon, then these "pre-transition" findings can hardly guide their further development within the EU.

In this study we tried to find out whether there are easily accessible institutional indicators available that may serve as determinants of economic growth and convergence within the enlarging EU. If such indicators had been available, we would have tried to assess Estonia's prospects considering these indicators.

We failed to prove the impact of education (measured by combined primary, secondary and tertiary enrolment or education index in the Human Development Report) on growth rates in EU member states and candidate countries. The problem may be also too aggregate information on education that fails to reveal structural differences in education, or its quality and compliance of nominal education levels with demand of labour market. Official statistics on education can be misleading in measuring actual knowledge of population.

We found a very weak impact of political rights and initial income levels on growth rates. Although these indicators can explain only about 10% of the growth rate variances, these findings confirmed that if no other determinants are considered, Estonia may expect relatively high growth rates (as initial income level was low and the highest level of political rights is shared with most of the European economies). As initial income level is counter productively related to growth, then it supports expectations about beta convergence and catching-up.

Overall index of economic freedom along with initial income levels proved to be rather weak determinants of growth rates also. Sub-indices of fiscal burden, foreign

capital inflow restrictions and monetary restrictions explained growth rates a little better. However, a combination of these sub-indices outperformed influence of initial income level differentials and thus does not confirm convergence or catching-up.

Our final test revealed that the growth rate differentials in the EU and candidate countries might be much better approximated if economic freedom indices were complemented by some real economy indicators. For instance, regression of growth rates on overall economic freedom and fiscal burden indices with gross capital formation ratios, inflation and shares of high technology exports in total manufacturing exports gave remarkably better results.

A simple exercise with available data on institutional development revealed that although institutions provide necessary environment for economic transactions, institutional development indicators alone could not predict growth rate differentials well enough. A reason for this finding may be that we discussed institutions in a too aggregate way. Although there are quite large growth rate differences between the EU member states, they often share similar level of institutional development. It may be also that the contribution of institutional development is more important worldwide and ceased to have great impact on growth after passing a certain threshold level or after becoming similar in the result of harmonisation process. Developed institutional framework may also support stability of growth and reduce risks or implications of adverse shocks. Nevertheless, it seems that institutional development provides preconditions for economic growth but the actual growth rates depend on many other factors as well. It confirms once again the conclusion reached by Havrylyshyn and van Roden (2000) that institutions matter (in transition) but so do policies.

## References

- Ahn, S., Hemmings, P. 2000. Policy Influences on Economic Growth in OECD Countries: An Evaluation of the Evidence, *OECD Economics Department Working Paper* No. 246.
- Altman, M. 1996. Human Agency and Material Welfare: Revisions in Microeconomics and their Implications for Public Policy. Kluwer, Boston, Dordrecht and London.
- Altman, M. 2001. Culture, Human Agency, and Economic Theory: Culture as a Determinant of a Material Welfare. - *Journal of Socio-Economics*, 30 (2001), 379-391.
- Barbone, L., Zalduendo, J. 1996. EU Accession and Economic Growth. The Challenge for Central and Eastern European Countries. *The World Bank. Policy Research Working Paper* No. 1721.
- Barro, R.J., Lee, J-W. 1994. Sources of Economic growth. *Carnegie-Rochester Conference Series on Public Policy*, 40, 1-57.
- Bassanini, A., Scarpetta, S. 2001. Does Human Capital Matter for Growth in OECD Countries? Evidence from Pooled Mean-group Estimates. *OECD. Economics Department Working Paper* No. 282.
- Bassanini, A., Scarpetta, S. 2002. Does Human Capital Matter for Growth in OECD Countries? - *Economics Letters*, 74 (2002), 399-405.
- Bassanini, A., Scarpetta, S., Hemmings, P. 2001. Economic Growth: The Role of Policies and Institutions. Panel Data Evidence from OECD Countries, *OECD. Economics Department Working Paper*, No. 283.

- Bassanini, A., Scarpetta, S., Visco, I. 2000. Knowledge, Technology and Economic Growth: Recent Evidence from OECD Countries. OECD. *Economics Department Working Paper* No. 259.
- Dani Rodrik, D., Arvind Subramanian, A., Francesco Trebbi, F. 2002. Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development. *NBER Working Paper* No. 9305.
- De La Fuente, A. and Donénech, R. 2000. Human Capital in Growth Regressions: How Much Difference Does Data Quality Make? *OECD Economics Department Working Paper*, No. 262.
- De Melo, M., Denizer, C., Gelb, A. 1997. From Plan to Market: Patterns of Transition. In: *Macroeconomic Stabilization in Transition Economies*, Eds. M. Blejer, M. Skreb. Cambridge University Press, Cambridge, 17-22.
- Doppelhofer, G., Miller, R. I. and Sala-i-Martin, X. 2000. Determinants of Long-term Growth: A Bayesian Averaging of Classical Estimates (BASE) Approach. *OECD Economics Department Working Paper* No. 266.
- Durlauf, S. N. and Quah, D. T. 1998. The New Empirics of Economic Growth. *NBER Working Paper* No. 6422.
- Easterly, W., Levine, R. 2002. Tropics, Germs, and Crops: How Endowments Influence Economic Development. *NBER Working Paper* No. 9106.
- European Commission, 2001. Real Convergence in Candidate Countries – Past Performance and Scenarios in the Pre-Accession Economic Programmes, ECFIN/708/01-EN.
- Freedom in the World Country Ratings 1972-73 to 2000-01. Freedom House. <http://www.freedomhouse.org/research/freeworld/FHSCORES.xls>
- Havrylyshyn, O. and Rooden, R. 2000 Institutions Matter in Transition, but so do Policies. *IMF Working Paper* WP/00/70.
- Human Development Report, HDR 2001. <http://www.undp.org/hdr2001/>
- Kaufmann, D., Kraay, A., Zoido-Lobaton, P. 1999. Governance Matters. *The World Bank Policy Research Working Paper* No. 2196.
- Kaufmann, D., Kraay, A., Zoido-Lobaton, P. 2002. Governance Matters II. Updated Indicators for 2000/01. *The World Bank Policy Research Working Paper* No. 2772.
- Knack, S., Keefer, P 1995. Institutions and Economic Performance: Cross-country Tests Using Alternative Institutional Measures. - *Economics and Politics*, Vol. 7, No. 3, 207-228.
- Leibenstein, H. 1966. Allocative Efficiency vs. 'X-efficiency'. - *American Economic Review*. 56, 392-415.
- Leibenstein, H. 1978. X-efficiency Exists: a Reply to an Exorcist. - *American Economic Review*, 68, 203-211.
- Leibenstein, H. 1987. *Inside the Firm: the Inefficiencies of Hierarchy*. Harvard University Press, Cambridge, MA and London, England.
- Murrell, P. 1992. Evolution in Economies and in the Economic Reform of the Centrally Planned Economies. In: *The Emergence of Market Economies in Eastern Europe*. Eds. C. Calgus and G. Rausser. Cambridge, Blackwell, 1992, 35-53.
- Murrell, P. 1996. How Far Has Transition Progressed? - *Journal of Economic Perspectives*, Vol. 10, No. 2, 25-94.
- North, D. 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge University Press.

- North, D. 1994. Economic Performance through Time. - *American Economic Review*, Vol. 84, No. 3, 359-368.
- Piazolo, D. 1999. The Credibility and Growth Effects of EU Institutions on Eastern Europe. EIB Economic and Financial Reports, No. 99/P2
- Pohjola, M. 2002. New Economy in Growth and Development. *UNU WIDER, Discussion Paper* No. 2002/67.
- Rajasalu, T. 2001. Convergence in the European Union and Some Guidelines for Institutional Reforms in Estonia. In: *Factors of convergence: A Collection for Analysis of Estonian Socio-Economic and Institutional Evolution*. Eds. Ü. Ennuste and L. Wilder, Tallinn, 3-36.
- Rodrik, D., Subramanian, A., Trebbi, F. 2002. Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. *NBER, Working Paper* 9305.
- Sala-i-Martin, X. X. 1997. I Just Ran Two Million Regressions. - *American Economic Association papers and Proceedings*, 87 (2), 178-183.
- Spagat, M. 2002. Human Capital, Growth and Inequality in Transition Economies. *CEPR, Transition Economics, Discussion Paper* No. 3556.
- The Heritage Foundation. 2002. Index of Economic Freedom.  
<http://www.heritage.org/index/>
- Voigt, S., Engerer, H. 2002. Institutions and Transformation - Possible Policy Implications of the New Institutional Economics. In: *Frontiers in Economics*, Ed. Klaus F. Zimmermann, Berlin: Springer Publishing Company, 127-184.

## Appendix 1.1. Estimation with all sub-indices of economic freedom

Dependent Variable: GROW?  
 Method: Pooled Least Squares  
 Date: 12/05/02 Time: 16:42  
 Sample: 1994 2001  
 Included observations: 8  
 Total panel observations 215

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.147808	0.023302	49.25847	0.0000
GDP93?	-0.001072	0.000708	-1.514441	0.1315
BANK?	0.005754	0.003136	1.834932	0.0680
BLAC?	-0.004005	0.002985	-1.341438	0.1813
FISC?	-0.013970	0.004476	-3.120897	0.0021
FORE?	-0.010985	0.004468	-2.458667	0.0148
GOVE?	0.000552	0.002899	0.190400	0.8492
MONE?	-0.003784	0.002149	-1.760614	0.0798
PROP?	-0.001923	0.004153	-0.463023	0.6438
REGU?	-0.009823	0.004062	-2.418172	0.0165
TRAD?	0.003777	0.002892	1.305873	0.1931
WAGE?	0.002979	0.003991	0.746340	0.4563
R-squared	0.182918	Mean dependent var	1.032595	
Adjusted R-squared	0.138643	S.D. dependent var	0.029126	
S.E. of regression	0.027032	Sum squared resid	0.148337	
F-statistic	4.131379	Durbin-Watson stat	1.463043	
Prob(F-statistic)	0.000017			

## Appendix 1.2. Estimation result with selected indicators of economic freedom and additional structural indicators

Dependent Variable: GROW?  
 Method: Pooled Least Squares  
 Date: 12/08/02 Time: 11:05  
 Sample(adjusted): 1996 2000  
 Included observations: 5 after adjusting endpoints  
 Total panel observations 127  
 Cross sections without valid observations dropped

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.115950	0.041396	26.95765	0.0000
FISC?	-0.023926	0.007807	-3.064448	0.0028
FORE?	-0.002521	0.006743	-0.373874	0.7092
GOVE?	-0.006631	0.004305	-1.540171	0.1265
MONE?	0.001851	0.003496	0.529605	0.5975
BANK?	0.010241	0.004025	2.544056	0.0124
BLAC?	-0.006102	0.003830	-1.593395	0.1140
PROP?	-0.004438	0.005679	-0.781469	0.4363
REGU?	-0.004225	0.005735	-0.736705	0.4629
TRAD?	0.001124	0.004103	0.274079	0.7846
WAGE?	-0.000123	0.004974	-0.024652	0.9804
EKSP?	7.37E-06	0.000161	0.045665	0.9637
CAP?	0.001880	0.000654	2.876700	0.0049
FDI?	0.000199	0.000708	0.280812	0.7794
HIGH?	0.000139	0.000257	0.543341	0.5880
INFL?	-0.006727	0.003124	-2.153752	0.0335



INT?	-0.000730	0.000727	-1.004388	0.3175
PC_?	0.001436	0.000672	2.136579	0.0349
PHON?	1.78E-05	0.000236	0.075609	0.9399
GDP93?	-0.001063	0.001623	-0.654916	0.5139
R-squared	0.488892	Mean dependent var	1.032233	
Adjusted R-squared	0.398135	S.D. dependent var	0.031221	
S.E. of regression	0.024221	Sum squared resid	0.062772	
F-statistic	5.386795	Durbin-Watson stat	1.852167	
Prob(F-statistic)	0.000000			

### Appendix 1.3. Final estimation with economic freedom and structural indicators

Dependent Variable: GROW?  
Method: Pooled Least Squares  
Date: 12/08/02 Time: 15:28  
Sample(adjusted): 1996 2000  
Included observations: 5 after adjusting endpoints  
Total panel observations 131

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.113579	0.029875	37.27503	0.0000
OVER?	-0.015608	0.005664	-2.755863	0.0067
FISC?	-0.018578	0.004542	-4.090284	0.0001
CAP?	0.001728	0.000525	3.292011	0.0013
INFL?	-0.007148	0.002878	-2.483783	0.0143
HIGH?	0.000400	0.000163	2.448647	0.0157
R-squared	0.396029	Mean dependent var	1.033141	
Adjusted R-squared	0.371870	S.D. dependent var	0.031282	
S.E. of regression	0.024792	Sum squared resid	0.076832	
F-statistic	16.39272	Durbin-Watson stat	1.505155	
Prob(F-statistic)	0.000000			

## **PART 2. Estonian Institutional Harmonisation and Socio-Economic Convergence with the EU: the Aspects of Development, Credibility and Consistency of Estonian Capital Markets**

**Alar Kein**

*Estonian Institute of Economics at Tallinn Technical University,  
Estonia Ave. 7, Tallinn 10143, Estonia,  
fax: 372 6998851, e-mail: Akein@clarku.edu*

---

### **2.1. Introduction**

The preconditions for the (re)establishment of securities markets started to emerge in Estonia at the beginning of 1990s in connection with the launch of transition reforms. Since then the securities market in Estonia has gone through several development stages:

- the spontaneous market stage (1991 - summer 1993) - an unregulated stage of the securities market and institutions development, began with the first public issues of securities and ended with the introduction of formal rules for securities markets and its institutions;
- the formalising market stage (summer 1993 – June 1996) – a stage when the formal rules (laws and regulation) were brought to the securities market and basic securities market infrastructure was created; (highlights: the Law on Securities Market; State Securities Board; Estonian Central Depository of Securities);
- the organised market stage (since June 1996) - introduced by the start of functioning of Tallinn Stock Exchange.

By now, as a result of gradual integration processes, the securities market development in Estonia has reached a new phase – the international integration stage, which is characterised by the strengthening of links with foreign markets and market participants. So far the integration process has been mostly of regional nature, occurring primarily at the Baltic-States-level and with Nordic (primarily Finnish) securities markets and its participants. The near-future challenge for the Estonian securities market and its participants is closer integration with the EU region in general. It is obvious that the success of this integration process depends largely on the credibility and consistency aspects (as well as the development prospects) of the Estonian securities market. However, it is also true that at the same time the integration process would shape these aspects as well. It is the task of the present paper to investigate to what extent the current Estonian securities market and its institutions could be regarded as “credible” and “consistent” and how these aspects would be affected by the two fundamental processes in the economy – the country’s accession to the EU and pension reform, which overlap with the present stage of securities markets development.

The paper is organised as follows. At first, an overview of the structural and organisational aspects of the Estonian securities market is provided. For obvious reasons, the overview is restricted to that part of securities market, which could be considered as an essentially public market. Thereafter, the major credibility and consistency issues in the securities markets design are analysed, whereas particular attention is focused on the design of investor protection framework, including both the

regulatory and supervisory aspects. For that the comparison of internationally recognised principles (those believed to be critical for the development and proper functioning of capital markets) and of those applied in the Estonian securities market design, is undertaken. Here the principles outlined by the respective EU directives as well as by the International Organization of Securities Commissions (IOSCO) serve as the benchmarks for analysis. As far as the present development stage of securities markets (the international integration stage) overlaps with two fundamentally important processes in the economy - the country's accession to the EU and pension reform, Section 2.3 discusses how these two fundamental processes would affect the credibility and consistency aspects and thereby also the development prospects of the Estonian securities market. Finally, based on the analysis undertaken, major shortcomings in the Estonian securities market design and obstacles in the securities market development are outlined and policy recommendations made in the concluding chapter.

## **2.2. Short overview of the Estonian securities market**

To begin with, it should be noted that the following overview is restricted to that part of the securities market, which could be considered as an “essentially public securities market”, i.e. the (publicly open) (organised) market for securities issued through public offerings.

### *2.2.1. General characteristics of the securities primary market*

It is evident that several factors influence the supply of securities to the public market. In general, one can distinguish economic (e.g. the need to finance growth), economic-political (e.g. privatisation policies) as well as administrative factors (e.g. the enforcement of capital adequacy requirements for commercial banks) for public issues of securities (see Kein, 1995). It is characteristic of Estonia (as well as other Eastern European countries) that a large proportion of corporate public issues, particularly equities have been rather an outcome of economic-political (i.e. privatisation policies) or administrative decisions<sup>5</sup>. These public issues tend to be of great importance in the earlier stages of securities markets development (during 1995 – 1996), suggesting a critical role for Government policy (at this stage) (see Kein, 1999 and Appendix 2.1).

It should be noted that despite of the institutionally promising breakthrough in the primary market in 1997 (when, supported by the favourable market conditions the voluntary-decision-based-public-issues became dominant), the public securities markets have not obtained any significant role in corporate financing (see Kein, 1999 and Appendix 2.1). Furthermore, since 1998 the raising of funds from “essentially public market” has retained only a marginal role in corporate financing<sup>6</sup>. There are probably two reasons for this: 1) the long-lasting implications of domestic and international stock (financial) markets' crises on the economy and investor confidence, 2) emergence of

---

<sup>5</sup> Namely, it can be said that the public issues of shares of banks are mostly induced by the capital adequacy requirements established for banks. While, of course, the economic rationale can not be excluded.

