

#### INSTITUTE OF ECONOMICS HUNGARIAN ACADEMY OF SCIENCES

# MŰHELYTANULMÁNYOK

### **DISCUSSION PAPERS**

MT-DP. 2004/11

# CORPORATE LAW AND CORPORATE GOVERNANCE THE HUNGARIAN EXPERIENCE

ISTVÁN CZAJLIK JÁNOS VINCZE

Institute of Economics Hungarian Academy of Sciences

**Budapest** 

		_	
K 41"11 1 - 1	_YTANU	II	$\sim$ 12
N/IIIHHII	$\mathbf{V} \mathbf{I} \Delta \mathbf{N} \mathbf{I} \mathbf{I}$	II N/I 🛆 NI 🗸	'( )K
	_		OIV

DISCUSSION PAPERS 2004/11

# CORPORATE LAW AND CORPORATE GOVERNANCE THE HUNGARIAN EXPERIENCE

ISTVÁN CZAJLIK JÁNOS VINCZE

> Budapest June 2004

KTK/IE Discussion Papers 2004/11 Institute of Economics Hungarian Academy of Sciences

KTK/IE Discussion Papers are circulated to promote discussion and provoque comments. Any references to discussion papers should clearly state that the paper is preliminary. Materials published in this series may subject to further publication.

# Corporate law and corporate governance. The Hungarian experience

Authors: István CZAJLIK (National Bank of Hungary)

János VINCZE (Budapest University of Economic Sciences and Public Administration; Institute of Economics of HAS)

Please address corresponcence to: János Vincze, BUESPA, Fővám tér 8., Budapest, H–1093. E-mail: janos.vincze@bkae.hu

Acknowledgements: A former version of this paper was written for the ACE Phare Programme (grant number: P98-1008-R). We benefited from comments by Loránd Ambrus-Lakatos, Jan Svejnar, Gerard Roland and Ákos Valentinyi. The views expressed herein do not necessarily represent the official views of the National Bank of Hungary.

HU ISSN 1785-377X ISBN 963 9588 04 0

Published by the Institute of Economics Hungarian Academy of Sciences, Budapest, 2004. With financial support from the Hungarian Economic Foundation

#### The Publications of the Institute of Economics

# BUDAPEST WORKING PAPERS ON THE LABOUR MARKET

BUDAPESTI MUNKAGAZDASÁGTANI FÜZETEK

BWP 2003/1	Ágnes Hárs	Channeled East-West labour migration in the frame of bilateral agreements			
BWP 2003/2	Galasi Péter	Munkanélküliségi indikátorok és az állásnélküliek munkaerő-piaci kötődése			
BWP 2003/3	Károly Fazekas	Effects of foreign direct investment on the performance of local labour markets – The case of Hungary			
BWP 2003/4	Péter Galasi	Estimating wage equations for Hungarian higher-education graduates			
BWP 2003/5	Péter Galasi	Job-training of Hungarian higher-education graduates			
BWP 2003/6	Gábor Kertesi and János Köllő	The Employment Effects of Nearly Doubling the Minimum Wage  – The Case of Hungary			
BWP 2003/7	Nemes-Nagy J. – Németh N.	A "hely" és a "fej". A regionális tagoltság tényezői az ezredforduló Magyarországán			
BWP 2003/8	Júlia Varga	The Role of Labour Market Expectations and Admission Probabilities in Students' Application Decisions on Higher Education: the case of Hungary			
BWP 2004/1	Gábor Kertesi	The Employment of the Roma – Evidence from Hungary			
BWP 2004/2	Kézdi Gábor	Az aktív foglalkoztatáspolitikai programok hatásvizsgálatának módszertani kérdései			
BWP 2004/3	Galasi Péter	Valóban leértékelődtek a felsőfokú diplomák? A munkahelyi követel- mények változása és a felsőfokú végzettségű munkavállalók reallokációja Magyarországon 1994–2002			
BWP 2004/4	Galasi Péter	Túlképzés, alulképzés és bérhozam a magyar munkaerőpiacon 1994–2002			
	LABOUR ECONOM	MICS ganised by KTK/IE and the Labour Science (	Committee HAS)		
Munkaerőpiac é	és regionalitás az átme	enet időszakában. Budapest, 1998.	Ed.: K. Fazekas		
A munkaügyi ka	A munkaügyi kapcsolatok rendszere és a munkavállalók helyzete. Budapest, 2000. Ed.: J. Koltay				
Oktatás és munl	kaerőpiaci érvényesülés	s. Budapest, 2001.	Ed.: A. Semjén		
A felzárkózás e	A felzárkózás esélyei – Munkapiaci látlelet a felzárkózás küszöbén. Budapest, 2003. Ed.: Gy. Kővár				
LABOUR MAR	KET YEARBOOKS				
Munkaerőpiaci tükör – 2000. Budapest, 2000.			Ed.: K. Fazekas		
Munkaerőpiaci tükör – 2001. Budapest, 2001. Ed.: K. Fazek			Ed.: K. Fazekas		
Munkaerőpiaci	tükör – 2002. Budape	st, 2002.	Ed.: K. Fazekas		
	tükör – 2003. Budape		Ed.: K. Fazekas		
•		• •	. Fazekas, J. Koltay		
The Hungarian	Labour Market – Revi	ew and Analysis, 2003. Bp., 2003 Eds.: K	. Fazekas, J. Koltay		

Budapest Working Papers on the Labour Market is jointly published by the Labour Research Department, Institute of Economics Hungarian Academy of Sciences and the Department of Human Resources, Budapest University of Economics and Public Administration. Copies are available from: Ms. Irén Szabó, Department of Human Resources, Budapest University of Economics, and Public Administration. H–1093 Budapest, Fővám tér 8. Phone/fax: 36-1 217-1936 E-mail: iszabo@workecon.bke.hu; Ms. Zsuzsa Sándor, Library of the Institute of Economics, H–1502 Budapest P.O. Box 262, Fax: 36-1 309-2649; E-mail: biblio@econ.core.hu. Papers can be downloaded from the homepage of the Institute of Economics: www.econ.core.hu

