INTELLECTUAL PROPERTY RIGHTS PROTECTION AND ECONOMIC GROWTH

by

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A thesis submitted in partial fulfilment
of the requirements for the degree of

Master of Arts

National University of "Kyiv-Mohyla Academy
Economics Educational and Research Consortium
Master's Program in Economics

2006

Approved by _____
Mr. Serhiy Korablin (Head of the State Examination Committee)

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Program Authorized
to Offer Degree ____Master's Program in Economics, NaUKMA _____

Date _____

National University of "Kyiv-Mohyla Academy
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Abstract

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The primary goal of the research was to investigate the impact of intellectual property rights protection on economic growth, including transition countries in the analysis. The dataset for 91 countries that covers the period of 2000-2004 was created for the study. On the basis of the new growth theory and using fixed effect panel data analysis it was found that in general intellectual property rights protection has positive influence on GDP growth in low-income countries and countries with low level of intellectual property rights protection. However, the significance of the coefficients turned out to be ambiguous. Inclusion of transition countries in the analysis influenced significance of estimated coefficients. Also, marginal effect of intellectual property rights protection on GDP growth for low-income and transition countries were estimated as positive and significant

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ACKNOWLEDGMENTS

I would like to express my largest gratitude to my parents, whose love and support were essential for me when I wrote thesis.

The special gratitude is to my thesis supervisor prof.Yuri Yevdokimov for his patience and valuable remarks.

Also I want to thank Dr.T.Coupé for his enthusiasm and all the comments during research workshops.

I am grateful to my classmates – Nadiya Klos, Oleksandr Shkurpat, Olga Zayets, Inna Bisovetska, Alena Piskurouskaya, Oleksandr Lytvyn, Pavlo Kostromytskyi and Dmytro Galytskyy for their moral support and sense of humor.

Also I would like to thank my Georgian friends and neighbors - Ivane Barbakadze, Maia Gejadze, Besik Samkharadze and Lily Samkharadze – for their friendly concerns about my thesis writing process.

GLOSSARY

Intellectual Property (IP). Any intangible asset that consists of human knowledge and ideas.

Intellectual Property Rights (IPR). All rights connected with usage, sale and rent of IP.

Agreement on Trade-Related Aspects of IPR (TRIPs)[*]. International treaty by the World Trade Organization (WTO) which sets down minimum standards for most forms of intellectual property (IP) regulation within all member countries of the World Trade Organization. It was negotiated at the end of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) treaty in 1994.

World Trade Organization (WTO)[*]. International, multilateral organization, which sets the rules for the global trading system and resolves disputes between its member states, all of whom are signatories to its approximately 30 agreements.

World Intellectual Property Organization (WIPO)[*]. Specialized agency of the United Nations. WIPO was created in 1967 with the stated purpose of encouraging creative activity and promoting the protection of intellectual property throughout the world. WIPO currently has 183 member states, administers 23 international treaties, and is headquartered in Geneva, Switzerland

Copyright[*]. IPR for creative and artistic works (eg. books, movies, music, paintings, photographs and software), giving a copyright holder the exclusive right to control reproduction or adaptation of such works for a certain period of time.

Patent[*]. IPR granted in relation to an invention that is new, useful and not simply an obvious advancement over what existed when the application was filed. A patent gives the holder an exclusive right to commercially exploit the invention for a certain period of time (typically 20 years from the filing date of a patent application).

Trademark[*]. Distinctive sign which is used to distinguish the products or services of one business from those of another business.

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[*] Definitions are taken from Wikipedia (http://en.wikipedia.org)

INTRODUCTION

Why intellectual property rights (IPR) should be protected? Does this protection do anything good for a country? These and other questions were raised in the Ukrainian society in summer 2005 and are still of great interest for an average person. In July 2005 the package of laws, including the IPR laws implementation within TRIPS agreement (essential for WTO accession) was adopted by the Ukrainian Parliament (Verkhovna Rada). This implementation provoked violent discussions regarding benefits and costs of stronger IPR protection between politicians, economists and ordinary citizens (Mojciejenko, 2005).

For the developed countries there is a strong evidence of positive effect of IPR protection on economic growth (Barton et al, 2002). Nevertheless, there is no certain opinion whether or not IPR protection is crucial for the developing countries. Developing countries are, in general, net importers of IP. This fact creates the double effect of stronger IPR protection: on the one hand, strict IPR legislation strengthens foreign trade and increases FDI inwards. On the other hand, strong IP protection makes the innovation more expensive for the reason of banned piracy and imitation reduction.

Effect of IPR protection on economic growth was not studied for transition countries. Moreover, all previous studies for IPR protection and economic growth did not include transition countries in their analyses. However, Central and Eastern European countries and former Soviet republics should be included in the research for the reason of the Soviet heritage and former absence of IPR protection (There were a large number of innovations, but all of them were the property of the state).

Given the importance of the issue, my intention is to make empirical research on influence of the IPR protection on the level of GDP growth of a country. The main idea of the research is to investigate the impact of IPR protection (its sign and significance) on economic within new growth theory framework. The analysis is done for the set of 91 countries, including 13 transition countries. Also I aimed to study the impact of including transition countries on the results of analysis.