<sup>6</sup> It should be clarified that these are the funds raised from general public through public offering of securities. Alternatively, the funds can be raised also via private (directed) issues of securities to predetermined private or institutional investors.

alternative financing sources (incl. raising funds through private (directed) issues), especially in connection with increasing international integration of Estonian corporate sector and financial markets.

Taking into account substantial increase in the demand for domestic securities accompanying the pension reform, international integration of capital markets, possible implications from the EU accession on the cost of capital and on the business prospects (expansion) of corporate sector as well as considering the prevailing debt/equity structure of corporate sector, there is reason to believe that the raising of funds via securities markets (incl. via “essentially public markets”) will increase in the near future. Nevertheless, considering the really small-scale nature of Estonian business sector (i.e. dominance of small-scale businesses) and the size of the domestic market, no shift from bank-centric-financing to securities-markets-based-financing is expected.

### *2.2.2. General characteristics of the securities secondary market*

*1. Secondary market segments:* - With the launch of the Tallinn Stock Exchange (TSE) on June 3<sup>d</sup>, 1996, and gradual listing of OTC<sup>7</sup>-traded-public-issues on the TSE the TSE shortly established its position as essentially the only organised (public) securities secondary market in Estonia. The statistics provided by the TSE and ECDS reveal that majority of transactions with publicly traded stocks are concluded via TSE<sup>8</sup>. At the same time, the statistics also suggest that since 2001 most of the turnover with publicly traded stocks has resulted from off-exchange trades (see Appendices 2.2 and 2.3). It should be noted that the interpretation of these figures should be taken with precaution. Namely, the turnover reported as an OTC (off-exchange) may essentially still originate from the trades concluded on the TSE. Besides, these OTC turnover figures (Appendix 2.2) also involve repo-transactions.

*2. Structure of securities traded on the secondary market:* - The securities secondary market in Estonia is predominantly equities-centric<sup>9</sup>. During June 3<sup>rd</sup> 1996 – December, 18<sup>th</sup> 2002, equities accounted for 57.2% of the total turnover and 73.5% of all transactions of those securities, which are traded on the Tallinn Stock Exchange, while the bonds (of which only the Compensation Fund bonds can be considered as publicly traded) accounted for 31.3% of the total turnover and only for 3.2% of total transactions in the public securities secondary market, whereas on the TSE, the role of bonds has been almost non-existent (see Appendices 2.2 and 2.3). Looking at the structural changes during the period mentioned, it is important to note that in terms of turnover the bonds replaced the dominant position of stocks in 1998 and 1999 (although not on the TSE). The change can be attributed primarily to the stock market crisis that induced investors to reallocate financial resources from equity markets to fixed income markets. At the same time, the development of the bond market was also supported by the widened gap between the bond yields and interest rates on deposits as well as by the substantial development of money-market and interest funds that enhanced the demand for fixed-income securities. However, since 2000 the gradual redemption of Compensation

---

<sup>7</sup> In the current context the OTC-market is considered to be the off-exchange trading (buying and selling) services offered by individual banks for publicly issued securities.

<sup>8</sup> The alternative, of course, is a direct transaction between counterparties.

<sup>9</sup> Here two proxies are taken to characterise the market structure: the turnover and number of transactions.

Fund bonds as well as restoration of investor confidence with regard to stock markets have re-established the vastly dominant position of the equities on the securities secondary market.

3. *Liquidity*: Among publicly tradable (issued) securities only few are traded rather actively on the secondary market and could be considered as (comparatively) liquid (in terms of turnover, number of transactions and traded volumes of securities in relation to total volume of securities). Those of more liquid securities generally share certain characteristics. They are usually: 1) the securities listed/traded at the TSE, 2) the stocks of larger firms, 3) the stocks of issuers with larger number of shareholders (see Kein, 1999).

4. *Economic sectors represented in the public stock market*: - One of the specific features of the Estonian stock market has been a large dominance of the banking sector, both in terms of market capitalisation as well as in terms of trading activities. For instance, since the opening of TSE the banking sector has accounted for 75.5% of the total turnover (of stocks) and 62.8% of all transactions (of stocks) on the Tallinn Stock Exchange (see Appendix 2.4). The vast dominance of a single economic sector in the stock market certainly raises concerns about the sector-specific-factors' impact on the overall securities market development. Particularly, the markets dominated by only one sector are probably more prone to instability and are also likely to experience larger cross-sector spillovers of volatility than diversified markets. It can be argued that the drastic changes in the Estonian securities market in 1996-1998 largely owe to the dominance of a single sector (banking sector). More balanced representation of economic sectors in the securities markets is certainly desirable as it diminishes the sector-specific-factors' impact on the overall securities market development and provides better diversification opportunities for investors. As a result of the listing of Estonian Telecom on the TSE in early 1999 and delisting of several banks, the relative importance of the banking sector (in terms of market capitalisation and trading activities) has diminished compared to its role at the early stages of Estonian stock market development. Nevertheless, in terms of turnover, the banking stocks have retained their dominant position in the Estonian stock market, and still account for 53.8% of the TSE-equity-market-capitalisation (as of December 18th, 2002) (Source: Tallinn Stock Exchange).

5. *Diversity of Stocks on the Secondary Market*: - As typical of a small economy, there are only few stocks traded on the secondary market. However, the troublesome fact is that the selection of securities on the public secondary market (in terms of different issuers) has diminished considerably since 1998 and in terms of market capitalisation the market has become vastly dominated by only two issuers. Respectively, the number of companies listed on the TSE has diminished from 38 (as of May 31, 1998) to only 14 and two major companies: Hansabank and Estonian Telecom account in total for 89.6% of TSE-equity-market-capitalisation (respectively: Hansabank 53.8%, Estonian Telecom 35.9%) as of December 18, 2002. This extremely high concentration of market capitalisation even deepens the concerns raised in the previous paragraph in connection with high sectoral concentration.

6. *Price Developments*: - The dynamics of stock prices in the Tallinn Stock Exchange is provided in Appendix 2.5. Please note that during its short history the Estonian stock market has already undergone rather dramatic changes in terms of price

movements and has tackled with both, excessive speculation as well as crash<sup>10</sup>. It should be noted that from the point of view of learning, this experience of extreme developments could be considered as a valuable experience for all market participants - for investors and issuers, as well as for supervisory and regulatory authorities. These extreme developments have revealed the weaknesses in the securities and financial markets design for regulators and supervisors, forcing them to act and reminded the risks associated with securities markets as well as with excessive leverage for investors as well as issuers, thus, promoting better risk management (see Kein, 1999).

7. *Securities Market and Foreign Investors*: - One of the specific features of the Estonian securities market is an important role of foreign investors. Since the beginning of the opening of the Tallinn Stock Exchange the foreign investors' share has accounted roughly between 1/3 – 4/5 of the market capitalisation of securities listed/traded on the Tallinn Stock Exchange, whereas the foreign stake has continuously increased (see Appendix 2.6)<sup>11</sup>. It should be noted that most of this foreign ownership is of strategic nature. Most notable strategic acquisitions in publicly traded companies took place during the II half-year of 1998, when the substantially declined stock prices induced take-overs of domestic banks by foreign strategic investors and thus brought foreign investors into the dominant position in the stock market. Although a great deal of foreign stake is of strategic nature, there is also sufficiently substantial part of purely portfolio foreign investments present in the Estonian stock market, and thus, should besides confidence in a company's prospects (or economic policies) also reflect the confidence in the Estonian securities market. Of course, it can be claimed that the presence of strategic foreign investors has probably substantially helped to build this confidence in the Estonian securities market among foreign (portfolio) investors.

So, what are the implications from this active foreign participation for the Estonian securities market? On the one hand, it is evident that the participation of foreign investors has considerably enhanced the size and liquidity of the market and thus also encouraged (accelerated) the development of securities markets and its institutions as well as contributed to the economic growth. The foreign investors' participation may have enhanced the (informational) efficiency, as well, provided the actions of foreign investors are driven by fundamentals and knowledge-experience gained in other markets. On the other hand, it is also obvious that there are significant risks involved with the large foreign ownership as far as it may act as a channel of transmission of instability from foreign into domestic market.

### **2.3. The design of the Estonian securities market: regulatory and supervisory aspects**

There are probably three major desirable aspects in case of every securities market – the efficiency, fairness and stability of securities (financial) markets. It's not perhaps

---

<sup>10</sup> It should be noted that given the banking sector's dominant position in the overall equity market capitalisation, these developments, indeed, largely reflect the developments in the banking sector.

<sup>11</sup> Still, the essentially "foreign ownership" is probably somewhat smaller given that also the off-shore companies founded by Estonian investors are accounted as foreign investors by the TSE statistics. For instance, according to estimations in 1998/1999 the domestically controlled off-shore companies may have owned 6-7% of the value of securities listed/traded on the TSE.

exaggeration to say that in one or another way all of these characteristics are closely related to the investor protection measures that have been applied in the securities market under consideration. In general, these measures can be divided into two categories: 1) regulatory measures, which comprise the enactment of proper investor protection framework by regulation and 2) supervisory measures, which comprise the enforcement of these enacted measures by supervision. Clearly, these two sets of measures are mutually underpinning each other and consequently, the investor protection is effective only if both categories of measures are adequately applied in practice. Until quite recently the Estonian securities market was characterised by severe shortcomings in both categories of measures. The investor protection measures enacted by regulatory framework were inadequate and supervision was weak. Attention to the shortcomings in the regulatory and supervisory framework prior to 2001 has been drawn by several authors (see for instance Kein 1999; IMF 2000). During 2001/2002 a set of measures were undertaken to increase the investor protection and hence also the credibility of the Estonian securities market. In 2002 the new Securities Markets Act, which strengthened the investor protection, became effective and unified supervision over financial sector began operating. As a result of these major changes the Estonian securities market has “potentially” undergone remarkable improvements from the point of view of its credibility and consistency with internationally recognised general principles. It is worthwhile to emphasise “potentially” since such evaluation is conditional that supervisory authority will also enforce the principles laid down in the regulations and prove its effectiveness. At least the basic preconditions for this have been established by regulatory and organisational changes.

### *2.3.1. Securities market supervision*

Supervision certainly plays an important role within the securities market infrastructure. Its major task is to provide for market discipline and ensure proper (fair) functioning of securities markets, in order to protect the investors’ interests/rights as well as to prevent the occurrence of systemic crisis in the financial markets. When evaluating the credibility and consistency of a security market, the design of the supervisory system and its effectiveness certainly represents one of the major evaluation criterions.

Estonia started to build up its securities market supervisory structure quite soon after the evidence of the spontaneous formation of securities market. As a first step the Securities Division of the Ministry of Finance, in charge of co-ordination of the State’s policy towards securities markets and drafting of the regulatory framework for securities markets was set up. Following the establishment of the basic regulatory framework for securities markets in summer/autumn 1993, a major supervisory body - the State Securities Board (SSB) subordinated to the Ministry of Finance, was established in October 1993<sup>12</sup>. Aside the monitoring responsibilities the SSB became responsible also for licensing and registration of public issues and professional participants of the securities market as well as involved in drafting of regulation on securities market. The next wave of organisational changes occurred in June 1996 when the SSB was reorganised into the State Securities Inspection (SSI) and the Tallinn Stock Exchange (TSE) began its activities. The reorganisation of the SSB into the SSI brought along little changes. In essence, the SSI continued the basic functions of the SSB. However, eventually with somewhat strengthened authority. The opening of the TSE

---

<sup>12</sup> It began to operate from 1994.

brought along much substantial changes from the point of view of securities market supervision. On the one hand, the rules and regulations established by the TSE for market participants carried essentially better and comprehensive investor protection measures compared to the overall regulatory framework of securities markets. From the other hand, the supervisory role assumed by the TSE (by its respective commissions), substantially strengthened the surveillance over the securities market covered by the regulations of the TSE. In essence, a new stage in the securities market supervision began, where the State-run supervision became supplemented by the supervisory system (entities) organised by market-participants themselves.

The foundations for the current organisational structure of securities markets supervision were established in 2001, when two fundamentally important acts were passed in the Parliament: 1) the Financial Supervision Authority Act (May 2001)<sup>13</sup>, 2) the (new) Securities Market Act (October 2001)<sup>14</sup>. These laws acknowledged the major weaknesses that had existed in the supervisory system and introduced radical changes into the organisational and regulatory structure of supervisory system in order to improve its efficiency and thereby also the credibility of the Estonian securities market<sup>15</sup>. Among these, the following should be mentioned: 1) The State Securities Inspection along with the Banking Inspection and Insurance Inspection were reorganised (consolidated) into a unified (consolidated) Financial Supervision Authority (FSA), which began operating as an autonomous (and independent) agency by the Bank of Estonia from January 2002. This radical reform in the supervisory system could be regarded as a response to the deepening integration between different segments of financial markets, which brought forth the need for closer co-operation and co-ordination among the supervisory authorities of financial sector<sup>16</sup>. This organisational change was also accompanied by important changes in the functional principles of the supervisory system. Most notable is the shift from the State-budgetary-funding to independent funding by imposing the costs of supervision on market participants<sup>17</sup>. This step provides greater guarantees to the independence (impartiality) of supervision and is expected to result in the increase of funding for supervision, thereby providing potential

---

<sup>13</sup> The Law became effective from June 1<sup>st</sup>, 2001

<sup>14</sup> The Law became effective from January 1<sup>st</sup>, 2002

<sup>15</sup> It should be noted that the radical reform in the supervisory system became into agenda already in 1998, mostly as a result of stock market crises and issues brought up by the mergers in the financial sector, which revealed the weaknesses in the existing supervisory system.

<sup>16</sup> The need for a supervisory body with a common responsibility for most sectors of the financial system became apparent in 1998, when, as a result of stock market crises and issues brought up by the mergers in the financial sector, the weaknesses in the existing supervisory system were revealed.

<sup>17</sup> The FSA is funded through obligatory surveillance fees imposed on the professional market participants (e.g. investment companies, credit institutions, insurance companies, fund management companies, etc.). The fees are capital-based as well as volume-based. For instance, investment companies, organiser of regulated market and fund management companies pay 1% from the minimum capital requirement established by law. Volume-based fees are determined each year by the Ministry of Finance and can range from 0.4 - 0.75% for investment companies and 0.05 – 0.25% for fund management companies (Source: FSA Act).



for better and more reliable supervision<sup>18</sup>. 2) The supervisory authority was furnished with more comprehensive inspection, investigation, surveillance and enforcement powers at the regulatory level. It can be claimed that an essential part of this increase in authority can be attributed to such regulatory means as the enactment of substantially severe penalties for violators of laws/regulations.

These radical measures at the regulatory and organisational level provide foundations for substantial improvement in the effectiveness of supervision over the securities market. However, whether the effectiveness of supervision actually improves, depends also on the realisation of these new potentials in practice. The evaluation of this aspect, however, is yet premature since the supervisory system is currently still essentially in the process of transition. Furthermore, the supervisory system is facing a major new challenge – to cope with (the possible dangers stemming from) the deepening international integration of Estonian securities markets and its participants. Here, the major challenge will be free provision of cross-border investment services and free branching within the EU jurisdiction, which will come into force in connection with Estonia's membership in the EU. It is clear that with increasing international integration the threats to systemic stability are not limited to domestic factors only, but may increasingly stem from foreign jurisdictions as well. The cross-border conduct of financial activities, acting of financial groups (investment firms) in different jurisdictions, cross-border (parallel) listing of securities as well as trading of domestic-security-based derivatives on foreign markets certainly call forth the need for cross-border co-operation among securities market supervisory authorities as well as for regulatory adjustments, which could ensure the effectiveness of cross-border supervision<sup>19</sup>. In the conditions of globalising financial markets the international co-operation certainly obtains ever growing importance since as IOSCO notes: "Fraud, market manipulation, insider trading and other illegal conduct that crosses jurisdictional boundaries can and does occur more and more frequently in a global market...". At the regulatory level the supervisory issues that arise in connection with increasing cross-border integration of securities markets and its participants, are already recognised (addressed). The FSAA (2001) and the SMA (2001) enact a set of measures designed to maintain adequate control (supervision) over the securities market and its participants in the conditions of cross-border integration processes: 1) The FSAA (2001) envisages international co-operation between domestic and foreign (international) supervisory authorities (of securities markets) as one of the major rights and tasks of the domestic supervisory authority and backs the FSA with the right to exchange confidential information with respective foreign (international) supervisory authorities (provided that the confidential information is used for supervisory purposes and the confidentiality is maintained). 2) The SMA (2001) furnishes FSA with regulatory means, which enable FSA to control or at least keep track on the cross-border activities related to securities markets. Thus, for instance, the SMA establishes that founding (or acquiring) a subsidiary or branch providing investment services abroad by an investment firm registered in Estonia as well as founding a branch in Estonia by an investment firm registered in a foreign country are subject to obtaining relevant permission from the

---

<sup>18</sup> It should be noted that the lack of funding has been considered as one of the underlying reasons that undermined the SI's authority. See for instance IMF (2000).

<sup>19</sup> As IOSCO notes it in its principles: "Legislation and the enforcement powers of the regulator should be sufficient to ensure that it can be effective in cases of cross-border misconduct."