<b>MT</b> -DP. 2003/1	NACSA Beáta – SERES Antal	Az éves munkaidő-elszámolás, mint a munkaidő flexibilizációjának egyik eszköze
MT- <b>DP.</b> 2003/2	Giovanni PERI – Dieter URBAN	The Veblen-Gerschenkorn Effect of FDI in Mezzo- giorno and East Germany
MT- <b>DP.</b> 2003/3	Robin MASON – Ákos VALENTINYI	Independence, Heterogeneity and Uniqueness in Interaction Games
MT- <b>DP.</b> 2003/4	M.B. DEVEREUX – C. ENGEL – P.E. STORGAARD	Endogenous Exchange Rate Pass-through when Nominal Prices are Set in Advance
MT-DP. 2003/5	Richard FRIBERG	Common Currency, Common Market?
MT- <b>DP.</b> 2003/6	David C. PARSLEY– Shang-Jin WEI	The Micro-foundations of Big Mac Real Exchange Rates
MT- <b>DP</b> . 2003/7	J.IMBS – H. MUMTAZ – M.O. RAVN – H. REY	PPP Strikes Back: Aggregation and the Real Exchange Rate
MT- <b>DP.</b> 2003/8	A. BURSTEIN –M. EICH- ENBAUM – S. REBELO	Why is inflation so low after large devaluations?
<b>MT</b> -DP. 2003/9	MAJOROS Krisztina	A múlt század jeles magyar közgazdásza: Varga István (1897–1962)
MT-DP. 2003/10	KOVÁCS Ilona	A fogyasztói árindex torzító tényezői
MT- <b>DP</b> . 2003/11	Mária CSANÁDI–Hairong LAI	Transformation of the Chinese party-state at prefecture and county level
MT- <b>DP</b> . 2003/12	Ilona KOVÁCS	Biasing Factors of the Consumer Price Index
MT- <b>DP</b> . 2003/13	Attila HAVAS	Socio-Economic and Developmental Needs: Focus of Foresight Programmes
MT- <b>DP.</b> 2004/1	Attila HAVAS	Assessing the Impact of Framework Programmes in a System in Transition
MT- <b>DP</b> . 2004/2	Max GILLMAN–Michal KEJAK	Inflation and Balanced-Path Growth with Alternative Payment Mechanisms
MT- <b>DP</b> . 2004/3	L. AMBRUS-LAKATOS- B. VILÁGI-J. VINCZE	Deviations from interest rate parity in small open economies: a quantitative-theoretical investigation
<b>MT</b> -DP. 2004/4	HALPERN László és szerzőtársai	A minimálbér költségvetési hatásai
<b>MT</b> -DP. 2004/5	FALUVÉGI Albert	A társadalmi-gazdasági jellemzők területi alakulása és várható hatásai az átmenet időszakában
MT- <b>DP</b> . 2004/6	Mária CSANÁDI	Budget constraints in party-states nested in power relations: the key to different paths of transformation
MT <b>-DP</b> . 2004/7	Mária CSANÁDI	A comparative model of party-states: the structural reasons behind similarities and differences in self-reproduction, reforms and transformation
<b>MT</b> -DP. 2004/8	KARSAI Judit	Helyettesítheti-e az állam a magántőke-befektetőket? Az állam szerepe a magántőke-piacon
MT- <b>DP</b> . 2004/9	Judit KARSAI	Can the state replace private capital investors? Public financing of venture capital in Hungary
MT- <b>DP</b> . 2004/10	Mária CSANÁDI	Are specifics of the Chinese transformation sufficient to avoid system demise?

Copies of both series are available from Ms. Zsuzsa Sándor, Library of Institute of Economics H–1502 Budapest P.O.Box 262 Fax: (36-1) 309-2649 E-mail: biblio@econ.core.hu. Papers can be downloaded from the homepage of the Institute of Economics: www.econ.core.hu



# INSTITUTE OF ECONOMICS HUNGARIAN ACADEMY OF SCIENCES

MŰHELYTANULMÁNYOK

#### **DISCUSSION PAPERS**

MT-DP. 2004/11

# CORPORATE LAW AND CORPORATE GOVERNANCE – THE HUNGARIAN EXPERIENCE

BY ISTVÁN CZAJLIK AND JÁNOS VINCZE

#### Abstract

In this paper our aim was to establish legal facts for Hungary in detail, to put the country's situation into international context, and to find new avenues for comparative research. We updated investor protection indicators already existing in the literature, while determined enforcement indicators for the first time. We hypothesize that besides indicators the dynamics of legislation must be an important topic for research. An analysis of the dynamics of legislation in Hungary indicates that two tendencies could be observed. one responding to actual challenges, leading to more reliance on the interpretation of law by judges, the second following the German-tradition resulting in more bright line rules, and more complicated legal regulation. To make the former workable political and financial independence is a necessary, though not sufficient, condition. We emphasize that though investor protection supports the supply of outside funds, there is a demand side to external finance, and more prudential regulation can lead to less demand for external finance.



#### INSTITUTE OF ECONOMICS HUNGARIAN ACADEMY OF SCIENCES

#### MŰHELYTANULMÁNYOK

#### **DISCUSSION PAPERS**

MT-**DP**. 2004/11

# CZAJLIK ISTVÁN – VINCZE JÁNOS GAZDASÁGI JOG ÉS VÁLLALATIRÁNYÍTÁS – A MAGYAR TAPASZTALAT

# Összefoglalás

Ebben a tanulmányban azt a célt tűztük magunk elé, hogy olyan "jogi tényeket" határozzunk meg Magyarországra, amelyeket a gazdaságirányítás és jog kapcsolatát vizsgáló irodalom fontosnak talált. Igyekszünk az ország helyzetét nemzetközi kontextusba helyezni, és megpróbálunk a további komparatív elemzések számára is új utakat találni. Felfrissítettünk az irodalomból már ismert "befektető védelmi" indikátorokat, és meghatároztunk olyan "jogalkalmazási mutatókat", amelyek tudomásunk szerint eddig nem voltak hozzáférhetőek az irodalomban. Hipotézisünk az, hogy a további kutatás számára a jogalkotás dinamikája nagyon fontosabb téma lehet. A magyarországi jogalkotás némely szegmensének dinamikáját elemezve azt látjuk, hogy két egymással ellentétesnek látszó tendencia látszik kirajzolódni. Egyfelől a jog a gyakorlat kihívásaira próbál meg válaszokat adni, amely sok esetben a törvények bírói interpretációjának viszonylag nagyobb szerepet ad, másfelől viszont jelen van a német jogi tradíció "öntörvényű" jogi fejlődése, a reguláció komplexitásának növekedése, a jogi kiskapuk elkerülésének igényével. Az első irány működőképességének biztosítá-sához a politikától való függetlenség, illetve a pénzügyi függetlenség szükséges feltételek Hangsúlyozzuk, hogy a befektetők védelme ugyan növeli a vállalatok számára elérhető külső források nagyságát, de van egy keresleti oldal is, és az "erősebb" szabályozás csökkentheti a külső források iránti keresletet.