For estimation of IPR protection impact on GDP growth panel data analyses is used. Also the effect of IPR protection on GDP growth is studied for the different groups of the countries (high-, medium-, low-income countries, and transition countries, countries with high, medium and low IPR protection) by separating the groups and by introducing dummies for a group.

The structure of the paper is the following: Chapter 1 provides relevant literature review, in Chapter 2 methodology and model used in the analyses are described, short description of used data is presented in Chapter 3, and Chapter 4 describes obtained empirical results and makes suggestions for further research. Finally, conclusions and policy implications are provided.

Chapter 1

LITERATURE REVIEW

1.1. Intellectual Property and its Protection

Before making literature review and further description of my study, it would be good to discuss shortly the nature of IP and importance of its protection both on micro- and macro- levels.

Intellectual property is a complicated issue because of its nonmaterial properties. Intuitively, IP can be defined as all possible knowledge and information which can bring profits to its owner. The World Intellectual Property Organization (WIPO) defined the full list of objects of IP All of them can be divided into four groups: 1) patents and industrial property; 2) copyright; 3) trademarks; and 4) all other nonmaterial objects which have economic value. (Sviatotsky, 1999).

It should be mentioned that IP has some properties of public good. It is partly non-excludable and non-rival (Gaisford and Richardson, 2000). While it can have rather large initial costs, the marginal cost of introducing additional user of IP is zero (Romer, 1996). Therefore, the question of protection is crucial in the context of IP. Without internalization by the state control for IPR protection, it has no economic value for its author/owner.

In macroeconomic context, issue of IPR protection definitely plays an important role in country's image. To mention only the US trade sanctions (according to the US Generalized System of Preferences) for Ukrainian goods at the end of 2001 imposed for the reason of poor protection of IP, namely for the CD piracy. The sanction restricted custom-free export of Ukrainian

goods for almost USD 40 million each year (Shamshur, 2006). The sanctions were removed in autumn 2005, after Ukrainian Parliament approved the law on laser CDs.

1.2. IPR Protection and Economic Growth

The question whether IPR protection has influence on economic growth has no precise answer (Barton et al., 2002, Falvay, Foster and Greenaway, 2004). In general, IPR protection has both positive and negative influence on GDP growth.

The recent empirical studies which found positive link between IPR protection and economic growth (GDP growth) are of Falvey, Foster and Greenaway (2004), Gould and Gruben (1996) and Thompson and Rushing (1996).

In the first mentioned research, authors created an empirical model based on the new growth theory with the factor of IPR protection. The authors found positive effect of strong IPR protection on economic growth only for high- and low- income countries. They used a panel data analysis for 80 countries for a 5-year period. Running simple OLS regression they found positive effect of IPR index on aggregate GDP per capita for a country but it was of low significance. For this reason more advanced econometric tool was used, namely the threshold regression analysis, which gave an opportunity to define existence and number of thresholds in the data and to conduct estimation within defined thresholds. Using this technique, the authors found two significant thresholds which divided the sample into three groups – with low GDP per capita, medium and high. Their results showed positive and statistically significant impact of IPR index on the economic growth, measured as GDP growth per capita, for countries with initially high level of economic growth as it was expected. The same results were obtained for the low income countries. However for the medium income countries the estimation found no strong relationship between the IPR protection and

economic growth, which was a kind of a surprise. Falvey, Foster and Greenaway (2004) explain these results by the fact that middle-income countries' growth rely hardly on imitation. Therefore stronger protection for these countries deteriorates positive effect of FDI and trade growth which appears in the low-income countries. In fact, Falvey, Foster and Greenaway (2004) argue that in general, they found no negative impact of the strong IPR protection on economic growth, and in particular, significantly positive impact for high- and low-income countries. Two possible things which could be done within the framework of this research should be mentioned. Firstly, it is necessary to include in the model transition countries, namely CIS and CEE countries, which were excluded from the analyses. Second, it is possible to run a simple regression of IPR index impact on economic growth within three mentioned groups.

Eearlier empirical studies (Gould and Gruben, 1996, Thompson and Rushing, 1996) formed the general opinion that the link between IPR protection and economic growth is positive but of little significance. The former study of Gould and Gruben (1996) found positive and significant effect of Rapp and Rozek IPR measure on economic growth using growth model for 95 countries in the period of 1960-1988. The analysis was done for two groups including open and closed economies. They found that effect of strong IPR protection for the open economies is larger than for small economies, which indeed was expected. Thompson and Rushing (1996) used a switching regression model for 112 countries for the period of 1970-1985 and found in general positive but insignificant impact of IPR protection on economic growth. They came to the conclusion that there is a certain level of initial GDP level, above which there is strong positive effect of strict IPR protection on economic growth; for other countries, there is no link between IPR protection and GDP growth. In both studies rather old datasets were used and transition countries were not included in the analyses.