FSA<sup>20</sup>. It is important to note that the SMA envisages that the FSA may refuse to grant permission (as well as revoke permission) if supervision over the subsidiary or branch can not be exercised adequately<sup>21</sup>. Permission from the FSA is also required in case of provision of cross-border investment services in Estonia<sup>22</sup>. Opening of a representative office abroad by an investment firm registered in Estonia as well as opening of a representative office in Estonia by an investment firm registered in a foreign country do not require such permission from the FSA, however, the firms are required to notify FSA about such intentions. Similarly, Estonian local governments and legal persons registered in Estonia shall notify FSA about any offer of securities issued and offered thereby in a foreign country. In order to make these requirements effective, the SMA envisages rather severe penalties in case of violations of these requirements.

## **2.4. Prospects of the Development of Securities Market in Estonia**

### *2.4.1. The Role of Pension Reform on the Development of Securities Market in Estonia*

The transformation from a pay-as-you-go pension system to a funded pension system, which started in Estonia in August 1998, could definitely open up new prospects for the development of securities market in Estonia. Moreover, it should be regarded as one of the major underlying processes that will determine the development of the securities market in Estonia in the near as well as in more distant future. Indeed, from the two core reform stages - 1) introduction of the voluntary funded pension schemes, and 2) introduction of the obligatory funded pension schemes - it is the second reform stage which is expected to have a major impact on the securities market development. By now Estonia has launched both of these major stages of pension reform. The voluntary funded pension scheme (so-called third pillar of pension system) was introduced in August 1998 with the enforcement of Pension Funds Act. The obligatory funded pension scheme (so-called second pillar of pension system) was introduced in October 2001 when the Funded Pensions Act (FPA) became into force<sup>23</sup>. It should be noted that the launch of the transition to an obligatory funded pension system has been very successful. As of October 31<sup>st</sup>, 2002 (the deadline for joining the funded-pension-schemes in 2002) 207,200 people had joined the scheme (Source: Estonian Securities Center), which was practically double what was initially expected by the Ministry of Finance<sup>24</sup>. According to preliminary estimations such a large number of participants

---

<sup>20</sup> The requirement does not apply in case of investment firms registered in the EU if Estonia joins the EU.

<sup>21</sup> The reasons for inadequate supervision may include, for instance, the absence of a co-operation agreement with the relevant foreign state's securities market supervisory authority or inability to establish it, or shortcomings in the foreign state's legislation.

<sup>22</sup> The requirement does not apply in case of entities registered in the EU if Estonia joins the EU.

<sup>23</sup> Please note that with the enforcement of FPA in October 2001 the Pension Funds Act became void as far as the FPA covers also the voluntary funded pension schemes.

<sup>24</sup> Such a large participation could be probably attributed to the favorable conditions enacted for the participants in the obligatory funded pension schemes. According to the FPA the employee pays 2% from his/her gross salary (whereas, effectively only 1.74% as far as the sums transferred to the pension fund can be deducted from taxable income) to obligatory pension fund, whereas the employer contributes 4% on the account of the individual's social tax.

could result in the total net flow of roughly 1 billion Estonian kroons into the pension funds already in 2003 and reach even higher levels during the next years as long as the number of participants in the pension scheme and wages increase<sup>25</sup>. As an immediate result, the pension reform has triggered a new wave of the emergence of institutional investors (pension funds) and revitalised the investment fund industry<sup>26</sup>. As of December 20, 2002 there were already 19 pension funds, of which 15 obligatory pension funds registered at the FSA (aside 17 other types of investment funds) (Source: FSA). The accumulation of domestic financial resources of such a magnitude and a long-term nature of these resources have certainly several significant implications for the domestic securities market:

- 1) First of all, the demand for domestic securities will be significantly enhanced. This, in turn, broadens the financing choices for domestic businesses and may lead to revitalisation of primary market (especially, if the enhanced demand will result in the reduction in the cost of (new) capital for domestic issuers).
- 2) The emergence of institutional investors (pension funds) should improve the market liquidity and provide depth to the domestic (otherwise thin) securities (secondary) market (i.e. making it possible to trade large amounts of stock without significantly affecting the stock's price).
- 3) The term structure of financial instruments issued may change as far as the long-term nature of resources managed by pension funds should also facilitate issuing of long(er)-term bonds.
- 4) The social importance of domestic securities market increases (as far as the social guarantees of a great part of population who participate in pension schemes become dependent on the securities markets), thereby, calling for more stringent and effective securities market supervision.
- 5) The emergence of pension funds as institutional investors may contribute to the improvement in market efficiency, provided that pension fund management teams become actively engaged in market research (which is likely to happen when there is bonus-based motivation or competitive pressure on fund's performance).

Thus, as discussed, the pension reform may lead to several improvements in the domestic securities market. However, these prospects should not be overestimated. On the one hand, the current state of domestic primary market, the limited choice of tradable financial instruments available in the domestic secondary market, the predominantly small-scale nature of corporate sector (i.e. lack of qualified potential corporate issuers) as well as the existing diversification requirements suggest that this surge in the demand might confront the supply side constraints in the domestic market and, thus, raise concerns that actually a larger outflow of domestically accumulated funds than desirable from the point of view of domestic economy, could occur.

---

<sup>25</sup> It should be noted that the actual allocation of funds into the pension funds started from July 1<sup>st</sup>, 2002 (for those 37,055 people who had joined the scheme by June 1<sup>st</sup>, 2002). Still, major surge in the inflow of funds into the pension funds will occur from January 1<sup>st</sup>, 2003, when the allocation of funds will start for those 170,145 participants who joined the scheme later in 2002.

<sup>26</sup> Prior to pension reform, the major impetus to the establishment of institutional investors (investment funds) probably came from the State privatisation program. However, from 1998, following the Estonian stock market crash in autumn 1997 and its consequences for the economy a rather long-lasting stagnation period began in the IFs industry (see Kein 1999).

#### *2.4.2. The role of Estonia's EU accession on the development of securities market in Estonia*

Aside the pension reform, Estonia's EU membership is another major process that could have a far-reaching, presumably positive impact on the securities market development in Estonia. There are probably three underlying processes accompanying the EU accession that could trigger the major developments in the securities market: 1) the institutional-regulatory adjustment of securities markets to EU (international) standards; 2) the revaluation of (country) risk; 3) the impact of the EU accession on the real economy.

It should be mentioned that the institutional-regulatory adjustment/harmonisation to EU (and international) standards has (in large extent) already taken place in the securities market. The regulatory framework of Estonian securities markets (the SMA 2001) is already designed in anticipation of Estonia's membership in the EU and contains also those EU-wide-applied-principles, which become into force with the Estonia's membership in the EU (most notable of these are the free provision of investment services in Estonia and free branching in Estonia for investment firms registered in an EU member state). Therefore, the Estonia's actual membership in the EU is not likely to call for any significant further changes in the design of the regulatory-institutional framework. However, the enforcement of several EU-relevant-principles in connection with Estonia's actual membership in the EU may trigger new developments in the Estonian securities market.

It can be expected that the EU membership would bring along a higher country rating for Estonia. This would have two effects: 1) it would lead to the reduction in the cost of capital for domestic issuers, which in turn would stimulate the supply of new securities; 2) it would lift the restrictions on investing into the Estonian securities for a number of foreign institutional investors (e.g. pension funds), which would enhance the demand-side of Estonian securities, thereby facilitating also the supply of (new) securities<sup>27</sup>. These effects are clearly positive for the securities market development in Estonia.

Similarly, positive impact could be also expected from joining the Euro-currency-zone. The introduction of euro in Estonia could increase the foreign participation in the Estonian securities market as far as its eliminates the currency risk for euro-zone investors and reduces the associated transaction costs for foreign investors. It should be noted, however, that the shift to the use of euros as a unit of account has already started in the Estonian securities market. Since February 25<sup>th</sup>, 2002, when the TSE was integrated into HEX (Helsinki Stock Exchange) trading system the stock prices on the TSE are essentially quoted based on euros.

Probably the most far-reaching implications for the securities market development in Estonia in connection with the EU accession still stem from the EU accession's impact on the real economy as far as, essentially, the prospects for the development of securities markets stem from economic fundamentals.

---

<sup>27</sup> However, given the size of the Estonian securities market and issuers the impact on the demand side is likely to be rather small (at least in the short-term).

## 2.5. Conclusions

1. The analysis of the Estonian securities market's structural aspects and their dynamics reveals that the role of public securities markets has shrunk considerably both in absolute as well as in relative terms and leads to conclusion that the public securities market in Estonia has not been able to achieve that position in the Estonian financial market that was initially expected. Besides, there are several weaknesses observable in the current structure of public securities market in Estonia. Among these, most notable are the high concentration levels in terms of economic sectors as well as issuers, which raise concerns about the excessive (and potentially unstabilising) role of sector- or issuer-specific-factors on the overall securities market development.

2. The securities market development in Estonia has reached a new phase – the international integration stage, which is characterised by the strengthening of links with foreign markets and market participants. Although this process should be viewed generally as a positive one from the point of view of securities market development, there could be also several unwanted developments that might accompany this process. Our primary concern is that the strengthening of integration with foreign markets and market participants may also lead to increasing transmission of instability from foreign markets into the domestic market. Such potential danger calls for policies that are aimed at reduction of transmission of instability from international markets.

3. The pension reform (the transformation from a pay-as-you-go pension system to a funded pension system) that was launched in 2001 should be certainly considered as a process which creates preconditions for several fundamentally important developments in the domestic securities market and would help to improve the credibility, consistency and importance of the Estonian securities market. With the expected annual flow of 1 billion Estonian kroons into the pension funds already in 2003 it clearly enhances the demand for securities and can potentially serve as a catalyst for securities market development. Given the current state and structure of primary market as well as the predominantly small-scale nature of corporate sector (i.e. lack of qualified potential corporate issuers) there is great concern that this increase in the demand would not be adequately met by the domestic supply of new securities. As a result, larger outflow of domestically accumulated funds than desirable from the point of view of domestic economy would occur. The supply constraints could be eased by privatisation of major large-scale state-owned infrastructure enterprises (such as Estonian Energy) or by the launch of issuing of Government (or its agencies') securities (bonds). Other ways to alleviate the problem could be assets securitisation and financial innovation in general in the domestic market.

4. In 2002 the new Securities Markets Act, which strengthened the investor protection, became effective and unified supervision over financial sector began operating. As a result of these major changes the Estonian securities market has “potentially” undergone remarkable improvements from the point of view of its credibility and consistency with internationally recognised general principles. It is important to emphasise “potentially” since such evaluation is conditional that supervisory authority will also enforce the principles laid down in the regulations and prove its effectiveness. At least the preconditions for this have been established by regulatory and organisational changes, although the increasing international integration with foreign markets and its participants calls also for more extensive co-operation with international supervisory authorities.

5. Considering the adjustment processes that have already occurred in the regulatory framework, the EU membership would affect the development of Estonian securities market primarily via its impact on the real economy. The prospects opened up (or closed) for the Estonian corporate sector from the EU membership are definitely another critical (underlying) factor that determines the development of Estonian securities market. Considering this, it is highly important to adopt or negotiate policies that increase the competitiveness of the Estonian corporate sector.

## References

HEX Tallinn (<http://www.hex.ee/english/>)

IMF, 2000. Report on the Observance of Standards and Codes (ROSC). Estonia. Prepared by a staff team from the International Monetary Fund and the World Bank in the context of the Financial Sector Assessment Program (FSAP) on the basis of information provided by the Estonian authorities. June 2000. Source: <http://www.imf.org/external/np/rosc/est/securities.htm>

Kein, A. 1995. Capital Market Institutions in Estonia. Institute of Economics, Estonian Academy of Sciences & International Center for Economic Growth. Tallinn 1995.

Kein, A. 1999. Formation of Securities Market in Estonia in 1990s. - In: *Harmonisation with the Western economics: Estonian Economic Developments and Related Conceptual and Methodological Frameworks*. Collection of Papers. (edited by Ü. Ennuste and L. Wilder). Estonian Institute of Economics at the Tallinn Technical University, Tallinn 1999, pp.41-90.

## Appendix 2.1. Securities primary market in Estonia: Public Issues Registered at the Financial Supervisory Authority and essentially "Public" Issues of Securities

	1994	1995	1996	1997	1998	1999	2000	2001
<b>I. Total number of so-called "public issues" registered at the Financial Supervisory Authority</b>								
<b>Total</b>	24	52	39	48	94	53	9	8
1. Equities	10	20	27	42	26	11	3	2
2. Debt securities*	10	17	4	3	68	42	6	6
3. Investment Funds' shares**	4	15	8	3	0	0	0	0
<b>II. Public issues offered via public offering</b>								
<b>Total</b>	15	42	28	30	5	8	5	1
1. Equities	8	20	18	24	2	4	3	0
1.1. of banks	5	4	1	1	1	0	0	0
1.2. of enterprises (non-banks)	3	16	17	23	1	4	3	0
1.2.1. under the privatisation program	1	16	16	6	0	1	1	0
2. Shares of Closed-end Investment Funds	3	12	6	3	0	0	0	0
3. Bonds	4	10	4	3	3	4	2	1
3.1. Corporate bonds	3	6	1	0	0	2	0	1
3.2. Compensation Fund bonds	1	4	3	3	3	2	2	0
Number of public offerings related directly to privatisation	2	20	19	9	3	3	3	0
Number of public offerings non-related directly to privatisation	13	22	9	21	2	5	2	1
Number of public offerings of stocks non-related directly to privatisation	7	4	2	18	2	3	2	0

Note 1: Grouped on the basis of registration date.

Note 2: The definition of "public issue" subject to registration at the FSA has changed during the period considered

\* Includes bonds, commercial papers, convertibles.

\*\* Includes only shares of closed-end-type investment funds

Source: Author's estimations. Compiled on the basis of data of FSA.

## Appendix 2.2. Turnover of Securities Traded on the Tallinn Stock Exchange (in million EEK)

	Turnover (in million Estonian kroons)					
	1996*	1997	1998	1999	2000	2001
<b>Tallinn Stock Exchange</b>						
Total	2 294	21 835	13 352	4 474	5 538	4 110
Stocks	2 268	21 329	13 146	4 161	5 100	3 873
Bonds	14	14	22	97	83	61
Other	13	493	184	216	354	176
<b>OTC (Payments)</b>						
Total	870	12 309	20 430	12 803	9 201	9 992
Stocks	477	2 033	1 302	3 073	4 654	4 148
Bonds	295	7 037	16 652	8 973	3 126	3 387
Other	98	3 239	2 476	757	1 421	2 457
<b>OTC (No Payments)</b>						
Total	-	-	-	-	-	-
Stocks	-	-	-	-	-	-
Bonds	-	-	-	-	-	-
Other	-	-	-	-	-	-
<b>TOTAL</b>						
Total	3 164	34 144	33 782	17 276	14 738	14 102
Stocks	2 744	23 361	14 448	7 234	9 754	8 022
Bonds	309	7 051	16 674	9 070	3 209	3 448
Other	111	3 732	2 660	972	1 775	2 633

Notes:

\* Data of 1996 starting from June 3rd (incl.)

\*\* Data of 2002 until December 18 (incl.)

Source: Tallinn Stock Exchange

### Appendix 2.3. Number of transactions with Securities Traded on the Tallinn Stock Exchange

	Number of transactions					
	1996*	1997	1998	1999	2000	2001
<b>Tallinn Stock Exchange</b>						
Total	19 865	125 236	94 172	44 656	36 694	30 083
Stocks	19 114	121 036	90 612	39 408	32 057	27 421
Bonds	550	1 241	1 341	1 750	1 612	781
Other	201	2 959	2 219	3 498	3 025	1 881
<b>OTC (Payments)</b>						
Total	3 924	19 588	12 286	8 925	15 075	11 888
Stocks	2 898	7 337	3 913	5 591	9 265	4 756
Bonds	183	729	1 740	1 400	1 118	1 128
Other	843	11 522	6 633	1 934	4 692	6 004
<b>OTC (No Payments)</b>						
Total	5 732	33 450	38 640	24 313	24 917	19 547
Stocks	5 152	20 851	20 955	9 337	6 736	4 212
Bonds	208	520	3 412	617	376	198
Other	372	12 079	14 273	14 359	17 805	15 137
<b>TOTAL</b>						
Total	29 521	178 274	145 098	77 894	76 686	61 518
Stocks	27 164	149 224	115 480	54 336	48 058	36 389
Bonds	941	2 490	6 493	3 767	3 106	2 107
Other	1 416	26 560	23 125	19 791	25 522	23 022

Notes:

\* Data of 1996 starting from June 3rd (incl.)

\*\* Data of 2002 until December 18 (incl.)