#### 1 Introduction

Corporate governance is a relatively new concept. Its introduction manifests that in the last decades economists have become aware of the difficulties of describing and analyzing the behavior of firms in the traditional (neoclassical) framework, and expresses the theoretical and empirical interest of the profession. Zingales (1998) defines corporate governance as "the complex set of constraints that shape the ex-post bargaining over the quasi-rents generated by the firm", and gives three main reasons why corporate governance matters. First, corporate governance sets up ex ante incentives, second, it alters ex post bargaining efficiency, and third, it allocates risks. Under the traditional approach to the theory of the firm, corporations are seen as simple decision making entities with a well-defined goal, value maximization, which they can actually realize. The new approach claims that the way firms are managed is important from the point of view of economic and social outcomes, and governance can be improved via policy intervention. Interesting problems with respect to the distribution of control rights, to the sharing of profits and quasi rents emerge, accordingly. A substantial body of literature has evolved around these issues, without having reached unanimously agreed upon solutions.

Corporate governance styles vary across and within countries. It is well established today that mature developed economies are not monochromic in their corporate governance structures, and the American (Anglo-Saxon), Japanese or German economies are characterized by their own corporate control mechanisms. Empirical research on other countries has started to discover that the global experience is indeed multicolored (Shleifer–Vishny (1997).

Students of the evolution of economic institutions have pointed out that institutions are heavily influenced by history, there exists path dependence. This must be true with respect to corporate governance styles, as well. In the transition economies of Eastern Europe this path dependence may have peculiar appearances, since here the former governance structures were connected to central planning, an economic framework abandoned around 1990 in this region. Old styles of corporate control became quickly unviable, but their vestiges might have survived. A large literature has treated the problems of privatization (both of banks and of non-financial corporations), bank consolidation (an issue that emerged in practically every transition country and had im-

portant relationship with corporate control), and the restructuring of enterprises. These issues are transitional problems, almost *per se*. After more than a decade on the transition path the more developed transition economies have practically finished with these issues, and have updated their corporate control structures. Still the current mechanisms may significantly differ from those existing in mature market economies, despite being very much different from their socialist forebears.

The problems of corporate governance are tightly interwoven with those of corporate finance. As a move away from the Miller-Modigliani propositions it has been found that financial contracts between enterprises and stakeholders (employees, owners, creditors, etc.) lie in the heart of the corporate governance problem. These contracts determine to a large extent the framework of corporate governance, by creating incentives, and by setting the stage for bargaining processes. For instance, an alternative definition of corporate governance in Shleifer-Vishny (1997) says that it ,,deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment". It is then not surprising that the relationship between nonfinancial corporations and financial markets has also been found to be variable across the world. Rajan-Zingales (1996) shows that in countries where financial markets are less developed sectors where external finance "should be significant" have a definitely lower rate of growth than in countries with more advanced financial markets. This finding can be construed as an indirect proof of the relevance of corporate control mechanisms, too.

By and large the corporate governance literature has been based on the assumption that the main reason why corporate control is an issue is the incompleteness of financial contracting. With contracts incomplete, governance mechanisms have to be devised to fill in the gaps financial markets cannot deal with. Thus corporate governance and financial markets work side by side, and in close interaction. Incomplete contracting provides a role for the legal system, including both laws and enforcement, since laws regulate contracts, and enforcement entails their interpretation in the event of disagreements between contracting parties.

This observation launched a series of studies attempting to identify the relevant features of typical legal systems, claiming that legal differences have resulted in important variation in financial sectors and corporate governance mechanisms across the world. La Porta et al (1997) introduced a set of legal

indicators in order to characterize the quality of investor protection, and showed that countries where investors are less well protected by the legal system have smaller capital markets. La Porta et al. (1998) tried to trace back the differences in legal protection to the legal origins of legal systems, and argued, also, that differences in financial markets, due to different legal protection, may have a large impact on the structure of ownership and on corporate governance in general. More recently Pistor (2000) and Pistor-Raise--Gelfer (2000) have extended this work to former socialist countries in a comparative framework. The most important conclusion of this latter research stresses the importance of enforcement. Whereas, La Porta et al. (1998) concludes that better enforcement does not additionally contribute to financial market depth in their sample of 49 countries (not including any transition economies), Pistor-Raiser-Gelfer (2000) suggests that among transition countries law enforcement is probably a stronger determinant of investor protection than laws on the books. To substantiate this claim in a cross-country empirical study La Porta-Lopez-de-Silanes-Shleifer (2003) examines whether private and public enforcement of the law matters for security markets, and finds an affirmative answer.

It has also been realised that politics play an essential role in financial development. In this spirit Rajan-Zingales (2001) proposes an "interest group" theory of financial development, as an alternative to the La Porta et al.'s (1998) "legal origin" theory. One can take, however, a more liberal view on the theory of financial development. We regard theories as complementary rather than competitive. The legal framework is certainly important for financial development, and it is possible that legal origins have long term effects, the working of the legal system exhibits path dependence. On the other hand interest groups may play substantial roles in shaping both the legal system, and the financial architecture. Needless to say other factors (culture, language, religion) may be also important, as it has been suggested in the literature. A priori it is hardly believable that one would have a single theory that would enable us to explain all the specificities and properties of financial systems and of corporate governance styles. In this paper we focus on the interrelationships between law and corporate governance in present-day Hungary, without endorsing the view that law is the main or even only determinant of corporate governance.

Those authors who want to test broad theories must take a comparative approach, conducting empirical studies involving many countries. Certainly

there is room for individual country studies to check whether their conclusions can stand up to closer scrutiny at the individual level. Our foremost goal is to establish legal facts for Hungary, and to find new avenues for comparative research. We find that some of details so far neglected are possibly important, and it is imperative to emphasis the dynamics of legislation. It is worth to know which events and motives have shaped legal change in order to "forecast" developments in corporate control, and to give better policy advice.

In Section 2 a general overview of the character of Hungarian corporate law is given. In Section 3.1 laws on the books are described, by specifying the values of investor protection indicators developed by La Porta et al (1997), and Pistor (2000) for the Hungarian case as they stand now. Section 3.2 determines the enforcement indicators of La Porta- Lopez-de-Silanes-Shleifer (2003), which has not been done for Hungary to the best of our knowledge, besides giving some material to understand the meaning of law enforcement in the Hungarian context. Section 4 offers two case studies enabling us to appreciate the significance of legal dynamics. Section 5 concludes.

#### 2 ABOUT HUNGARIAN COMMERCIAL LAW

Hungarian civil law is German in legal origin. By the analysis of La Porta et al (1997), this fact would suggest that the chances are not very good for investors' rights being particularly strongly protected by the laws. The sample used by La Porta et al (1997) and La Porta et al (1998) contained six German legal origin countries (Germany, Switzerland, Austria, Japan, South Korea, Taiwan). (The other three groups included common law-origin, French-origin, and Scandinavian-origin countries.) The general result was that outside investors' rights are best protected in common law countries, though German-origin countries perform relatively well in protecting creditors' rights. Among transition economies Pistor (2000) identifies many other German-origin countries, such as Croatia, the Czech Republic, Estonia, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia.

German law is typical "lawyers' law", using a very specific technical language and definitions, striving for absolute preciseness. It makes also a very extensive use of codes. This is in contrast with the judge-made character of Common Law, and the more laymen-oriented French tradition. A corollary of

the German-style approach is that codes are classified in a way that seems strange to non-lawyers, with apparently very different issues being brought together by general concepts. (For instance, selling and doing damage can come together in the same rule, since both acts create "in personam" rights.).

In Hungary under the socialist era, business law did not have a particularly prominent role in regard to the management of firms. (See Kereszty (1999).) The Hungarian reform process in the late 1980s put great stress on modernizing company law, as a necessary means to transform the enterprise sector, wishing to lay the foundations of a primarily private property based market economy. However, the 1988 Company Law was found deficient in many respects, giving rise to a new wave of law-making that resulted in a new company law promulgated in 1998. It is interesting to quote from the preamble of this latter statute:

"In 1988 the primary aim of legislation, understandably in view of the state dominance under socialism, was to pave the way for entrepreneurship and the founding of private companies by residents and non-residents alike. Necessarily, this was only made possible by neglecting the protection of creditors, and consequently and sadly, this facilitated the abuse of law." (*Translation of the authors.*)

Whether the "neglect of creditor protection" was indeed a necessity, is a problem we will not address below. Still one related point should be noted here. The opinion inherent in this quotation implies that entrepreneurship is hindered by strong protection of investors. We will return to this view in the concluding section.

A closer look at the new legislation gives the impression that legislators in 1998 did not quite, or not solely, care for the amelioration of creditors' and equity holders' position. Rather they were anxious about the destiny of those claimants who acquired liabilities in enterprises, as it were, unintentionally. Examples include the government (tax liabilities, or social security contribution liabilities), suppliers (if we think that some trade credit is normally arising in business, and is not fully intentional), or society at large (by having shares in firms via the State Property Agency). Indeed, the new legislation seemed to be concerned with defining as criminal offence many acts that had accompanied the privatization of many formerly state owned business entities via their decapitalization.

A Bankruptcy Law was promulgated in 1992, whose explicit aim was to quicken the enterprise restructuring process. It forced into bankruptcy thousands of enterprises, but the law preferred reorganization, and left managers with significant room of manoeuvre, thereby tending to be less protective towards creditors.

#### 3 LAWS ON THE BOOKS AND ENFORCEMENT IN HUNGARY

#### 3.1 Laws on the books

La Porta et al. ((1997) (1998)) advance the idea that the origin of legal systems has a very strong impact on the way outside investors' rights are protected. These papers attempt to prove that the efficiency of financial systems is, to a large extent, determined by the strength of legal protection. Even if one believes that enforcement is probably more important, or stresses the importance of cultural (religious) origins, or even if agrees with Rajan-Zingales (2001) that the political structure has in fact the most crucial impact on the evolution of the financial sector, one must admit that the law probably plays a significant role. Pistor (2000), extending this research into transition countries, defined new indicators, to cover a wider range of laws intended to protect outside investors.

First we replicated the indicators reflecting shareholder rights. This first group of legal indicators measures how well any given system of laws protects minority shareholders' rights. An indicator of 1 means strong protection, whereas 0 a lack of protection. Legal protection of outside equity holders does not seem to be strong in Hungary, and international comparisons show that it is weak even in a transition country context, see Pistor–Raiser–Gelfer (2000). However, this is what one would expect from a German-law origin country. The next set of criteria measures creditors' rights. La Porta et al (1997) emphasizes that analyzing creditor rights is more complex than analyzing the rights of outside equity holders, since preference of one type of creditors might mean putting at a disadvantage some other type. The criteria focus on senior secured creditors. It seems that creditors protection is stronger than equity owner protection in Hungary, but it is of medium-plus strength even in a transition country comparison, and of lower than medium strength

in a full international comparison, see Pistor-Raiser-Gelfer (2000). (The numbering and definitions follow Pistor-Raiser-Gelfer (2000).)

### 3.1.1 Investor protection indicators: Shareholder rights

### 1. One-share one-vote principle 0

If this were the case, then there would be no discrepancy between ownership share and voting rights. In fact, it is possible that a company charter sets a maximum degree to voting rights. *One-share one-vote* is rather rare in general, irrespective of legal origin, only 22 % of countries of the La Porta et al. (1997) sample exhibited this feature.

## 2. Proxy by mail 0

This means that voting can occur via mail, which is not allowed in Hungary. This is again rare in general (18 % of all cases), except in countries with a common-law origin, where it is pretty common.

#### 3.a Shares cannot be blocked 1

This means that those who have an ownership title at the time of an assembly can vote. "Shares cannot be blocked" in countries with Scandinavian and common law origins, and in the majority of French-origin countries. In German-origin countries, however, it is only Japan where this restriction cannot be applied.

# 3.b No registration cut-off date before the meeting 1

This has changed recently from a registration cut-off date of 60 days before the meeting.