Source: Tallinn Stock Exchange

### Appendix 2.4. Share of Economic Sectors in the Turnover and Number of Transaction in the Estonian Stock Market

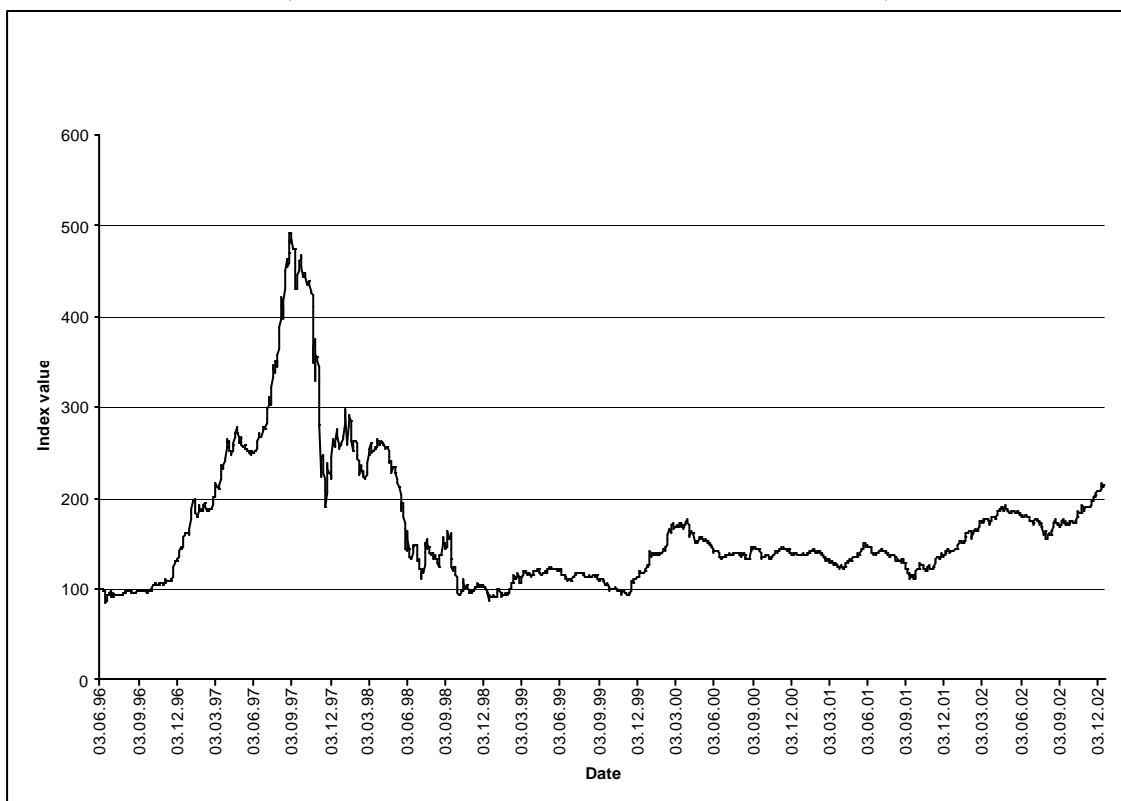
	1996	1997	1998	1999	2000	2001	2002	TOTAL
<b>TOTAL MARKET</b>								
<b>Telecommunications</b>								
% from total no. of transactions	0,0%	0,0%	0,0%	22,9%	14,0%	34,9%	23,4%	8,6%
% from total turnover	0,0%	0,0%	0,0%	35,5%	12,6%	23,4%	9,9%	8,9%
<b>Banking sector</b>								
% from total no. of transactions	64,7%	75,7%	72,8%	43,5%	49,7%	36,0%	43,1%	62,4%
% from total turnover	77,2%	84,3%	81,9%	45,0%	67,7%	59,6%	73,0%	73,5%
<b>Others</b>								
% from total no. of transactions	35,3%	24,3%	27,2%	33,6%	36,3%	29,1%	33,5%	29,0%
% from total turnover	22,8%	15,7%	18,1%	19,5%	19,7%	17,0%	17,1%	17,6%
<b>I. Tallinn Stock Exchange</b>								
<b>Telecommunications</b>								
% from total no. of transactions	0,0%	0,0%	0,0%	22,3%	16,7%	38,5%	28,2%	8,8%
% from total turnover	0,0%	0,0%	0,0%	30,8%	14,7%	28,6%	17,4%	7,2%
<b>Banking sector</b>								
% from total no. of transactions	67,0%	76,7%	74,0%	43,4%	45,1%	32,5%	36,3%	62,8%
% from total turnover	78,6%	85,6%	82,2%	48,7%	63,7%	52,8%	65,3%	75,5%
<b>Others</b>								
% from total no. of transactions	33,0%	23,3%	26,0%	34,3%	38,3%	29,1%	35,4%	28,4%
% from total turnover	21,4%	14,4%	17,8%	20,5%	21,6%	18,5%	17,3%	17,2%
<b>II. OTC-Market (payment)</b>								
<b>Telecommunications</b>								
% from total no. of transactions	0,0%	0,0%	0,0%	20,4%	6,0%	19,9%	12,8%	9,7%
% from total turnover	0,0%	0,0%	0,0%	42,8%	10,1%	17,9%	6,6%	13,1%
<b>Banking sector</b>								
% from total no. of transactions	32,5%	34,7%	59,4%	38,6%	61,9%	51,6%	50,4%	49,6%
% from total turnover	69,5%	57,5%	76,0%	39,3%	72,4%	66,8%	76,4%	68,4%
<b>Others</b>								
% from total no. of transactions	67,5%	65,3%	40,6%	41,1%	32,1%	28,5%	36,8%	40,7%
% from total turnover	30,5%	42,5%	24,0%	17,9%	17,5%	15,3%	17,0%	18,5%

Note: Includes only securities traded on the Tallinn Stock

Source: Author's calculations. Based on the trading statistics of the TSE and ECDS.



**Appendix 2.5. Dynamics of TALSE index during June 3<sup>rd</sup>, 1996 – December 18, 2002 (Base value: TALSE as of June 3<sup>rd</sup>, 1996 = 100)**



**Appendix 2.6. Investments into securities traded on the Tallinn Stock Exchange by countries (% from TSE market capitalisation)**

	01.12.02	01.01.02	01.01.01	01.01.00	01.01.99	01.01.98	01.01.97
Estonia	20,2	22,5	23,6	27,0	34,9	65,0	66,9
Foreign	79,8	77,5	76,4	73,0	65,1	35,0	33,1
<i>of which</i>							
Sweden	48,3	45,4	45,4	38,6	29,7	3,9	5,6
Finland	6,5	7,0	5,1	5,5	12,8	12,4	11,7
USA	8,6	7,5	8,4	12,5	3,4	1,8	2,3
United Kingdom	6,7	7,7	5,4	3,8	2,1	3,2	1,3
Netherlands	4,5	4,6	4,6	6,2	n/a	n/a	n/a
Luxembourg	1,6	1,1	0,2	1,5	3,1	n/a	n/a
Liechtenstein	n/a	n/a	3,2	1,9	4,8	n/a	n/a
Others	3,6	4,2	4,1	3,0	9,2	13,7	12,2

Source: Tallinn Stock Exchange

### **PART 3. A LP Analysis of Economic Sector Institutional Structure**

**Ülo Ennuste**

*Estonian Institute of Economics at Tallinn Technical University,  
Estonia Ave. 7, Tallinn 10143, Estonia,  
fax: 372 6998851, e-mail: ylo.ennuste@mail.ee*

---

*“Policy Advice #2: Modifying institutions  
should be the exception rather than the  
rule.”*

*Voigt and Engerer, 2002.*

*If institutional structures really matter  
there should be ways to quantify their  
impacts and accordingly design these  
structures.*

#### **Abstract**

The paper synthesises on the basis of the paradigms of the New Institutional Economics a quantifiable linear optimal choice model for computable social designing of perspective institutional cluster of a national economy. We describe this model with binary integer institutional choice variables and with structural parameter values as subjective probabilities collected from experts by calibration questionnaires.

The optimisation goal may be e.g. high expected probability of the stable national economic performance under socio-economic development-credibility constraints, dependent on the realisation of prospective significant events. The model may be useful as a complementary tool for the social design of the effective institutional structure, especially for evaluation of the socially optimal values of co-ordinating shadow prices and implementing side-payments in the political institutional design game.

We give some specifications of the experimental Estonian case model variables and data calibration table illustrations mainly to demonstrate the broad spectre of issues that may be involved in this analysis.

*Journal of Economic Literature* Classification numbers: B4, D71, E5, K0, P3, F15.

*Keywords:* The New Institutional Economics, market design, comparative institutional analysis, economic sector institutional design, institutional structures, credibility effects, linear programming, implementing side-payments, co-ordinating shadow prices, computational economics, data calibration.

#### **Acknowledgements**

I would like to thank Geoffrey M. Hodgson, Gary McMahon, Sergey Slobodyan, Teet Rajasalu and many participants of the GDN Research Competition Prague Workshop August 4-5, 2002 at CERGE-EI for helpful and valuable suggestions and corrections. The remaining errors are mine.

Financial support from the CERGE-EI GDN Program (Project No. 34, 2002) and the Estonian Ministry of Education (Project No. 0341765s01) are gratefully acknowledged.

### **3.1. Introduction and general methodology**

Implementation theory has explored and developed more and more robust mechanisms for the implementation of various choice rules and for different sets of agents. E.g. a recent paper by Eliaz (2002) explores the question of implementation that is robust in the case the social planner is facing a limited number of agents who in their activities have a potential to err or being faulty etc.

A very well-known and powerful instrument of enhancing implementation robustness is the side-payment system or implementing transfers by social planner (Matsushima, 1993) but here the application complication may be the issue of computation of correct values of these side payments, especially in the cases where the choice rules are not “mathematically nice”. The implementation models of institutional designs or structures certainly belong to the latter class of problems. These design models contain among other things necessarily binary choices, integer variables etc. The reviews of literature in this field (the New Institutional Economics) are given in e.g. Voigt and Engerer (2002) and some titles of the latest works that have been seminal for our study are included in the References but the results of these theoretical studies are not explicitly reiterated in this more or less applications-oriented paper.

In this paper a stylised linear planning (LP) model has been synthetically set up to analyse the problems of implementation of optimal institutional structure for the economic sector. This is a simplified version of the more general conceptual national social planner economic design model (in Ennuste, 2001, p. 332, formulae (1)) for optimisation analyses of the prospective national economic institutional structure.

This LP model may be a rational means of study in the cases where there are numerous institutional changes taking place for the national economy and the impacts of these changes may be closely interconnected and there are the conditions of complementarities of the institutions.

The implicitly conceptual logic behind the model is meant to be in plain words as follows. It is assumed that the prospective economic development will be more effective the higher the expected prospective economic credibility is (or the less uncertainty there will be in the economy).

We assume that the prospective quantity or magnitude of economic credibility may be modelled by a collection of proxy indicators and their values will depend among other factors heavily on prospective institutional structure of the economy that will mainly reduce the uncertainties connected with economic transactions, incentives, confidences, reduce impacts of shocks etc. The purpose of this model is to try to specify the optimal prospective institutional structure for the economy among possible structure clusters considering some possibilities of measurement of the quantities of some proxy indicators of economic credibility and measurement of the quantitative relations of credibility indicators and institutional characteristics.

And it is most important to model the institutional interaction phenomenon, e.g. that the introduction of some new institutional elements may condition (“input”) introduction of some additional supporting institutional arrangements or certain

institutional initial conditions (Saint-Paul, 2002, has named this as restricted local optima principle).

Optimal institutional structure means in this context that this structure will prospectively maximise the quantified value of the indicator that is chosen as proxy to model institutional credibility of the economy, and also satisfy some quantitatively expressed indicators as constraint values. E.g., we may institutionally maximise the stability  $t$  of prospective economic development (e.g.:  $t=q/s$ , where  $q$  describes e.g. average quantity of national income and  $s$  models standard deviation etc.) subject to a constraint that more than that given level of price stability should be guaranteed etc. The expected impact (“output”) of the prospective existence of a certain structural element on some indicator is conceptually modelled by the expected effects or outputs. It is assumed that these element’s outputs add linearly to the all-economic credibility of this indicator.

As it is extremely complicated to quantify the named expected effects by their real values, as the experts have no prime experiences about new alternative institutions or about old institutions in the new coming environments. Therefore, first, we suggest for experts to calibrate the parameters by adjusting the values with the mainstream research results in this field like in the engineering approaches (Roth, 2002; Ledyard and Palfrey, 1999).

And, second, to make the task of quantification even more convenient we suggest in this model approximate input-output parameter values by comparative probability values. In the last case all comparisons in the model are best to base on the present institutional structural elements (*status quo*). The output parameters of the perspective institutional elements are probability estimates (or their intervals) indicating that these elements will expectedly be more effective than the basic institutional element. Basing all the future comparisons on the present or the prior institutions makes the calibration estimates hopefully more reliable as some present institutional effects may be quantified statistically e.g. as parameters of linear regressions (Rajasalu, 2002). Also basing comparisons on the present institutions we take into consideration the importance of prior existence of many in our context implicitly involved institutions such as language etc. (Hodgson, 1998 and 2002).

The model may be useful as one modest tool in the “political market game” process of the social design of the effective institutional structure, especially for the evaluation of the values co-ordinating shadow prices in the political institutional design game. In other words, this model may give some macro approaches and co-ordinating parameters for stimulating micro calculations in the political institutional design game to go in the right direction (Brekke and Moxnes, 2002, and Ennuste, 2001). The implementation problem (the problem of collection from the agents of un-manipulated information) we overcome here by introducing the correlated agents assumption and relevant side-payment system (Aoyagi, 1998).

There is no commonly agreed definition of institutions (Voigt and Engerer, 2002), not yet. In our model we take a broad approach to the definition of economic institutions: devices and arrangements that co-ordinate the economic interactions and shape economic decisions by reduction of economic interaction and co-ordination uncertainties (North, 1998). Or in other words, economic institutions are devices to enhance credibility of economic transactions and create confidence in economic activities.

We try to model the institutions on micro-, meso- and macro-level (Yu, 2001). And in all these levels we try also to model internal and external institutions (Voigt and

Engerer, 2002) and individual and public institutions, we also distinguish formalised (*de jure*) and unformalised (*de facto*) institutions. E.g. monetary system belongs to the set of macro-level or society level public external institutions. The same type are of institutional alternatives are e.g. efficient public goods mechanisms versus their simplified approximations by national voting referenda (Ledyard and Palfrey, 2002). On the other hand, for instance, the reputation climate in a firm belongs to the set of internal micro-level individual or local institutions and the market organisation form (e.g. monopoly) of the firm belongs to the set of external formalised *de facto* institutions and the legal status of the state language is *de jure* public external institution etc.

### 3.2. Technical-methodological remarks

As according to our assumptions, already concisely noted before, institutional structures are meant to enhance the credibility of economic interactions and therefore we take for the maximand and constraint indicators such indicators-proxies that are important for forming credibility estimates and that are mainly affected by institutions. In our model the indicators that may be the initial factor-components or proxies for the synthetic economic confidence indicators (Laven and Perotti, 2001) are such as stable economic development, trade balance, attraction of foreign direct investments, good access to capital markets etc. According to our approach the high economic credibility is in turn the main determinant of good industrial performance.

The prospective structural parameters of the perspective design model should be based on deductive predictive reasoning and therefore in essence the experts' subjective *a priori* probabilistic data (based of course on econometric studies). As for the experts, the most convenient way for them to model data in this "institutional accounting" may be to estimate subjective probabilities. Therefore we model the structural parameters as probabilities, and with these simple questions we may avoid the phenomenon of pragmatic overconfidence of experts (Hvide, 2002) that may be a danger in the institutional analysis.

We set up this model as a linear planning model (additive effects) with binary integer (1;0) decision variables, so we may call this also an optimal constraint choice model, or a design model. We take the target function (social maximand) and constraints here as linear combinations and all structural (input-output) parameters estimated by experts in these combinations are taken as descriptions of probabilities (possibly with interval distributions) as we assume that the probability values are most convenient for the experts to estimate and most natural here also for the robustness considerations.

Namely: 1) e.g. the probability of prospective good credibility of national economics is sufficiently adequate to model as a sum of weighted credibility indicators of economic activities, where the weights are based e.g. on the volumes of activities, 2) the probabilities of good credibility of certain activities are easy to estimate as dependent on certain institutional arrangements in the economy, and 3) in these probability estimates it is easy also to take into account the situations of prospective economic recession and crises.

It may also be important to note that if multiplicative effects of activities or arrangements are considered initially in the model, the logarithmic transformation allows us again to reduce the model to the linear form.

The co-ordinates of optimisation vector denote various alternative economic institutions applied by organisations of national economy and in companies. Here we differentiate between two kind of institutions: 1) public institutions which have the impact on all economy and are implemented by governmental legislation and other organisations and 2) individual or local non-public (e.g. company, municipality etc.) institutions implemented by companies and municipalities for themselves and effective only in the same company and municipality etc.

The target function will be a linear combination of the optimisation vector to maximise the average weighted probability of high national economic performance (e.g. economic growth). The constraint inequalities are linear combinations of weighted probabilities of certain socio-economic development effects (“out-puts”) that should in sum be not less than certain externally given levels. Certain constraints of the model contain also institutional “in-puts”: for the implementation of certain institutional arrangements there is the need for existence of certain public institutional arrangements.

Here we assume that for the sake of robustness of the design in the future, the set of constraints may have different parameter values dependent on the realisation of the states of nature in perspective (e.g. national economy will be member of the EU or alternatively will not be member) with the given probabilities. Not that the values of parameters of the target function may vary according to the realisation of prospective events.