# 4.a Cumulative voting or proportional representation 0

These are both voting mechanisms to ensure that minority shareholders get some representation on the board. These institutions are unknown for Hungarian corporate law. Indeed, these rules are allowed only in 27 % of all countries analyzed by La Porta et al. (1997), among them only a single European country, Spain, has this feature.

- 4.b Other rules to ensure proportional board representation 0
- 5.a Judicial recourse against decisions by executives, supervisory board 0.5
- 5.b Judicial recourse against taken by the shareholder meeting 1

La Porta et al. (1998) calls these last two *oppressed minorities mechanisms* that serve to give an escape route to minority shareholders, when they feel that either the management or the assembly has made a decision that is fundamentally against their interests. (Including mergers or even asset sales.) These mechanisms are frequently found in common-law origin countries, as well as in a number of French law origin countries. However, in this latter case, all of these are non-European, with the exception of Spain. German law origin countries in Asia have these mechanisms, while German law origin countries in Europe do not. In the case of the former group, American influence was important after WWII. No Scandinavian law origin country knows of this institution.

6. Pre-emptive right to new issues for current shareholders 1

This gives precedence to old shareholders in the event of new public offerings, and exists in Hungary. This right is most common in Scandinavian law origin countries, and not infrequently found in French law origin countries.

- 7. Shareholders representing less than 10 % of total shares may demand the convocation of and extraordinary shareholder meeting 1
- 8. Mandatory dividends 0

This exists in some French-origin countries.

9. Executives are appointed and dismissed by the supervisory board, rather than by the shareholder meeting 0

Both rights belong to the shareholder meeting in Hungary.

- 10. Management and supervisory board members can be dismissed without cause 1
- 11. A 50 % minimum quorum requirement for a shareholder meeting to take binding decisions 1.

At the first call at least half of voters must be present, but the company charter can give a higher threshold. At the second call there is no minimum requirement.

12 The right of minority shareholders to call an audit commission 1

If at least 10 % of voting shareholders request it, the court will order an audit despite a contrary decision by the shareholder meeting.

13. Supermajority requirement (at least ¾) for adopting decisions that affect the existence of the corporation in its current form 0.75

There is a 75 % majority rule in respect of the following decisions: modifying the charter, liquidation, change of legal form, but major assets can be sold without the supermajority requirement.

- 14. Supervisory board members are elected only by shareholders 0
- 15 Right to transfer shares may not be limited 1
- 16 No formal requirement exists for the transfer of shares 1
- 17 Minority shareholders have a put option 0
- 18 Mandatory takeover bid threshold exists 0,75

The threshold is 30 %.

19 Conflict of interest rules 0

Only the prospectus contains such provisions.

- 20 Shareholder register must be conducted by an independent firm 0
- 21 Insider trading is prohibited by law 1
- 22 Threshold for mandatory disclosure in case of acquisition of large block of shares 1

The threshold is 10 %.

- 23 A state agency conducts capital market supervision 1
- 24 Capital market supervision is independent 0

It is subordinated to the Ministry of Finance.

# 3.1.2 Investor protection indicators: creditors' rights

1. Restrictions for going into reorganization 0

This means that reorganization procedures can be initiated only with the consent of creditors. This restriction does not exist in Hungarian law. This restriction is quite common in common-law and Scandinavian-law origin countries, and exists in Germany and Austria as well.

## 2. No automatic stay on secured assets 0

This means that during reorganization secured creditors may not repossess collateral. The lack of this restriction on creditors' rights is frequent in common law and German-law origin countries. While Switzerland has this restriction, Austria or Germany do not.

# 3. Secured creditors first 1

This means that in the event of liquidation creditors with secured debts enjoy precedence. Secured creditors are given priority in common-law, German-law origin and Scandinavian-law origin countries.

4. Management does not stay during reorganization 1

This means that a defaulted company's managers cannot participate in the reorganization process. In most common law countries the value is 1, whereas in all Scandinavian and European German-origin countries it is 0. The average for French-origin countries is roughly 0.26.

# 5. Legal reserve 1

Qualified majority of shareholders is needed for voluntary dissolution.

6. Automatic trigger to file bankruptcy 0

There is no automatic trigger to initiate bankruptcy.

- 7. Creditor consent is necessary for reorganization or liquidation  $\theta$
- 8. Establishing a security interest in movable assets does not require transfer of assets 1
- 9. Law requires establishment of register for security interests in movables 1
- 10. An enforceable security interest in land may be established 1

Land can be used as collateral, but the land market is so thin that it is infrequently used.

- 11. Legal provisions that allow creditors to pierce the corporate veil 1
- 12. Management can be held liable for violating provisions of insolvency law 1
- 13. Transactions preceding the opening of bankruptcy procedure may be declared null and void 1

This provision applies even more than 1 year prior the bankruptcy procedure.

#### 3.2 Enforcement

La Porta-Lopez-de-Silanes-Shleifer (2003) defines two sets of indices for the evaluation of enforcement. To the first set belong characteristics bearing on disclosure requirements and liabilities (private enforcement). The second contains indicators concerning the character of the Supervisor, its investigatory powers, non-criminal and criminal sanctions (public enforcement). In Appendix 3 we give short definitions and values for Hungary. (For precise definitions of scores see La Porta-Lopez-de-Silanes-Shleifer (2003).) A value of "1" generically means strong enforcement of investor protection, whereas a "0" the lack of it. The private enforcement index combines the first three indices, and the public enforcement index the last two. The scores are 0.36 and 0.31. Comparisons with other countries (see *Table 1*) indicate weak private enforcement, and weaker than average public enforcement. It is interesting to note that in German legal origin countries public enforcement is apparently even weaker than in Hungary. However, one may ask whether these enforcement indicators are not to be amendable with other aspects of the enforcement issue. Or one may wonder whether political dependence of the supervisor, which seems to be the case in Hungary, would not nullify or weaken the effects of other aspects of public enforcement.

Table 1: Enforcement indices

("All" means the average in the La Porta–Lopez-de-Silanes–Shleifer (2003) study, and "German" the average of those countries having German legal origin.)

	All	"German"	Hungary
Disclosure	0.6	0.6	0.5
Burden of proof	0.49	0.42	0.22
Private enforcement	0.54	0.51	0.36
Supervisor	0.5	0.29	0
Investigation	0.6	0.17	0.5
Orders	0.38	0.04	0.33
Criminal	0.5	0.42	0.5
Public enforcement	0.48	0.23	0.31

### 3.2.1 Private enforcement

## **Disclosure requirements**

Prospectus: 1

Listed securities cannot be sold without providing a prospectus.

Compensation: 0

The compensation of directors and key officers are not required to be reported in the prospectus.

Shareholders: 0.5

The name and ownership stake of "substantial" shareholders must be disclosed, but it is only direct shareholding with which the law is concerned.

*Inside ownership: 1* 

The ownership shares of directors and key officers must be disclosed individually.

Irregular contracts: 0

No requirement exists to disclose material contracts made by the issuer outside its course of ordinary business.

Transactions: 0.5

Some, but not all transactions between the issuer and "related parties" (directors, key officers, shareholders) must be included in the prospectus. (To wit: those that materially influence the working of the corporation.)

The disclosure index is the arithmetic average of the above six values, which in this case equals 0.5. (See in Table 1 the corresponding values for the average of countries participating in the La Porta- Lopez-de-Silanes-Shleifer (2003) study, and for the average of German legal origin countries in the aforementioned study.)

# **Liability regime (burden of proof)**

Burden director: 0

Investors cannot sue directors directly in case of misinformation given in the prospectus. (Though they can sue the issuer that can sue directors. So maybe 1/3 would be a more appropriate score.)

Burden distributor: 2/3

Misleading statements in the prospectus are not sufficient for the liability of the distributor, it must be proven also that there was a causal relationship between misinformation and loss.

Burden accountant: 0

Restitution from the accountant (i.e auditor) is not available.

The burden of proof index has an average of 0,22.

### 3.2.2 Public enforcement

## Characteristics of security market supervisor

Appointment: 0

Appointment is unilaterally made by the Executive.

Tenure: 0

The appointing authority can dismiss.

Focus:0

There is no separate supervisor for stock exchanges and banks.

Rules: 0

The supervisor cannot issue regulations concerning primary offerings.

Accordingly the average is 0, which unfavorably compares to an average of 0.5 in the sample of La Porta–Lopez-de-Silanes–Shleifer (2003). Still a 0 average exists in other countries, such as Belgium, Japan and Norway.

# Investigative powers of the supervisor

Document: 1

The supervisor can issue an order for everyone to turn over documents for the sake of investigation.

Witness, 0

The supervisor cannot subpoena.

The average is 0.5, which is lower than the La Porta–Lopez-de-Silanes–Shleifer (2003) average of 0.6, but is above the very low (0.17) average of German legal origin countries.

#### **Orders**

Order issuer: 0.5.

Limited range of actions can be required by the supervisor from the issuer.

Order distributor 0.5

Again limited is the range of actions the supervisor can order to rectify problems with a prospectus.

Orders accountant: 0

The supervisor cannot require any action form the auditor.

The average orders index is 0.33, which is jut a little below the La Porta–Lopez-de-Silanes–Shleifer (2003) average of 0.38, and significantly above the German legal origin country average of 0.04.

#### **Criminal sanctions**

Criminal director/officer: 0,5.

Criminal distributor: 0.5
Criminal accountant: 0.5

Only awareness of misinformation in the prospectus leads to criminal liability in all three cases.

The average is 0.5, which corresponds to the La Porta- Lopez-de-Silanes-Shleifer (2003) average, and is above the German legal origin country average of 0.42.

# 3.2.3 Enforcement in practice

So far we have dealt with enforcement form the point of view of laws, not of actual practice. Actual practice can be assessed for instance by questionnaires. Systematic studies of law enforcement in transition countries have been carried out under the aegis of the EBRD. The annual survey of the EBRD makes composite assessments in terms of legal indicators in transition economies. There exist two types of indicators, one for judging commercial law and the other for financial regulation.

As for commercial law, Hungary has been in the lead among transition countries, but together with 9 other countries. The explanations given in the EBRD's Transition Report 2000 indicate that the main problems are with the

pledge law (the lack of a centralized registry), and the efficiency of the courts. As for financial regulation, Hungary shares first place with Poland and Slovenia. Basically the EBRD Reports state that the regulatory framework is similar to those customary in developed countries, but "it may benefit from more systematic and rigorous enforcement", i.e. one may get away with breaching the law more easily.

To understand what the problems with the efficiency of the courts mean we can quote Kereszty (1999) at some length.

"In 1998 almost 8000 liquidation procedures were started, but in most cases liquidators found empty (phantom) companies. In about 80 % of liquidated companies there were no assets at all, and in numerous cases it was impossible to find any documentation, let alone the executive officer. On the other hand, the relative and absolute number of reorganization procedures has diminished since 1992."

Reorganization Liquidation

Table 2: New bankruptcy cases

Source: Ministry of Justice, Hungary. Quoted by Kereszty (1999).

Kereszty (1999) then proceeds with the woes of creditors, For instance, liquidators claim that the reduction in the number of reorganization procedures have certain mutually reinforcing reasons. It is estimated that due to the lengthiness of bankruptcy procedures, in 30 % of commercial cases courts cannot reach a decision within one year, while creditors want to get their money as soon as possible, and do not want to reorganize the firms in distress. At the same time, banks may try to have a side deal with debtor firms, rather than initiating a bankruptcy procedure, where they have to share the liquidation value with other creditors. This explains why creditors sometimes choose to liquidate solvent companies with only transitory liquidity problems. (See *Table 2* for more details.)

<sup>&</sup>lt;sup>1</sup> 1992 was the year when the new bankruptcy law was introduced.

According to Kereszty (1999) if a firm goes into liquidation in Hungary the majority of creditors make losses, sometimes recovering nothing at all. This is obviously a very serious problem in particular for small entrepreneurs, who provide trade credit. In the latter half of the 1990s tax, social security and tariff liabilities of companies in bankruptcy amounted to 400 billion forints, and the recovery ratio was about 5 %. Liquidation costs were estimated amounting to 50-100 thousand forints per case, which is a large loss regarding that in 8 out of 10 cases the liquidated firm had zero liquidation value.

The full story can be complemented with noticing that, after 1989, about 400,000 companies have been registered, of which 70,000 ceased to exist by 1998. It was widely believed that 1/3 of all companies did not submit any balance sheet report as required by the law. A frequent complaint was that executive officers did not pass the company books to the liquidator, or sign an *affidavit*. This happened despite the fact that they could be fined, or even prosecuted.