It is important to note also that the proxies of Lagrangean solutions of this model may be used by social planners as co-ordinating indicators (side-payments, e.g. Matsushima, 1993) for a game-form mechanism design and implementation of the nationally optimal institutional structures by autonomous decisions of national institutional design agencies or in the “political market” institutional design game.

The paper is organised as follows. In the third section, we describe the framework of the model. Next we give an abstract specification example of the model where some indicators are specified for illustrative purposes. The paper concludes with an experimental Estonian case study of the prospective partial optimal national economic design and modest conclusions. There is also an illustrative table form for collecting experts’ calibration data for the model.

### 3.3. Set-up

1) In this paper we take into consideration only optimisation of the institutional aspect or economic institutional structure  $x=(x_j)$ ,  $j\hat{I}N=(1,\dots,n)$  *ceteris paribus* and abstract away optimisation of other aspects (e.g. intensities of economic activities, technological structure etc.) and take these other activities as given exogenously with optimal intensities. 2) In this model, we make an optimal choice of optimal institutional structure and model this by describing the co-ordinate variable values  $x_j$  by binary digits 1 or 0, where 1 denotes the choice or enforcing  $x_j$  type of institution, and 0 rejecting  $x_j$  type. 3) Institutional effects on the national socio-economic development probabilities are here assumed to be additive (linear combinations) and the chosen institutional structure  $x$  should satisfy the given linear constraint system  $Ax=b$ , where  $A=(x_{ij})$ ,  $i\hat{I}M=(1,\dots,m)$ ;  $j\hat{I}N$  is institutional “input-output” matrix where element  $x_{ji}$  describes the additive impact of application of institution  $x_j$  (e.g. progressive income tax system) on

the value of the national socio-economic development indicator (e.g. average weighted probability of avoiding national economic failure). The constraint vector  $b=(b_i)$ ,  $i \in \hat{M}$  is the vector of co-ordinates of the external limiting constraint values of socio-economic indicators for the economy. 4) Note that the triple  $\{x, A, b\}$  may contain also “technical” elements to model the constraints like e.g.  $x_1+x_2=1$  e.g. to model that  $x_1$  and  $x_2$  are alternatives etc. 5) The target indicator of the model is functional  $cx$ , where vector  $c=(c_j)$ ,  $j \in \hat{N}$  and co-ordinate  $c_j$  is the impact value (weighted probability) of institutional choice  $x_j$  on the target indicator (e.g. probability of the growth of national economy).

And last but not least: there should be in the model a constraint to avoid too many institutional adjustments and changes to build stable expectations (Voigt and Engerer, 2002) and credible institutional evolution.

### 3.4. Some solution and calibration notes

Implicitly we may have here in mind a two-stage model where at the first stage a structure of  $x$  is fixed (“here and now”) and at the second stage this structure has to meet a certain set of alternative constraints with given realisation probabilities of certain events (e.g. constraints in the case of EU membership, in the case of staying out of the EU etc.) and maximise the expected value of the target function. For simplification we dismiss here the consideration of possibility of corrective (“wait and see”)  $x_j$  type activities in the second stage. Note only that the probabilities of realisations of certain events may be used for calculation of the expected values of target function coefficients.

It is important to add that the initial calibrations of the values of the model parameters are asked from experts, and it is rational to ask these in the form of intervals in the form of e.g.  $a_{ij}=(a_{ijl}, a_{ijh})$ , where letter  $l$  denotes lower value of the estimate and  $h$  denotes higher value of the estimate. This makes the calibration more convenient and the range of the estimation intervals gives some information on uncertainties connected with the parameters of the model.

The interval setting will also enable to use conveniently some kind of sensitivity analysis and the elements of the “wait and see” solution approach. Namely, by random selection of the point values of parameters from the intervals it is possible to formulate numerous random collections of the point parameters of the model and by solving these to produce numerous optimal  $x$  structures. Analysis of the variations of these structures may give some additional information for the social institutional designer.

In the mechanism constructed the social planner is required to disseminate for the agents 1) the shadow cost system to achieve the allocative efficiency and 2) the side payments system for the truth telling. The agents are required to reveal their direct estimates of input-output quantities.

Note that the proxies of Lagrangean solutions of this model may be used by social planner as co-ordinating indicators (shadow prices) for a decentralised game-form mechanism implementation of a nationally optimal institutional structure by autonomous decisions of national institutional agencies.

Also note that for the calculation of the side payments we assume the condition of correlated types of the agents (Aoyagi, 1998).

To justify this inelegant approach we refer to a Roth (2002) statement: “design calls for an engineering approach”, and engineering is really less elegant than simple theoretical modelling.

### 3.5. Illustrative specification example and discussions for Estonian case studies

For illustration we present here a most reduced example of specifications of such kind of model for the partial economic institutional system of the Estonian national economy. These partial specifications demonstrate the very broad spectre of the issues that may be under study in this approach. The specifications of the optimisation vector of the partial institutional structure  $x$ , the constraint vector  $b$ , input-output matrix  $A$  and objective function parameter vector  $c$  in this illustration reflect mainly the present Estonian transformational socio-economic institutional issues. The experimental solution is based only on point estimates.

The choice of the dimension of the vector of institutional choice variables in the linear programming problem has been as follows:  $x=(x_1, x_2, \dots, x_{17})$  in the set  $X$  of the  $n=17$  dimensional integer binary space with the co-ordinate values (0;1). In the following Table-Form the vector of constraint constants is presented  $b=(b_1, b_2, \dots, b_{76})$  in the set  $E76$ ,  $m=76$ . In this vector the first 38 co-ordinates are the constraint values in the situation that will occur if Estonia will miss the first accession wave to the EU in 3 years or so (situation  $C1$ ), and the next 38 constraints belong to the situation where Estonia takes part in the first wave of accession and is in 3-4 years a member of the EU ( $C2$  situation). And in addition to the 76 essential constraints there will be + several technical solution constraints.

Matrix  $A$  of institutional input-output was given with  $n \times m$  elements, and  $c$  was the given vector in  $E17$ . The dual problem variables (Lagrange multipliers) vector was denoted as  $y=(y_1, y_2, \dots, y_{26})$  in the space  $E76+$ . Note here that vector  $c$  elements (co-ordinates) follow the names of vector  $x$  elements and the elements of the matrix  $A$  obtain their names as elements in the set defined by names of the elements of vectors  $x$  and  $b$ .

The institutional essence of the 17 chosen choice variables (0;1) in the experimental model is described as follows:

- $x_1$  - Estonian language as single official state language;
- $x_2$  - changes in the laws to make the Russian legally another state language (the relevant formalised technical constraint of alternativeness for  $x_1$  and  $x_2$  is:  $x_1+x_2=1$ );
- $x_3$  - present flat personal income tax;
- $x_4$  - progressive personal income tax ( $x_3+x_4=1$ );
- $x_5$  - present company income tax on distributed profit only;
- $x_6$  - company income tax on gross profit ( $x_5+x_6=1$ );
- $x_7$  - kroon as the single national legal tender will stay;
- $x_8$  - two parallel national legal tenders will be implemented: kroon and euro ( $x_7+x_8=1$ );
- $x_9$  - national stock exchange as autonomous company;
- $x_{10}$  - national stock exchange affiliated with the Finnish *counterpart* ( $x_9+x_{10}=1$ );
- $x_{11}$  - national electric generating system as state monopoly in the closed market as it is now;
- $x_{12}$  - the same system but in the open market;
- $x_{13}$  - disintegrated privatised monopoly in the open market ( $x_{11}+x_{12}+x_{13}=1$ );
- $x_{14}$  - present monopoly price regulations by the state will stay;
- $x_{15}$  - new amended more effective monopoly price regulations ( $x_{14}+x_{15}=1$ );
- $x_{16}$  - status quo corporal party policy (partocracy) system in national socio-economic decision making will prevail;



$x_{17}$  - shift in election and governmental laws towards civic society rules in socio-economic decision making based on more technocratic principles and national referendums ( $x_{16}+x_{17}=1$ ).

The institutional essence and names of the essential constraint vector elements were formulated according to the following Table-Form indicators and two times in succession: first *C1* and then *C2* state, starting from the second indicator as the first indicator was chosen to be objective function.

**Table-Form**

(Probability %)

Input-output indicators	Alternative institutional variants					
	<i>Status quo</i>		New alter.1		New alter.2	
	Prospective events					
	<i>C1</i>	<i>C2</i>	<i>C1</i>	<i>C2</i>	<i>C1</i>	<i>C2</i>
In the economic sphere (E)						
1. Higher stability of economic development						
2. More stable employment						
3. Improvement of trade balance						
4. Higher attraction of foreign direct investments						
5. Bigger inflow of portfolio investments						
6. Better access to international capital markets						
7. Better ratio of financial reserves/budget						
8. Stable prices						
9. Stable interest rates						
10. Stable currency						
.....						
In the social sphere (S)						
1. Lower value of Gini coefficient						
2. Improvement of average ratio of pensions/salaries						
3. Improvement of unemployment support						
4. Stronger penalties for late payments						
5. Increase of education expenditure						
.....						
In the socio-economic transactions sphere (T)						
1. Better tax legislation						
2. Better labour legislation						
3. Better social insurance legislation						
4. Stronger penalties for late payments						
5. Stronger penalties for breach of contracts						
6. Better protection of property rights						
7. Better enforcement of contracts						
8. More rigorous regulation of monopolies						

.....			
Inputs (“consumption”) of all-national and other complementary Institutional designs (tick the necessary) (M)			
1. Member of the EMU			
2. Zero investment tax			
3. Proportional income tax			
4. Progressive income tax			
5. Better social security system			
6. Stronger penalty systems for breach of economic regulations			
7. Better monopoly regulations			
.....			

The probabilities of the states  $C1$  and  $C2$  to realise were e.g. estimated to be 25% and 75% respectively, and the average expected values of the vector  $c$  elements were weighted according to these probabilities. The matrix  $A$  elements have been estimated by experts experimentally and one example of the initial estimation data for one economic institutional activity is given in Appendix B. All activities were given in this illustration the same significance factors and accordingly the weighting coefficients of all columns of the preliminary matrix  $A$  and vector  $c$  got the same value - 1. Vector  $b$  elements were taken all the same for the  $C1$  situation - 60%, and for  $C2$  - 70%, meaning that membership in the EU demands greater probability of realisation of higher institutional effectiveness.

### 3.6. Conclusions

The purpose of this paper has been specification of the quantifiable linear planning model for the design and implementation analysis of optimal institutional structure for an economic sector of national economy.

In this model the choice variables denote alternative institutional arrangements and the objective function and constraints are mainly focused on modelling economic credibility and stability indicators, the indicators that are the main targets of the influence of institutional designs.

The structural parameters of this model in their content are markedly different from the typical macroeconomic models where direct input-output effects are described. Here the structural parameters describe probabilities that the given institutional alternatives will have prospective better effects than the currently implemented alternatives should have in the future. These types of parameters are most convenient for the experts to quantify as their subjective probabilities. And experiments suggested that in the case of interval estimates there is not much danger to quantify experts' pragmatic overconfidence.

From the modelling aspect the model has binary integer institutional choice variables and the numerical values of the structural parameters are subjective probabilities given by expert questionnaires.

The problems of implementation are solved in this model by assumption of correlated agents and the possibilities for decentralised computations of effective institutional elements are proposed by the shadow price co-ordination system.

The paper demonstrates that application of the linear planning model in the institutional design for the national economy should help to arrange and systematise the lines of reasoning in this field and to quantify the mysterious effects of institutional arrangements. Therefore, the presented model may be a useful complementary tool in the design analysis of national industrial institutional structures. Moving from results of this type of macro-models to the complicated micro-economic “political market games” for national institutional designs we may have a better understanding how to socially co-ordinate these games in a more positive direction.

### References and some latest relevant publications

- Aoki, M. 2001. *Toward a Comparative Institutional Analysis*. Cambridge, MA, MIT Press.
- Barro, R. and Sala-i-Martin, X. 1992. Convergence - *Journal of Political Economy*, 100, 2, 223-249.
- Bewly, T. 2002. Interviews as a Valid Empirical Tool in Economics. – *Journal of Socio-Economics*, 31, 343-353.
- Boeri, T. 2000. Social Europe: Dramatic Visions and Real Complexity. <http://www.cepr.org/pubs/new-dps/dplist.asp?dpno=2371>.
- Brekke, K. and Moxnes, E. 2002. Do Numerical Simulation and Optimization Results Improve Management? - *Journal of Economic Behaviour & Organizations* (forthcoming).
- Brusco, S. and Jackson, M. 1999. The Optimal Design of a Market. - *Journal of Economic Theory*, 88, 1, 1-39.
- Bütner, M. 2000. The Political Feasibility of Pension Reform Options: the Case of Switzerland. - *Journal of Public Economics*, 75, 389-416.
- Casamatta, G., Cremer, H. and Pestieau, P. 2000. Political Sustainability and the Design of Social Insurance. - *Journal of Public Economics*, 75, 341-364.
- Chattaopadhyay, S. and Gottardi, P. 1999. Stochastic OLG models, Market Structure, and Optimality. - *Journal of Economic Theory*, 89, 1, 21-67.
- Corneo, G. and Marquardt, M. 2000. Public Pensions, Unemployment Insurance, and Growth. - *Journal of Public Economics*, 75, 293-311.
- Dewatripont, M. and Roland, G. 1992. Economic Reform and dynamic Political Constraints.- *Review of Economic Studies*, 59, 4, 703-730.
- Dewatripont, M. and Roland, G. 1995. The Design of Reform Packages under Uncertainty. - *The American Economic Review*, 85, 5, 1207-1223.
- Devereux, M., Pearson, M. 1995. European Tax Harmonization and Production Efficiency. - *European Economic Review*, 39, 9, 1657-1681.
- Dougan, W. and Snyder, J. 1996. Interest-Group Politics under Majority Rule. - *Journal of Public Economics*, 61, 1, 49-71.

- Durlauf, S. N. and Quah, D. T. 1998. The New Empirics of Economic Growth. University of Wisconsin, Centre for Economic Performance, Discussion Paper No. 384.
- Eatwell, J., Ellman, M., Karlsson, M., Nuti, M. and Shapiro, J. 1997. Not “Just Another Accession”. The Political Economy of EU Enlargement to the East. Institute for Public Policy Research, London.
- Ellingsen, T. 1998. Externalities vs Internalities: A Model of Political Integration. - *Journal of Public Economics*, 68, 2, 251-268.
- Edwards, S. 1992. The Sequencing of Structural Adjustment and Stabilization, International Center for Economic Growth, Occasional Papers, No. 34, San Francisco.
- Eliasson, G. and Wihlborg, C. 1994. The Necessary Institutional Framework to Transform Formerly Planned Economies. Almqvist & Wiksell International, Stockholm.
- Eliaz, K. 2002. Fault Tolerant Implementation. – *Review of Economic Studies*, 69, 589-610.
- Ennuste, Ü. 1996. On Adaptive Implementation of Economic Systems: A Bayesian Nash Analysis. - *Proc. Estonian Acad. Sci. Humanities and Social Sciences*, 45, 1, 1-12.
- Ennuste, Ü. 2001. Quasi-Implementing Design Mechanisms: Estonian Empirical Illustrations. In: Ü. Ennuste and L. Wilder (eds.), *Factors of Convergence: A Collection for the Analysis of Estonian Socio-Economic and Institutional Evolution*. Tallinn, 325-361.
- Gollier, C., Jullien, B. and Treich, N. 2000. Scientific Progress and Irreversibility: An Economic Interpretation of the “Precautionary Principle”. - *Journal of Public Economics*, 75, 229-253.
- Hagen, R. J. 2002. The Electoral Politics of Public Sector Institutional Reform. – *European Journal of Political Economy*, 18, 449-473.
- Heinemann, F. 2002. The Political Economy of EU Enlargement and the Treaty of Nice. – *European Journal of Political Economy*, 673.
- Hodgson, G. 1998. The Approach of Institutional Economics. - *Journal of Economic Literature*. 36, 1, 166-192.
- Hodgson, G. 2002. The Evolution of Institutions: An Agenda for Future Theoretical Research. - *Constitutional Political Economy* (forthcoming).
- Howitt, P. and Lower, R. 2000. The Emergence of Economic Organization. - *Journal of Economic Behaviour & Organization*, 41, 1, 55-84.
- Hvide, H. 2002. Pragmatic Beliefs and Overconfidence. - *Journal of Economic Behaviour & Organization*, 48, 1, 15-28.
- Intriligator, M. 1997. The Role of Institutions in the Transition to a market Economy. In: *The Transition to a Market Economy. Transformation and Reform in the Baltic States*. Edited by Tarmo Haavisto. Edward Elgar, 222-239.
- Kwoka, J. 2002. Vertical Economies in Electric Power: Evidence on Integration and its Alternatives. - *International Journal of Industrial Organization*. 20, 5, 653-671.
- Ledyard, J. and Palfrey, T. 1999. A Characterization of Interim Efficiency with Public Goods. – *Econometrica*, 67, 2, 435-448.