#### **4 LEGAL DYNAMICS**

### 4.1 Case study 1: Acquisitions

The legal regulation of acquisitions and mergers is important both for protecting minority shareholders, and also for ensuring that managers can be controlled by the threat of takeovers. In Hungary a 1996 statute on Stock Exchange stipulated that any purchase of more than 33 % of shares in a public shareholding company necessitates a public offer. This is clearly a "bright line rule", whose extensive use is characteristic of civil law systems. The big problem with bright line rules is that they can be frequently circumvented. We can illustrate this thesis by the following case study.

Borsodchem is a public company belonging to the chemical industry. Its main input supplier is TVK, another public company, which purchases its natural gas and oil requirements from MOL (the Hungarian Oil Company), one of the biggest enterprises in Central Europe, and the largest firm quoted at the Budapest Stock Exchange. The three companies were tied together with

<sup>&</sup>lt;sup>2</sup> It is interesting to note that a similar loophole was created by a similar bright line rule in he US, a century ago.

cross-ownership, and also by the fact that the government had ownership shares in each of them. They had also cooperated closely over the years.

In the Summer of 2000, Milford Holdings, an Irish off-shore company, acquired some 24.75% of Borsodchem's shares. Beside Milford, two Austrian companies and a Russian bank also bought shares in Borsodchem, amounting to a combined share of over 50 %. On the announcement of these events stock prices fell by some 20 %. The reason for this was that there was a general suspicion that Gazprom, the Russian oil giant was behind these actions.

The Hungarian supervision agency started an investigation into the ownership structure of Borsodchem in October 2000, and suspended the voting rights of Milford. As a response Milford sold its shares to a Hungarian bank (CIB), but simultaneously acquired a buy option for Sibur, a Russian firm. (Sibur was known to be an affiliate of Gazprom.) It turned out that the contract also ensured that CIB would vote according to the interests of Sibur in the January 2001 shareholders' meeting of Borsodchem. In fact, in that meeting CIB changed the executive and supervisory boards completely, in cooperation with the two Austrian companies. Finally, in July 2001 one of the Austrian firms made a public offer, at a price which was about half of the price prevailing before these events started to unfold.

These events caused turmoil, resulting in radical changes in legislation. The new legal formula does not contain bright line rules, interpreting the term "acquiring influence" very widely, and subsuming even the "coordinated acts of independent actors" within this category. Clearly, this formulation puts a greater burden on judges, whose interpretation of the law will become more important. The question is, whether Hungarian judges are prepared and/or are given the right incentives to assume law-making functions. This problem underlines the role of both enforcement and the efficiency of the judicial system, and its independence of political influence. However, most observers believed that political interference was a key element in the Borsodchem story.

# 4.2 Case study 2: Risk capital regulation

Venture capital is presumably aimed at supplying equity finance to high-risk startup companies, that may be innovative, too. Initially, venture capital was an American phenomenon. Despite some active government participation, legislation has not played any role in promoting this type of financing in the US. In the common law tradition, existing rules were applied or adapted.

In contrast, the mostly civil law based European approach has been different. Besides providing direct support to venture capitalists, European legislators thought wiser to introduce new specific laws. This was the route followed by Hungary, as could be expected on account of its legal traditions.

The view behind supporting risk capital is that there exists a market failure here, and with appropriate incentives the state can enhance technological development. If the incentives include tax incentives, this provides a good reason for legal intervention, but it is, of course, not necessary that tax incentives be part of government support.

The 1998 "Act on Venture Capital Investments, Venture Capital Associations, and Venture Capital Funds" had basically three goals:

- 1. supporting the financing of high risk-high return activities
- 2. preventing tax evasion
- 3. protecting investors.

As noted above, item 1 is the specific goal, and item 2 is a corollary of it. Item 3 is a generic principle, as the protection of investors seems to be in the forefront of more recent Hungarian economic legislation.

To achieve the main goal (promoting investment in risky ventures) tax holidays (rebates) are stipulated by the law. In economic terms this is equivalent to raising the expected return on the investment, without affecting the consequences of bad (loss-making) outcomes. To reduce the risk incurred by investors, another part of the law stipulates that the government provide guarantees for risk capital funds. It is a key question whether these things really appropriately belong to the law. Nevertheless, the special provisions which distinguish a risk capital fund from a normal investment fund cannot be justified unless the above incentives are in place.

The most important restrictions on risk capital funds refer to their legal form, their minimum capital requirement, their admissible investment portfolio, and their accounting rules. With respect to the first, any risk capital fund must be a shareholding company. This restriction is not quite understandable, as risk capital usually needs personal involvement by experts, who are able to advise and monitor the firms they deal with.

As for the second, the minimum capital requirement for a risk capital fund is 500 million forints, ten times the normal sum for shareholding companies. Again, this requirement may have two implications: either increasing the size

or the number of projects. Increasing the size of projects may result in more risk-taking, whereas a larger number of projects may burden the advisory-supervisory capacity of the risk fund. There is little reason to increase risk-taking, while the resources for advising-supervising are presumably scarce.

The next restriction ensures that risk funds are involved in risky activities, in the form of providing equity, rather than investing safe. This restriction is clearly a corollary of the tax exemptions, since risky investments are the primary reason why a risk capital fund should be given tax incentives.

Finally, there is a set of detailed accounting rules, mostly aimed at preventing companies from finding loopholes, and from raising executive compensation by tax avoidance. This is quite understandable again as a corollary of the nature of incentives the law wishes to give.

One may ask where investors' protection is to be found in this law. Investor protection is provided by government guarantees (hardly a subject for a legal rule), and maybe, in the minimum capital requirement. Otherwise, protecting investors falls under the authority of the company law, with respect to shareholding companies. As we have seen this is not the strongest protection in an international comparison.

We can draw a few lessons from risk capital fund legislation. First, the law regulating risk capital was not introduced as a response to practical problems. Its content betrays no serious economic analysis. Rather, this is a law which was introduced because other countries had had their own statutes. The law strives for internal consistency, at the cost of dealing with many problems that properly should not be dealt with by legislators. In short, this is indeed a "lawyers' law", caring little for economic agents or economists, and wishing to provide judges with "bright line rules" rather than invite them to interpret the law. As shown in the former example this is not a route that is easily negotiable. On the other hand we cannot see what sort of events could occur to push legislators into modifying this law. There is little chance that political motives would interfere.