- Ledyard, J. and Palfrey, T. 2002. The Approximation of Efficient Public Good Mechanisms by Simple Voting Schemes. - *Journal of Public Economics*, 83, 2, 153-171.
- Laven, L. and Perotti, E. 2001. Confidence Building in Emerging Stock Markets. CEPR Discussion Paper Series No. 3055.
- Matsushima, H. 1993. Bayesian Monotonicity with Side Payments. - *Journal of Economic Theory*, 59, 1, 107-121.
- Miles, D. 2000. Funded and Unfunded Pensions: Risk, Return and Welfare. <http://www.cepr.org/pubs/new-dps/dplist.asp?dpno=2369>.
- Nelson, R. and Sampat, B. 2001. Making Sense of Institutions as a Factor Shaping Economic Performance. - *Journal of Economic Behaviour & Organizations*. 44, 1, 31-54.
- North, D. 1998. Where have we been and where are we going? In: Economics, Values, and Organizations. Edited by A. Ben-Ner and L. Putterman. Cambridge University Press, New York, 491-508.
- Piazolo, D. 1999. The Credibility and Growth Effects of EU Institutions on Eastern Europe. European Investment Bank, Economic and Financial Reports, Report No. 99/P2.
- Rodrik, D. 2000. Institutions For High-Quality Growth: What They Are And How To Acquire Them. <http://www.cepr.org/pubs/new-dps/dplist.asp?dpno=2370>.
- Roth, A. 2002. The Economist as Engineer: Game Theory, Expectation, and Computation as Tools for Design Economics. - *Econometrica*, 70, 4, 1341-1378.
- Saint-Paul, G. 2002. The Complexity of Economic Policy: I. Restricted Local Optima in Tax Policy Design. CEPR Discussion Papers.
- Treaty Establishing the European Community. 1997. Consolidated version - *Official Journal C* 340, 10.11.1997, 173-308.
- Voigt, S. and Engerer, H. 2002. Institutions and Transition. - Possible Policy Implications of the New Institutional Economics. In: K. Zimmermann (ed.): *Frontiers in Economics*, Berlin, Springer.
- Wallner, K. 1997. Anticipatory Specific Investments and the EU Enlargement Negotiations. SITE Working Papers No.124, Stockholm School of Economics.
- Yu, T. 2001. An Entrepreneurial Perspective of Institutional Change.- *Constitutional Political Economy*, 12, 2, 217-236.



### Appendix A.3. Fiscal burden of government (acronym FISC\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Belgium	...	5	5	5	5	5	5	5
Bulgaria	5	5	5	4.5	4	4	4	4.5
Czech Republic	4	4	4	4.5	4	4	4	4.5
Cyprus	...	3	3	4	3.5	3.5	3.5	3.5
Denmark	...	4	4.5	4.5	4.5	4.5	4.5	4.5
Estonia	4	4	4	4	4	4	3.5	3.5
Finland	...	4	4	4.5	4.5	4.5	4.5	4.5
France	4	4	5	5	4.5	5	5	5
Germany	5	5	5	5	5	5	5	4.5
Greece	4	4	4	4	4	4	4.5	4
Hungary	5	4	4	4	4	4	4.5	4.5
Ireland	4	4	4	4	4	3.5	3.5	3.5
Italy	5	5	5	5	5	5	5	5
Latvia	...	2.5	3.5	3.5	3.5	3.5	3.5	3.5
Lithuania	...	3	4	4	4.5	4	3.5	3.5
Luxembourg	...	4.5	4.5	3	4	3	4	4
Malta	3.5	3.5	3.5	3.5	3.5	3.5	4	4
Poland	4	4	4	4	4	4	4.5	4.5
Portugal	4	5	4	4	4	4	4	4
Romania	5	5	5	5	5	5	4.5	4
Slovak Republic	4	4	4.5	4.5	4	4	4.5	4.5
Slovenia	...	4	4	4	4	4	4	4.5
Spain	4	4.5	4.5	4.5	4	4	4	4
Sweden	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
The Netherlands	...	4.5	5	5	4.5	4.5	4.5	4
Turkey	3	4	4	3	4	3.5	4	4.5
United Kingdom	4.5	4.5	4	4	4	4	4	4

### Appendix A.4. Government intervention in the economy (acronym GOVE\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	2.5	2.5	2.5	2.5	2.5	2.5	2	2
Belgium	...	2	2	2	2	2	2	2
Bulgaria	3	3	3	3	3	3	3	3
Czech Republic	2	2	2	2	2	2	2	2
Cyprus	...	3	3	3	3	3	3	3
Denmark	...	4	4	4	4	4	4	3
Estonia	2	2	2	2	2.5	2	2	2
Finland	...	2.5	2	2	2.5	2.5	2	2
France	2	2	2	2	2	2	2	3
Germany	2	2	3	2	2	2	2	2
Greece	3	2	2	2.5	2.5	2.5	2.5	2
Hungary	2	3	3	3	2.5	1.5	2	1
Ireland	2	2	2	2	2	2	2	2
Italy	3	2	2	2	2	2	2	2
Latvia	...	2	2	2	2	2	3	2
Lithuania	...	2.5	2	2	2	2	2	2
Luxembourg	...	2.5	2.5	2.5	2.5	2	2.5	3
Malta	4	3	3	3	3	3	3	3
Poland	3	3	2	2	2	2	2	2
Portugal	3	2.5	2	2	2	2	2	2
Romania	5	4.5	3	3	3	3	2	3
Slovak Republic	3	3	3	3	3	3	2	3
Slovenia	...	2	3	3	3	3	3	3
Spain	2	2.5	2	2	3	3	3	3
Sweden	5	5	5	5	4	4	4	4
The Netherlands	...	2.5	2.5	2	2	2	2	2
Turkey	2	2	2	1	2	2	2	2.5
United Kingdom	3.5	2.5	2	2.5	2	2	2	2

### Appendix A.5. Monetary policy (acronym MONE\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	2	2	1	1	1	1	1	1
Belgium	...	1	1	1	1	1	1	1
Bulgaria	5	5	5	5	5	5	5	5
Czech Republic	4	4	3	3	3	3	2	2
Cyprus	...	2	2	2	2	1	1	2
Denmark	...	1	1	1	1	1	1	1
Estonia	5	5	5	5	5	4	3	2
Finland	...	1	1	1	1	1	1	1
France	1	1	1	1	1	1	1	1
Germany	2	2	1	1	1	1	1	1
Greece	4	4	3	3	3	2	2	2
Hungary	5	5	5	5	5	4	4	3
Ireland	1	1	1	1	1	1	1	2
Italy	2	2	2	2	1	1	1	1
Latvia	...	5	5	5	4	3	2	2
Lithuania	...	5	5	5	5	4	2	1
Luxembourg	...	1	1	1	1	1	1	1
Malta	2	2	2	2	2	1	1	1
Poland	5	5	5	5	4	4	3	3
Portugal	3	3	2	2	1	1	1	1
Romania	5	5	5	5	5	5	5	5
Slovak Republic	4	4	3	3	3	2	3	3
Slovenia	...	5	5	4	3	3	3	3
Spain	2	2	2	2	1	1	1	1
Sweden	2	2	1	1	1	1	1	1
The Netherlands	...	1	1	1	1	1	1	1
Turkey	5	5	5	5	5	5	5	5
United Kingdom	1	1	2	1	1	2	1	1

### Appendix A.6. Capital flows and foreign investment (acronym FORE\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	2	2	2	2	2	2	2	2
Belgium	...	2	2	2	2	2	2	1
Bulgaria	2	2	3	3	2	2	2	2
Czech Republic	2	2	2	2	2	2	2	2
Cyprus	...	2	2	2	3	3	3	3
Denmark	...	2	2	2	2	2	2	2
Estonia	1	1	1	1	1	1	1	1
Finland	...	2	2	2	2	2	2	2
France	3	3	3	3	3	3	3	3
Germany	2	2	2	2	2	2	1	1
Greece	2	2	2	2	2	2	2	3
Hungary	2	2	2	2	2	2	2	2
Ireland	2	2	2	2	2	2	1	1
Italy	2	2	2	2	2	2	2	2
Latvia	...	3	2	2	2	2	2	2
Lithuania	...	3	2	2	2	2	2	2
Luxembourg	...	2	2	2	2	2	1	1
Malta	2	2	2	2	2	2	3	3
Poland	2	2	2	2	2	2	2	2
Portugal	3	2	2	2	2	2	2	2
Romania	2	2	2	2	2	2	3	3
Slovak Republic	2	2	3	3	3	3	2	2
Slovenia	...	4	3	2	2	3	3	3
Spain	2	2	2	2	2	2	2	2
Sweden	2	2	2	2	2	2	2	1
The Netherlands	...	2	2	2	2	2	1	1
Turkey	2	2	2	2	2	2	2	3
United Kingdom	2	2	2	2	2	2	2	2



**Appendix A.7. Banking and Finance (acronym BANK\_)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	1	1	1	2	2	2	2	2
Belgium	...	2	2	2	2	2	2	2
Bulgaria	3	3	3	3	3	3	3	3
Czech Republic	1	1	1	1	1	1	1	1
Cyprus	...	2	2	2	2	2	2	2
Denmark	...	2	2	2	2	2	2	1
Estonia	2	2	2	2	2	2	2	1
Finland	...	3	3	3	3	3	3	2
France	3	3	3	3	3	3	3	3
Germany	2	2	2	3	3	3	3	3
Greece	4	4	4	4	4	4	3	3
Hungary	3	2	2	2	2	2	2	2
Ireland	2	2	2	2	2	2	1	1
Italy	3	3	2	2	2	2	2	2
Latvia	...	3	2	2	2	2	2	2
Lithuania	...	4	3	3	3	3	3	3
Luxembourg	...	2	2	2	2	2	1	1
Malta	3	3	3	3	3	3	2	2
Poland	3	3	3	3	3	3	3	2
Portugal	3	3	3	3	3	3	3	3
Romania	3	3	3	3	3	3	4	4
Slovak Republic	3	3	3	3	3	3	3	2
Slovenia	...	2	2	2	2	3	3	3
Spain	2	3	3	2	2	2	2	2
Sweden	3	3	2	2	2	2	2	1
The Netherlands	...	1	1	1	1	1	1	1
Turkey	2	2	2	2	2	2	3	3
United Kingdom	1	1	1	1	1	1	1	1

**Appendix A.8. Wages and prices (acronym WAGE\_)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria		2	2	2	2	2	2	2
Belgium	...		2	2	2	2	2	2
Bulgaria	3	3	3	3	3	3	3	2
Czech Republic	2	2	2	2	2	2	2	2
Cyprus	...	3	3	3	3	3	3	2
Denmark	...	1	1	1	1	1	1	1
Estonia	2	2	2	2	2	2	2	1
Finland	...	3	3	2	2	2	2	2
France	3	3	3	3	3	3	3	3
Germany	2	2	2	2	2	2	2	2
Greece	3	3	3	3	3	3	3	3
Hungary	2	2	2	2	2	2	2	2
Ireland	2	2	2	2	2	2	2	2
Italy	2	3	2	2	2	2	2	2
Latvia	...	2	2	2	2	2	2	2
Lithuania	...	3	3	3	3	3	2	2
Luxembourg	...	2	2	2	2	2	2	2
Malta	4	4	4	4	4	4	4	3
Poland	3	3	3	3	3	3	3	3
Portugal	2	2	2	2	2	2	2	2
Romania	2	2	2	2	2	2	2	3
Slovak Republic	3	3	3	3	3	3	3	3
Slovenia	...	3	3	3	3	3	3	3
Spain	3	3	3	3	3	3	3	2
Sweden	2	2	2	2	2	2	2	2
The Netherlands	...	2	2	2	3	3	3	2
Turkey	3	3	3	3	3	3	3	3
United Kingdom	2	2	2	2	2	2	2	2

### Appendix A.9. Property rights (acronym PROP\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	1	1	1	1	1	1	1	1
Belgium	...	1	1	1	1	1	1	1
Bulgaria	3	3	3	3	3	3	3	3
Czech Republic	2	2	2	2	2	2	2	2
Cyprus	...	3	3	3	2	2	1	1
Denmark	...	1	1	1	1	1	1	1
Estonia	2	2	2	2	2	2	2	2
Finland	...	1	1	1	1	1	1	1
France	2	2	2	2	2	2	2	2
Germany	1	1	1	1	1	1	1	1
Greece	2	2	2	2	2	2	2	3
Hungary	2	2	2	2	2	2	2	2
Ireland	1	1	1	1	1	1	1	1
Italy	2	2	2	2	2	2	2	2
Latvia	...	3	3	3	3	3	3	3
Lithuania	...	3	3	3	3	3	3	3
Luxembourg	...	1	1	1	1	1	1	1
Malta	3	3	3	2	2	2	1	1
Poland	3	2	2	2	2	2	2	2
Portugal	2	2	2	2	2	2	2	2
Romania	4	4	4	4	4	4	4	4
Slovak Republic	2	3	3	3	3	3	3	3
Slovenia	...	4	3	2	2	2	2	3
Spain	2	2	2	2	2	2	2	2
Sweden	2	2	2	2	2	2	1	1
The Netherlands	...	1	1	1	1	1	1	1
Turkey	2	2	2	2	2	2	2	3
United Kingdom	1	1	1	1	1	1	1	1

### Appendix A.10. Regulation (acronym REGU\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	3	3	3	3	3	3	3	3
Belgium	...	3	3	3	3	3	3	3
Bulgaria	4	4	4	4	4	4	4	4
Czech Republic	1	1	1	2	2	2	2	3
Cyprus	...	2	2	2	2	2	2	2
Denmark	...	2	2	2	2	2	2	2
Estonia	2	2	2	2	2	2	2	2
Finland	...	4	3	3	3	3	3	2
France	2	2	2	2	2	3	3	3
Germany	2	3	3	4	3	3	3	3
Greece	3	3	3	3	3	3	3	3
Hungary	2	3	3	3	3	3	3	3
Ireland	2	2	2	2	2	2	2	2
Italy	2	3	3	3	3	3	3	3
Latvia	...	3	2	3	3	3	3	3
Lithuania	...	3	3	3	3	3	3	3
Luxembourg	...	2	2	2	2	2	2	2
Malta	3	3	3	3	3	3	3	3
Poland	3	3	3	3	3	3	3	3
Portugal	3	3	3	3	3	3	3	3
Romania	4	4	4	4	4	4	4	4
Slovak Republic	2	3	3	3	3	3	3	3
Slovenia	...	3	3	3	3	3	2	2
Spain	3	3	3	3	3	3	3	3
Sweden	3	3	3	3	3	3	3	3
The Netherlands	...	2	2	3	3	3	3	3
Turkey	2	2	3	3	3	3	3	4
United Kingdom	1	2	2	2	2	2	2	2

### Appendix A.11. Black market (acronym BLAC\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	1	1	1	1	1	1	1	1.5
Belgium	...	1	1	1	1	1	1	2
Bulgaria	4	4	4	4	4	3	3	3.5
Czech Republic	3	3	4	3	3	3	3	3.5
Cyprus	...	3	3	3	3	3	3	2
Denmark	...	1	1	3	3	3	2	1
Estonia	3	3	3	2	2	2	2	2.5
Finland	...	1	1	1	1	1	1	1
France	1	1	1	1	1	1	1	2
Germany	1	1	1	1	1	1	1	1.5
Greece	3	3	3	3	3	3	3	3
Hungary	3	3	3	3	3	2	2	2.5
Ireland	3	3	3	1	1	1	1	1.5
Italy	2	1	2	2	2	2	2	2.5
Latvia	...	3	4	4	4	4	4	3.5
Lithuania	...	4	4	4	4	4	4	3
Luxembourg	...	1	1	1	1	1	1	1
Malta	5	5	4	4	4	4	4	4
Poland	3	2	3	3	3	3	3	3.5
Portugal	2	2	2	2	2	2	2	2
Romania	5	4	4	3	3	3	4	4
Slovak Republic	3	3	3	3	3	3	3	3.5
Slovenia	...	4	3	3	3	3	3	2.5
Spain	3	3	2	2	2	2	2	2
Sweden	1	1	1	1	1	1	1	1
The Netherlands	...	1	1	1	1	1	1	1
Turkey	5	5	3	3	3	3	3	3.5
United Kingdom	1	1	1	1	1	1	1	1.5

**Appendix B. Indices of political rights and civil liberties from ANNUAL FREEDOM IN THE WORLD COUNTRY SCORES 1972-73 TO 2000-2001 (<http://www.freedomhouse.org/ratings/index.htm>)**

**Appendix B.1. Index of political rights (acronym POLI\_ followed by country acronym in regressions)**

Country	Regressor	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Austria	POLI_AUS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Belgium	POLI_BEL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Denmark	POLI_DEN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Finland	POLI_FIN	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
France	POLI_FRA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Germany	POLI_GER	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1	1	1	1	1	1	1
Greece	POLI_GRE	2	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Ireland	POLI_IRE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Italy	POLI_ITA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Luxembourg	POLI_LUX	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
The Netherlands	POLI_HOL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Portugal	POLI_POR	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spain	POLI_SPA	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sweden	POLI_SWE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
United Kingdom	POLI_UK	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bulgaria	POLI_Bul	7	7	7	7	7	7	7	7	7	7	3	2	2	2	2	2	2	2	2	2	2	2
Czech Republic	POLI_CZR	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1	1	1	1
Cyprus	POLI_CYP	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Estonia	POLI_EST	...	...	...	...	...	...	...	...	...	...	...	2	3	3	3	2	1	1	1	1	1	1
Hungary	POLI_HUN	6	6	6	6	6	5	5	5	5	4	2	2	2	1	1	1	1	1	1	1	1	1
Latvia	POLI_LAT	...	...	...	...	...	...	...	...	...	...	...	2	3	3	3	2	2	1	1	1	1	1
Lithuania	POLI_LIT	...	...	...	...	...	...	...	...	...	...	...	2	2	1	1	1	1	1	1	1	1	1
Malta	POLI_MAL	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Poland	POLI_POL	6	5	6	6	6	6	6	5	5	4	2	2	2	2	2	1	1	1	1	1	1	1
Romania	POLI_ROM	7	7	7	7	7	7	7	7	7	7	6	5	4	4	4	4	2	2	2	2	2	2
Slovak Republic	POLI_SLR	...	...	...	...	...	...	...	...	...	...	...	...	...	3	2	2	2	2	2	1	1	1
Slovenia	POLI_SLO	...	...	...	...	...	...	...	...	...	...	...	2	2	1	1	1	1	1	1	1	1	1
Turkey	POLI_TUR	5	5	4	4	3	3	3	2	2	3	2	2	2	4	5	5	4	4	4	4	4	4

**Appendix B.2. Index of civil liberties (acronym CIVI\_ followed by country acronym in regressions)**

Country	Regressor	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Austria	CIVI_AUS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Belgium	CIVI_BEL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Denmark	CIVI_DEN	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Finland	CIVI_FIN	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
France	CIVI_FRA	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Germany	CIVI_GER	...	...	...	...	...	...	...	...	...	...	2	2	2	2	2	2	2	2	2	2	2
Greece	CIVI_GRE	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
Ireland	CIVI_IRE	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1
Italy	CIVI_ITA	2	2	2	2	1	1	1	1	1	1	1	1	2	3	2	2	2	2	2	2	2
Luxembourg	CIVI_LUX	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
The Netherlands	CIVI_HOL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Portugal	CIVI_POR	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1
Spain	CIVI_SPA	3	3	2	2	2	2	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2
Sweden	CIVI_SWE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
United Kingdom	CIVI_UK	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Bulgaria	CIVI_Bul	7	7	7	7	7	7	7	7	7	7	4	3	3	2	2	2	3	3	3	3	3
Czech Republic	CIVI_CZR	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	2	2	2	2	2	2
Cyprus	CIVI_CYP	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Estonia	CIVI_EST	...	...	...	...	...	...	...	...	...	...	...	3	3	2	2	2	2	2	2	2	2
Hungary	CIVI_HUN	5	5	5	5	5	5	5	4	4	3	2	2	2	2	2	2	2	2	2	2	2
Latvia	CIVI_LAT	...	...	...	...	...	...	...	...	...	...	...	3	3	3	2	2	2	2	2	2	2
Lithuania	CIVI_LIT	...	...	...	...	...	...	...	...	...	...	...	3	3	3	3	2	2	2	2	2	2
Malta	CIVI_MAL	3	3	3	4	4	4	4	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Poland	CIVI_POL	4	4	5	5	5	5	5	5	5	3	2	2	2	2	2	2	2	2	2	2	2
Romania	CIVI_ROM	6	6	6	6	7	7	7	7	7	7	5	5	4	4	3	3	3	2	2	2	2
Slovak Republic	CIVI_SLR	...	...	...	...	...	...	...	...	...	...	...	...	...	4	3	3	4	4	2	2	2
Slovenia	CIVI_SLO	...	...	...	...	...	...	...	...	...	...	...	3	2	2	2	2	2	2	2	2	2
Turkey	CIVI_TUR	5	5	5	5	5	5	4	4	4	3	4	4	4	4	5	5	5	5	5	5	5

**Appendix C. Life expectancy and education indicators for 1999 from Human Development Report 2001.**  
<http://www.undp.org/hdr2001/>

HDI rank	Country	Life expectancy at birth (years)	Combined primary, secondary and tertiary gross enrolment ratio(%)	Life expectancy index	Education index
1	Norway	78.4	97	0.89	0.98
2	Australia	78.8	116	0.90	0.99
3	Canada	78.7	97	0.89	0.98
4	Sweden	79.6	101	0.91	0.99
5	Belgium	78.2	109	0.89	0.99
6	United States	76.8	95	0.86	0.98
7	Iceland	79.1	89	0.90	0.96
8	Netherlands	78.0	102	0.88	0.99
9	Japan	80.8	82	0.93	0.93
10	Finland	77.4	103	0.87	0.99
11	Switzerland	78.8	84	0.90	0.94
12	Luxembourg	77.2	72	0.87	0.90
13	France	78.4	94	0.89	0.97
14	United Kingdom	77.5	106	0.87	0.99
15	Denmark	76.1	97	0.85	0.98
16	Austria	77.9	90	0.88	0.96
17	Germany	77.6	94	0.88	0.97
18	Ireland	76.4	91	0.86	0.96
19	New Zealand	77.4	99	0.87	0.99
20	Italy	78.4	84	0.89	0.94
21	Spain	78.3	95	0.89	0.97
22	Israel	78.6	83	0.89	0.91
23	Greece	78.1	81	0.89	0.92
24	Hong Kong, China	79.4	63	0.91	0.83
25	Cyprus	77.9	68	0.88	0.87
26	Singapore	77.4	75	0.87	0.87
27	Korea, Rep. of	74.7	90	0.83	0.95
28	Portugal	75.5	96	0.84	0.93
29	Slovenia	75.3	83	0.84	0.94
30	Malta	77.9	80	0.88	0.88
31	Barbados	76.6	77	0.86	0.90
32	Brunei	75.7	76	0.85	0.86
33	Czech Republic	74.7	70	0.83	0.89
34	Argentina	73.2	83	0.80	0.92
35	Slovakia	73.1	76	0.80	0.91
36	Hungary	71.1	81	0.77	0.93
37	Uruguay	74.2	79	0.82	0.92
38	Poland	73.1	84	0.80	0.94

39	Chile	75.2	78	0.84	0.90
40	Bahrain	73.1	80	0.80	0.85
41	Costa Rica	76.2	67	0.85	0.86
42	Bahamas	69.2	74	0.74	0.89
43	Kuwait	76.0	59	0.85	0.74
44	Estonia	70.3	86	0.76	0.94
45	United Arab	74.8	68	0.83	0.73
46	Croatia	73.6	68	0.81	0.88
47	Lithuania	71.8	80	0.78	0.93
49	Trinidad and	74.1	65	0.82	0.84
50	Latvia	70.1	82	0.75	0.93
51	Mexico	72.4	71	0.79	0.84
52	Panama	73.9	74	0.81	0.86
53	Belarus	68.5	77	0.73	0.92
54	Belize	73.8	73	0.81	0.86
55	Russian	66.1	78	0.69	0.92
56	Malaysia	72.2	66	0.79	0.80
57	Bulgaria	70.8	72	0.76	0.90
58	Romania	69.8	69	0.75	0.88
60	Macedonia, FYR	73.0	70	0.80	0.86
61	Venezuela	72.7	65	0.79	0.83
62	Colombia	70.9	73	0.76	0.85
63	Mauritius	71.1	63	0.77	0.77
64	Suriname	70.4	82	0.76	0.89
65	Lebanon	72.9	78	0.80	0.83
66	Thailand	69.9	60	0.75	0.84
67	Fiji	68.8	83	0.73	0.90
68	Saudi Arabia	71.3	61	0.77	0.71
69	Brazil	67.5	80	0.71	0.83
70	Philippines	69.0	82	0.73	0.91
72	Armenia	72.7	80	0.80	0.92
73	Peru	68.5	80	0.72	0.86
74	Ukraine	68.1	77	0.72	0.92
75	Kazakhstan	64.4	77	0.66	0.92
77	Maldives	66.1	77	0.68	0.90
78	Jamaica	75.1	62	0.84	0.78
79	Azerbaijan	71.3	71	0.77	0.88
80	Paraguay	69.9	64	0.75	0.83
81	Sri Lanka	71.9	70	0.78	0.84
82	Turkey	69.5	62	0.74	0.77
83	Turkmenistan	65.9	81	0.68	0.92
84	Ecuador	69.8	77	0.75	0.86
85	Albania	73.0	71	0.80	0.80

86	Dominican	67.2	72	0.70	0.79
87	China	70.2	73	0.75	0.80
88	Jordan	70.1	55	0.75	0.78
89	Tunisia	69.9	74	0.75	0.71
90	Iran, Islamic Rep.	68.5	73	0.73	0.75
91	Cape Verde	69.4	77	0.74	0.75
92	Kyrgyzstan	67.4	68	0.71	0.87
93	Guyana	63.3	66	0.64	0.87
94	South Africa	53.9	93	0.48	0.87
95	El Salvador	69.5	63	0.74	0.73
96	Samoa (Western)	68.9	65	0.73	0.75
97	Syrian Arab	70.9	63	0.76	0.70
98	Moldova	66.6	72	0.69	0.90
99	Uzbekistan	68.7	76	0.73	0.84
100	Algeria	69.3	72	0.74	0.69
101	Vietnam	67.8	67	0.71	0.84
102	Indonesia	65.8	65	0.68	0.79
104	Bolivia	62.0	70	0.62	0.80
105	Egypt, Arab Rep.	66.9	76	0.70	0.62
106	Nicaragua	68.1	63	0.72	0.66
107	Honduras	65.7	61	0.68	0.70
108	Guatemala	64.5	49	0.66	0.62
109	Gabon	52.6	86	0.46	0.71
110	Equatorial Guinea	50.6	64	0.43	0.76
111	Namibia	44.9	78	0.33	0.80
112	Morocco	67.2	52	0.70	0.49
113	Swaziland	47.0	72	0.37	0.77
114	Botswana	41.9	70	0.28	0.74
115	India	62.9	55	0.63	0.56
116	Mongolia	62.5	58	0.62	0.61
117	Zimbabwe	42.9	65	0.30	0.80
119	Ghana	56.6	42	0.53	0.61
120	Lesotho	47.9	61	0.38	0.75
121	Cambodia	56.4	62	0.52	0.66
122	Papua New	56.2	38	0.52	0.55
123	Kenya	51.3	51	0.44	0.71
124	Comoros	59.4	35	0.57	0.51

125	Cameroon	50.0	43	0.42	0.64
126	Congo, Rep.	51.1	63	0.44	0.74
127	Pakistan	59.6	40	0.58	0.43
128	Togo	51.6	62	0.44	0.58
129	Nepal	58.1	60	0.55	0.47
130	Bhutan	61.5	33	0.61	0.39
131	Lao People's	53.1	58	0.47	0.51
132	Bangladesh	58.9	37	0.57	0.39
133	Yemen, Rep.	60.1	51	0.59	0.47
134	Haiti	52.4	52	0.46	0.50
135	Madagascar	52.2	44	0.45	0.59
136	Nigeria	51.5	45	0.44	0.57
139	Mauritania	51.1	40	0.43	0.41
140	Tanzania	51.1	32	0.44	0.61
141	Uganda	43.2	45	0.30	0.59
142	Congo, Dem. Rep.	51.0	31	0.43	0.51
143	Zambia	41.0	49	0.27	0.68
144	Côte d'Ivoire	47.8	38	0.38	0.43
145	Senegal	52.9	36	0.47	0.36
146	Angola	45.0	23	0.33	0.36
147	Benin	53.6	45	0.48	0.41
148	Eritrea	51.8	26	0.45	0.44
149	Gambia	45.9	45	0.35	0.39
150	Guinea	47.1	28	0.37	0.33
151	Malawi	40.3	73	0.26	0.64
152	Rwanda	39.9	40	0.25	0.57
153	Mali	51.2	28	0.44	0.36
154	Central African	44.3	24	0.32	0.38
155	Chad	45.5	31	0.34	0.38
156	Guinea...Bissau	44.5	37	0.33	0.37
157	Mozambique	39.8	23	0.25	0.36
158	Ethiopia	44.1	27	0.32	0.34
159	Burkina Faso	46.1	23	0.35	0.23
160	Burundi	40.6	18	0.26	0.37
161	Niger	44.8	16	0.33	0.15
162	Sierra Leone	38.3	27	0.22	0.30





**Appendix D.2. GDP per capita at PPP (current US dollars, acronym GDP+year number)**

<b>Country</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000*</b>
Austria	19850	20589	20846	21650	22753	23261	23523	24013	25107	27001
Belgium	20151	21078	20748	21604	22974	23341	24193	24533	25462	26190
Bulgaria	5626	4994	5053	5278	5700	5242	4874	4967	5163	5808
Czech Republic	...	10733	10952	11364	12458	13360	13272	12891	12963	14285
Cyprus	12932	14453	14549	15563	16896	17323	17573	18017	19005	17838
Denmark	20171	20854	20980	22441	23611	24324	25048	25341	25888	29061
Estonia	7620	6396	6046	6135	6582	6985	8043	8247	8350	7882
Finland	17181	17340	17492	18177	19273	20033	21042	22008	23113	25175
France	18535	19378	19410	20170	21140	21433	21713	22042	22914	24152
Germany	19094	20109	20119	21052	22108	22421	22710	23041	23759	25885
Greece	11673	12062	12317	12733	13406	13897	14305	14651	15425	16817
Hungary	8510	8511	8607	9083	9611	9799	10275	10803	11438	12435
Ireland	13116	14140	14650	15676	17908	19185	21351	22849	25937	29174
Italy	18131	18953	19035	19798	20962	21284	21516	21644	22188	25161
Latvia	7806	5327	4687	4878	5055	5310	5806	6027	6329	6223
Lithuania	8201	6694	5708	5263	5647	6043	6550	6840	6683	6845
Luxembourg	20929	23604	27754	30403	32459	33465	36464	39713	42801	47053
Malta	9623	10476	11139	12116	13284	14001	14590	15216	15759	11616
Poland	5577	5835	5773	6210	6819	7237	7726	8006	8456	9588
Portugal	11750	12424	12453	12998	13824	14522	15108	15406	16078	18021
Romania	5574	5390	5582	5909	6567	6933	6531	6176	6144	4771
Slovak Republic	7885	7591	7413	7929	8698	9332	9874	10173	10599	11643
Slovenia	11335	11131	11781	12299	13244	13883	14630	15065	16109	14312
Spain	13460	14046	14049	14747	15467	16033	16657	17130	18092	20124
Sweden	18260	18710	18576	19221	20522	20956	21273	21483	22653	24843
The Netherlands	18080	19031	19324	20103	21162	22111	22531	23134	24232	27836
Turkey	4928	5310	5773	5474	5946	6306	6639	6635	6374	6439
United Kingdom	16773	17242	17938	18761	19951	20526	21069	21270	22109	24398

\* Data for 2000 from OECD (<http://www.oecd.org/pdf/M00018000/M00018518.pdf>) or from national sources

**Appendix D.3. Inflation, GDP deflator (annual index, acronym INFL)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	1.030	1.022	1.013	1.012	1.008	1.009	1.011	1.017
Belgium	1.024	1.015	1.012	1.013	1.016	1.010	1.012	1.024
Bulgaria	1.960	1.620	2.211	10.491	1.222	1.031	1.056	1.070
Czech Republic	1.100	1.091	1.088	1.080	1.107	1.031	1.009	1.058
Cyprus	1.047	1.026	1.019	1.025	1.022	1.021	1.029	...
Denmark	1.020	1.021	1.025	1.022	1.019	1.030	1.037	1.023
Estonia	1.479	1.289	1.240	1.109	1.089	1.039	1.053	0.995
Finland	1.011	1.008	0.998	1.021	1.030	1.005	1.029	1.025
France	1.017	1.018	1.015	1.013	1.009	1.005	1.009	1.016
Germany	1.028	1.017	1.010	1.008	1.011	1.009	0.996	1.024
Greece	1.109	1.089	1.074	1.068	1.052	1.029	1.035	1.034
Hungary	1.191	1.285	1.212	1.185	1.126	1.084	1.075	1.122
Ireland	1.024	1.025	1.023	1.044	1.058	1.038	1.042	1.041
Italy	1.041	1.052	1.053	1.024	1.027	1.016	1.023	1.028
Latvia	1.357	1.250	1.165	1.066	1.055	1.074	1.041	1.017
Lithuania	1.750	1.395	1.251	1.132	1.067	1.032	1.021	1.008
Luxembourg	1.022	1.019	1.017	1.033	1.015	1.022	1.042	1.027
Malta	1.041	1.040	1.009	1.023	1.023	1.027	1.023	...
Poland	1.332	1.281	1.188	1.140	1.118	1.067	1.071	1.051
Portugal	1.054	1.042	1.030	1.037	1.038	1.033	1.032	1.043
Romania	2.371	1.132	1.453	2.472	1.542	1.478	1.441	1.370
Slovak Republic	1.134	1.100	1.045	1.066	1.051	1.066	1.065	1.053
Slovenia	1.210	1.135	1.111	1.088	1.078	1.066	1.057	1.099
Spain	1.047	1.047	1.035	1.022	1.023	1.029	1.035	1.036
Sweden	1.024	1.029	1.014	1.017	1.009	1.006	1.008	1.029
The Netherlands	1.028	1.019	1.012	1.020	1.019	1.013	1.035	1.047
Turkey	2.050	1.890	1.778	1.815	1.757	1.556	1.499	1.557
United Kingdom	1.025	1.034	1.033	1.029	1.030	1.023	1.018	1.022