The main negative consequences of this approach are twofold. First, the law may hinder the creation of small risk capital undertakings with true value added, i.e. where experts provide advisory and supervisory services to startup entrepreneurs. Second, it is hard to believe that the bright line rules extensively used in the formulation of the law can prevent circumvention, and, possibly, one of the "uses" of this law will be reducing tax liabilities legally,

22

without engaging in those risky investment activities the law was made to support. However, these two problems are unlikely to generate public dissent, or government dissatisfaction. As the potential for true venture capital undertakings is probably not very large in Hungary, the first adverse effect will be rarely noticed. On the other hand, the regulation is good enough to prevent the most blatant abuse of tax incentives.

#### **5 CONCLUSIONS**

This study has indicated the legal protection of outside investors in Hungary is probably relatively weak. So now we can ask: what are the mechanisms that guarantee the return on investment in Hungary, and what sort of investors are there? Shleifer–Vishny (1997) suggests that concentrated ownership is the most widespread and most plausible solution in such a situation. Indeed concentrated ownership and self-finance characterizes the largest part of the Hungarian economy, but this governance style comes in two varieties: multinationals and domestic private owners.

Multinational ownership is effectively transferring the problem outside the borders. Whether this is an efficient solution would need a separate international comparative work. Domestic concentrated private ownership is another solution with some commendable features, but with a vengeance. This appears to be an escape from agency problems and the commitment problem behind the soft budget constraint phenomenon, too. However, the budget constraint of these firms may be too strong, linking too closely together investment and current profitability. Concentrated ownership suffers from other inefficiencies as well. For instance, it reduces the incentives of nonowner stakeholders to make firm-specific investments, and probably put a limit to the growth of enterprises.

There exists, however, a third government style, substantial state involvement in a combination of ways. In fact, this might have positive effects by lessening the force of the inefficiencies arising from concentrated ownership. However, one can be always suspicious, whether state ownership will not result in politically motivated, economically inefficient decisions frequently. Again this is a topic for further international comparative research.

Our analysis of the Hungarian company law confirms that the protection of outside equity investors is relatively poor according to laws in the books,

23

which is not surprising in view of the German legal origin of the country. As Pistor et al (2000) strongly emphasized, transition experience has shown that enforcement of laws are more important for investor protection than laws on the books. Having said that, we do not believe that legislation is totally unimportant, indeed its importance will increase in tandem with the improvement in enforcement. Current lawmaking should have a more active role in the strengthening of enforcement. Two tendencies can be observed: one leading to more reliance on the interpretation of law by judges, responding to actual challenges, and the second, following the German-tradition, resulting in a higher number of bright line rules, and more complicated legal regulation. To make the former workable requires political and financial independence as a necessary, though not sufficient, condition. All in all, a larger emphasis should be put on enforcement than on emulating "Western" laws (the latter is simpler). Another important point is that a simple tax code may be a prerequisite to a good legal framework, since the chief concern of lawmakers involves the undoing of loopholes provided by a complicated tax system, which is especially unsuitable for very small businesses.

Besides influencing enforcement, legislation can shape the behavior of financial market participants, and the extent of financial markets in several ways. New legislation sometimes strives for greater prudence by providing bright line rules, rather than letting the public learn. Investor protection supports the supply of outside funds, but there is a demand side to external finance, and stricter prudential regulation can lead to less demand for external finance. On the other hand, investment restrictions on certain groups of investors can weaken the supply side, too.

It is interesting to note how economic legislation developed in Hungary. We divide the reasons why new laws were promulgated into roughly three categories: 1. Practical reasons. These changed with transition proceeding, here besides a longer term view, legislators were usually worried about short term problems. 2. External demand. This is basically the demand set by international organizations Hungary has wished to join. 3. Internal reasons. Apparently these follow from the internal logic of the legal system. For international comparative studies of the legal infrastructure it would be useful to learn about the dynamics of legal change, what sort of motives make countries adopt new laws. In this way one may find out something about the ability of legal systems to adapt successfully or less successfully to unforeseen challenges.

24

Hay-Shleifer-Vishny (1996) provide an example of how legal systems must be reformed with a definite goal, which is in their case the effective implementation of privatization. We can only make some modest proposals here. Path dependence and other external factors may limit the scope of law in shaping corporate governance. It may be worthwhile to find out what other investor protection mechanisms exist in Hungary, and whether they are efficient arrangements or not. From a policy point of view this sort of investigation would help focus institutional changes on improving the available mechanisms. For example, a discovery that there is little chance that the market for corporate control will play a major direct role in Hungarian corporate governance would have certain implications about the utility of efforts to broaden and deepen the local stock exchange. Should the conclusion be that it is more plausible that banks could play a more significant role in the financing of medium sized companies with concentrated ownership, then legislation and other governmental actions should shift focus onto promoting the bankled governance style. Indeed, our paper suggests that the above two conditionals are true.

#### REFERENCES

- Hay, Jonathan, Andrei Shleifer and Rober Vishny (1996): Toward a theory of legal reform. *European Economic Review* 40.
- Kereszty, Béla (1997): The New Company Law: In Defence of Creditors' Rights (*in Hungarian*). In: Tanulmányok Dr. Bérczi Imre egyetemi tanár születésének 70. évfordulójára, Budapest.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny (1997): Legal determinants and external finance. *Journal of Finance*, July.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny (1998) Law and finance. *Journal of Political Economy*, no.6.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer (2003): What works in securities laws? NBER Working paper, 9882.
- Pistor, K. (2000): Patterns of legal change: shareholder and creditor rights in transition economies. EBRD Working Paper No. 49.
- Pistor, K., M. Raiser and S. Gelfer (2000): Law and finance in transition economies. EBRD Working papers No. 48.
- Rajan, Raghuram and Luigi Zingales (1996): Financial dependence and growth. NBER Working Paper 5758.
- Rajan, Raghuram and Luigi Zingales (2001): The great reversals: the politics of financial development in the 20<sup>th</sup> century. NBER Working Paper 8178.
- Shleifer, Andrei and Robert Vishny (1997): A survey of corporate governance. *Journal of Finance*, June.
- Stulz, Rene and Rohan Williamson (2001): Culture, openness, and finance. NBER Working Paper 8222.
- Zingales, Luigi (1998): Corporate governance. CEPR Discussion Paper 1806.