**Appendix D.4. Gross capital formation (% of GDP, acronym CAP)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	23.6	24.3	23.7	24.2	24.2	24.0	24.2	23.0
Belgium	20.3	20.1	19.9	20.4	20.9	21.2	21.5	20.7
Bulgaria	...	...	8.4	11.4	16.9	19.1	16.6	16.9
Czech Republic	29.8	34.0	34.3	32.6	30.2	27.9	29.7	30.0
Cyprus	...	...	22.3	19.8	20.8	19.4	18.2	18.6
Denmark	17.6	19.7	18.9	20.8	21.7	20.2	22.1	21.1
Estonia	27.4	26.6	27.8	30.9	29.4	24.6	25.8	28.5
Finland	16.9	17.5	16.8	18.4	19.7	19.3	19.8	20.1
France	19.0	19.2	18.3	17.9	19.1	19.4	20.6	20.1
Germany	23.2	22.7	21.7	21.6	21.8	22.2	22.7	19.6
Greece	19.2	18.9	19.8	20.2	21.9	22.3	22.7	...
Hungary	22.1	23.9	27.2	27.7	29.7	28.5	30.6	27.3
Ireland	16.1	18.1	19.6	21.5	23.4	23.3	23.9	23.4
Italy	18.5	19.3	18.7	18.9	19.3	19.8	20.5	19.7
Latvia	...	...	18.8	22.8	27.6	27.0	27.1	27.7
Lithuania	...	...	24.5	26.5	24.4	22.7	20.7	21.9
Luxembourg	20.4	21.8	20.2	20.4	19.5	22.8	21.2	22.3
Malta	...	...	28.6	25.6	23.7	24.0	27.9	...
Poland	17.6	19.7	21.9	24.6	26.2	26.4	26.5	27.2
Portugal	23.0	24.3	23.8	25.7	26.7	27.2	28.2	28.2
Romania	...	...	25.9	20.6	17.8	17.0	19.4	19.0
Slovak Republic	21.4	26.5	37.1	36.6	36.1	31.9	30.1	34.7
Slovenia	...	...	23.5	24.2	25.6	28.4	27.8	25.5
Spain	21.5	22.3	21.9	22.2	23.2	24.7	25.9	25.5
Sweden	15.9	16.6	15.9	15.6	16.8	17.0	17.9	17.6
The Netherlands	20.3	21.0	21.3	21.6	21.9	22.0	22.3	21.9
Turkey	21.5	25.5	24.6	25.1	24.2	23.4	24.4	15.5
United Kingdom	16.5	16.9	16.8	17.2	18.0	17.5	17.9	16.6

**Appendix D.5. Foreign direct investment, net inflows as % of GDP (acronym FDI)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	...	...	1.9	1.3	2.2	1.4	4.8	...
Belgium	...	...	1.6	3.0	3.9	4.8	7.9	...
Bulgaria	...	...	1.1	5.0	4.4	6.5	8.3	...
Czech Republic	...	...	2.5	2.4	6.5	11.6	9.0	...
Cyprus	...	...	0.6	0.9	0.8	1.3	1.8	...
Denmark	...	...	0.4	1.7	3.8	6.9	21.1	...
Estonia	...	...	3.4	5.7	11.1	6.0	7.8	...
Finland	...	...	0.9	1.7	9.3	3.6	7.5	...
France	...	...	1.4	1.6	2.0	3.2	3.3	...
Germany	...	...	0.3	0.6	1.1	2.6	10.1	...
Greece	...	...	0.9	0.8	...	0.5	1.0	...
Hungary	...	...	5.0	4.7	4.3	4.1	3.7	...
Ireland	...	...	3.6	3.4	12.8	19.9	24.3	...
Italy	...	...	0.3	0.3	0.2	0.6	1.2	...
Latvia	...	...	7.4	9.2	5.9	5.2	5.7	...
Lithuania	...	...	1.9	3.7	8.6	4.6	3.3	...
Luxembourg	...	...	...	...	...	...	...	...
Malta	...	...	8.3	2.4	7.8	22.3	17.7	...
Poland	...	...	3.1	3.4	4.0	4.7	5.9	...
Portugal	...	...	1.5	2.4	2.8	0.9	5.9	...
Romania	...	...	0.7	3.4	4.8	2.9	2.8	...
Slovak Republic	...	...	1.8	0.9	2.6	1.8	10.7	...
Slovenia	...	...	1.0	2.1	1.3	0.9	1.0	...
Spain	...	...	1.1	1.1	2.0	2.6	6.4	...
Sweden	...	...	2.1	4.3	8.1	24.6	9.7	...
The Netherlands	...	...	4.0	2.9	9.6	10.6	14.8	...
Turkey	...	...	0.4	0.4	0.5	0.4	0.5	...
United Kingdom	...	...	2.3	2.8	5.3	6.1	9.5	...

**Appendix D.6. Exports of goods and services (% of GDP, acronym EKSP)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	36.5	36.8	39.6	42.7	43.5	45.1	50.2	52.2
Belgium	67.1	69.0	71.1	75.7	75.8	76.6	88.1	84.4
Bulgaria	...	...	62.9	61.9	48.0	44.1	58.5	60.2
Czech Republic	50.5	53.6	52.5	56.5	58.6	60.9	71.5	71.3
Cyprus	...	...	46.9	47.1	43.5	44.6	47.7	...
Denmark	35.5	35.4	35.8	36.5	35.4	37.4	42.4	45.6
Estonia	75.3	72.0	67.1	78.1	79.9	77.0	83.7	91.1
Finland	35.1	37.0	37.5	39.1	38.8	37.5	42.5	40.1
France	21.5	22.5	23.1	25.5	26.1	26.1	28.7	27.9
Germany	23.6	24.5	25.3	27.9	28.9	29.4	33.4	35.1
Greece	17.6	17.6	17.5	19.4	19.9	20.2	26.1	25.9
Hungary	31.0	36.9	38.9	45.5	50.6	53.0	62.5	60.5
Ireland	70.8	76.3	77.7	79.8	86.8	87.6	96.1	95.4
Italy	23.9	27.0	25.8	26.4	26.4	25.6	28.4	28.3
Latvia	...	...	50.9	51.0	51.3	43.8	45.8	45.5
Lithuania	...	...	53.4	54.5	47.2	39.7	45.2	46.1
Luxembourg	110.6	108.9	106.1	109.8	113.7	113.4	119.6	152.0
Malta	...	...	87.1	85.1	87.7	90.7	103.1	86.3
Poland	23.6	25.4	24.3	25.5	28.2	26.1	27.5	19.8
Portugal	28.4	30.2	29.7	30.4	30.7	29.7	31.4	31.6
Romania	...	...	28.1	29.2	23.3	28.7	33.9	33.9
Slovak Republic	59.1	57.4	55.2	58.0	61.2	61.5	73.5	74.4
Slovenia	...	...	55.8	57.4	56.6	52.5	59.1	60.0
Spain	21.0	22.6	23.9	26.8	27.4	27.3	29.9	29.9
Sweden	36.5	40.5	39.1	42.7	43.7	43.7	47.4	46.5
The Netherlands	54.9	57.4	57.9	61.2	60.9	60.6	71.7	65.3
Turkey	21.4	19.9	21.5	24.6	24.3	23.2	24.1	33.8
United Kingdom	26.5	28.3	29.1	28.5	26.5	25.9	27.2	27.2

### Appendix D.7. High-technology exports (% of manufactured exports, acronym HIGH)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	...	...	10.0	11.4	11.4	12.6	13.7	...
Belgium	...	...	7.6	7.7	8.1	9.4	10.1	...
Bulgaria	...	...	3.8	3.6	...	...	...	...
Czech Republic	...	...	6.9	7.3	7.9	8.3	8.2	...
Cyprus	...	...	6.2	3.9	4.2	4.1	2.5	...
Denmark	...	...	16.2	17.2	17.6	19.4	20.7	...
Estonia	...	...	8.8	9.0	11.6	13.4	29.8	...
Finland	...	...	16.3	19.2	22.0	23.9	27.3	...
France	...	...	18.5	21.3	22.4	22.9	24.3	...
Germany	...	...	12.8	13.6	14.6	15.9	17.7	...
Greece	...	...	6.2	5.5	8.0	9.0	...!	...
Hungary	...	...	5.7	18.0	20.6	22.6	26.4	...
Ireland	...	...	46.6	46.2	44.1	46.7	47.5	...
Italy	...	...	7.7	7.4	7.9	8.1	9.2	...
Latvia	...	...	5.2	6.4	4.0	4.1	4.0	...
Lithuania	...	...	3.5	3.7	3.2	3.1	4.2	...
Luxembourg	...	...	...	...	...	14.6	16.8	...
Malta	...	...	58.9	56.0	60.4	61.7	71.7	...
Poland	...	...	2.9	2.6	2.9	2.6	3.3	...
Portugal	...	...	4.3	4.2	4.0	4.9	...	...
Romania	...	...	1.6	0.9	1.5	3.1	5.6	...
Slovak Republic	...	...	4.0	4.0	4.0	4.0	...!	...
Slovenia	...	...	4.0	4.0	4.0	4.0	5.0	...
Spain	...	...	7.4	6.8	6.7	7.6	7.6	...
Sweden	...	...	17.0	19.0	20.0	21.0	22.0	...
The Netherlands	...	...	26.5	26.6	30.0	32.9	35.5	...
Turkey	...	...	2.0	2.0	2.0	4.0	5.0	...
United Kingdom	...	...	26.4	25.7	28.8	29.8	32.0	...

### Appendix D.8. Personal computers (per 100 persons, acronym PC\_)

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	11.2	16.2	17.4	21.1	23.3	25.7	27.6	28.0
Belgium	15.9	17.8	21.7	24.5	28.6	31.5	34.4	34.5
Bulgaria	1.4	1.7	1.9	2.2	2.4	2.7	4.4	4.4
Czech Republic	4.4	5.3	6.8	8.3	9.7	10.7	12.1	12.1
Cyprus	3.9	5.4	7.7	11.4	13.5	19.3	22.1	25.1
Denmark	19.2	27.1	30.5	36.0	37.7	41.4	43.2	43.2
Estonia	...	...	6.8	9.6	11.4	13.5	15.3	17.5
Finland	15.9	23.2	27.3	31.1	34.9	36.0	39.6	42.4
France	13.5	14.7	16.2	19.4	23.2	26.7	30.4	33.7
Germany	15.1	17.8	20.9	23.9	27.9	29.7	33.6	33.6
Greece	2.9	3.4	3.5	4.5	5.2	6.0	7.0	8.1
Hungary	3.4	3.9	4.4	5.8	6.5	7.5	8.5	10.0
Ireland	15.6	18.3	21.0	24.0	27.3	31.5	35.9	39.1
Italy	7.2	8.4	9.2	11.3	13.3	15.7	18.0	19.5
Latvia	0.3	0.8	2.0	4.0	6.1	8.2	14.0	15.3
Lithuania	0.5	0.7	2.7	3.4	5.4	5.9	6.5	7.1
Luxembourg	...	...	37.1	37.8	38.4	39.0	45.3	51.5
Malta	6.8	8.1	10.7	13.2	15.6	18.1	20.4	23.0
Poland	2.2	2.9	3.1	3.9	4.9	6.2	6.9	8.5
Portugal	4.3	5.5	6.7	7.4	8.1	9.3	10.5	11.7
Romania	1.1	1.3	1.6	1.8	2.1	2.7	3.2	3.6
Slovak Republic	...	...	...	7.0	8.7	10.9	13.7	14.8
Slovenia	7.5	10.1	12.6	18.9	21.1	25.1	27.5	27.6
Spain	4.9	6.1	7.9	9.7	10.9	11.9	14.3	16.8
Sweden	18.2	24.9	29.4	33.9	39.5	45.1	50.7	56.1
The Netherlands	16.9	20.0	23.1	28.1	32.4	35.9	39.4	42.9
Turkey	1.3	1.5	1.8	2.1	2.7	3.4	3.8	4.1
United Kingdom	17.0	20.1	21.6	23.9	26.8	30.3	33.8	36.6

**Appendix D.9. Internet users (per 100 persons, acronym INT)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	1.37	2.01	3.10	4.46	8.79	15.45	25.89	32.00
Belgium	0.69	0.99	2.95	4.91	7.84	11.73	22.69	28.04
Bulgaria	0.02	0.12	0.72	1.20	1.82	2.86	5.27	7.45
Czech Republic	1.26	1.45	1.94	2.91	3.89	6.81	9.73	13.64
Cyprus	0.13	0.41	0.68	4.44	9.08	11.67	15.85	19.72
Denmark	1.35	3.83	5.70	11.35	18.86	28.20	36.54	44.86
Estonia	1.13	2.71	3.45	5.61	10.67	14.42	28.60	31.72
Finland	4.90	13.90	16.78	19.46	25.44	32.27	37.22	43.09
France	0.48	1.64	2.59	4.29	6.34	9.16	14.43	26.46
Germany	0.92	1.84	3.05	6.70	9.87	17.54	29.21	36.50
Greece	0.38	0.76	1.43	1.91	3.33	7.12	9.47	13.24
Hungary	0.49	0.68	0.97	1.95	3.91	5.87	7.00	14.53
Ireland	0.56	1.11	2.20	4.09	8.08	18.10	20.66	23.35
Italy	0.19	0.52	1.02	2.26	4.51	14.22	22.88	27.73
Latvia	...	...	0.80	2.03	3.27	4.36	6.32	7.26
Lithuania	...	...	0.28	0.98	1.97	2.92	6.42	7.17
Luxembourg	0.49	1.59	5.53	7.12	11.72	17.36	22.81	22.52
Malta	0.00	0.26	1.05	3.92	6.49	7.73	13.08	25.26
Poland	0.39	0.65	1.29	2.07	4.09	5.43	7.24	9.83
Portugal	0.73	0.91	2.32	2.71	5.02	10.01	24.98	35.19
Romania	0.03	0.07	0.22	0.44	2.22	2.67	3.57	4.46
Slovak Republic	...	0.52	1.86	3.53	9.28	11.12	12.03	16.64
Slovenia	1.06	2.86	5.02	7.55	10.09	12.59	15.09	30.16
Spain	0.28	0.38	1.34	2.80	4.40	7.18	13.65	18.70
Sweden	3.40	5.10	9.05	23.73	33.45	41.39	45.64	51.73
The Netherlands	...	3.88	5.80	6.41	10.19	18.98	24.50	33.06
Turkey	0.05	0.08	0.20	0.48	0.71	2.33	3.06	3.77
United Kingdom	1.03	1.88	4.08	7.30	13.50	21.01	30.13	40.06

**Appendix D.10. Telephone lines and cellular subscribers per 100 population (from ITU, acronym PHON)**

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	49.4	52.0	55.8	63.6	77.3	99.2	124.2	127.5
Belgium	46.3	48.5	52.1	58.3	67.2	82.0	102.3	124.0
Bulgaria	29.6	30.7	32.0	33.1	34.6	38.5	44.4	55.1
Czech Republic	21.4	24.1	29.3	37.0	45.8	56.0	79.8	103.3
Cyprus	55.4	60.8	67.2	72.5	78.3	85.5	98.1	110.7
Denmark	69.8	77.0	87.0	90.7	102.4	117.9	134.9	146.0
Estonia	26.1	29.8	34.6	42.0	51.4	62.6	75.0	80.8
Finland	68.2	74.4	84.6	97.6	110.2	118.6	127.1	132.6
France	56.5	58.3	60.9	67.9	77.6	94.4	107.0	117.9
Germany	50.6	55.9	60.5	65.2	73.7	87.2	119.7	131.8
Greece	49.2	52.0	56.0	60.5	71.5	89.6	109.7	128.1
Hungary	18.7	23.6	30.6	37.4	44.1	53.3	68.7	87.2
Ireland	37.0	40.7	46.3	55.5	68.7	91.5	107.7	121.4
Italy	46.8	50.2	55.2	65.3	81.0	99.1	121.1	131.0
Latvia	26.3	28.4	30.7	33.0	37.0	41.2	46.9	58.8
Lithuania	24.3	25.8	28.2	32.9	37.3	40.1	46.4	56.6
Luxembourg	58.0	63.2	72.5	81.9	98.7	119.4	143.7	175.0
Malta	46.1	48.8	51.6	54.0	55.8	61.0	81.7	88.4
Netherlands	53.2	55.9	60.7	67.6	80.5	103.1	129.1	136.0
Poland	13.1	15.0	17.5	21.5	27.7	36.5	45.8	55.5
Portugal	36.8	40.2	45.2	55.3	72.1	89.0	109.5	120.1
Romania	12.4	13.1	14.1	16.0	18.9	22.8	28.5	35.5
Slovakia	18.9	21.1	23.7	29.6	37.3	43.0	52.0	68.6
Slovenia	29.8	32.3	35.5	40.5	44.4	69.1	100.6	116.1
Spain	38.6	40.9	46.9	51.4	59.3	71.6	104.3	108.6
Sweden	83.3	90.8	96.4	106.5	118.6	131.9	146.3	151.0
Turkey	20.4	22.2	24.1	27.8	32.3	40.7	52.9	58.7