Negative effect of strong IPR protection on economic growth was found in theoretical studies. Horii and Iwaisako, (2005), used the quality-ladder model of endogenous growth with two assumptions about IP, specifically about R&D sector. First assumption was that strong IPR protection increases the number of firms in monopolistic sector. A monopolistic firm has little incentive to make further innovation to promote economic growth in the long-run. The innovators stay in a competitive sector and with increasing IPR protection their quantity increases which in fact reduces the number of innovation (for the reason of possible duplication) and decreased expected value of a single innovation. Based on these two assumptions and using mathematical tools, Horii and Iwaisako (2005) found that imperfect (low) IPR protection maximizes the countries output in the long-run due to more efficient imitation facilities. However, these conclusions were not supported by empirical results that give a wide field for further studies.

Gaisford and Richardson, (2000) also concluded that strong protection of IPR do nothing good for developing countries. The authors estimated the impact of TRIPS agreement on the countries' welfare. Their model states that developed countries obtain more gains from TRIPS agreement than developing countries. The latter can experience even losses. Gaisford and Richardson proposed the asymmetric protection of IPR with lower level for developing countries and higher (stronger) for developed countries which could harmonize the benefits from TRIPS agreement for both types of the countries. The conclusions are, however, theoretical, and need further empirical testing.

Hence, the influence of IPR on economic growth can not be easily estimated. Empirical studies found some positive link between strict protection of IPR and GDP growth, but the results were not always significant. The opposite results were obtained from theoretical models, with

no empirical testing. Such confusion in the literature can be explained by the complicated direct and indirect links between IPR protection and GDP.

1.3. The influence mechanism of IPR Protection on Economic Growth

All possible links between IPR protection and economic growth can be formally divided on positive and negative. However, this division should be treated carefully, as far as classification often depends on the level of IPR protection (for example, appropriate level of IPR protection can force competition, but in case of too strong protection monopoly appears). The positive impact is associated with incentives for innovation, investments (including FDI), international trade, technological transfer, and competition. The negative influence of strong IPR protection arises because of banned duplication and monopolistic use of IPR (which can also negatively influence competition and GDP growth). Let's look at all these effects in detail.

Incentive for Innovation. The primary goal of IPR protection is to create larger incentives for innovations, Dnes (2005). And the larger amount of innovations should positively influence a country's growth. The intuition for this conclusion is as follows: in the case of low protection of IPR, firms and individuals would become free-riders on innovations and market failure would appear, Gaisford and Richardson (2000). GDP will grow at a slower path in the case of little or no innovation. Besides, acquisition of innovations stimulates further growth of knowledge in society, as usually information about innovations is publicly available (Maskus, 2000).

Investments and FDI. Other positive but indirect effect of IPR protection on economic growth can be intuitively observed through incentive for investments, namely FDI. There are a lot of different factors influencing investment decisions and all of them can be divided into three groups: location advantages, ownership factors and internalization, Yepisov (2003). IPR protection can be regarded as a resource (factor) which protects the IP of

foreign investor in the host country, thus positively influencing investor's decision. However, empirical studies on link between IPR protection and FDI often have opposite results.

Smarzynska (1999) found that strong IPR protection is essential for FDI in high technology intensive sectors such as medicine, chemicals and machinery. The results were obtained using firm-level data for the CEE and Former Soviet Union countries (25 countries). In particular, it was shown that weak protection of IPR increases non-manufacturing expenditures of the investors.

Similar conclusions were drawn by Nunnenkamp and Spatz (2003), who used the measure of IPR proposed by the World Economic Forum, 2002. The analysis was done at the sector and regional levels. It was concluded that IPR protection has positive significant impact on FDI only for regions with average imitation facilities such as population education, technology level etc. Another important result of the study is that stronger IPR protection increases quality of FDI in terms of technological transfer.

Yepishov (2003), in his empirical study for 23 transition countries, came to the opposite results. He found that: 1) the level of IPR protection has no impact on the amount of investments obtained by a firm in transition countries; and 2) the effect of the IPR protection on the level of FDI at the industry level was ambiguous. On the one hand, Yepishov concluded that there is no strong evidence of the IPR influence on FDI is the same for different sectors. On the other hand, he found unexpected influence of IPR protection in low technology sectors like farming and fishing. Yepishov explains such results by the poor data in transition countries.

The general conclusion on link between IPR protection and FDI is that strong IPR protection is not sufficient for the large FDI in a country, Maskus (2000). At the same time strong protection is a factor of great significance for the high-technology industries (chemicals, pharmaceuticals

etc.). Besides, appropriate IPR protection can be regarded as a part of country's profile as well as positive signal to investors about investment climate in a host country, Sherwood (1990).

International Trade. Other positive indirect impact of IPR protection on GDP growth comes through international trade. The effect of stronger IPR protection on trade flows is ambiguous, but in general, it is positive even for a country which is a net consumer of innovations, Shevtsova (2004). In the empirical study, using panel data analyses based on the Gravity model for the industry dataset from 48 countries (24 of which were transition countries and 24 – OECD countries), Shevtsova found two effects of strict IPR protection on international trade volume. First, the market expansion effect has positive impact on international trade, but this effect is significant only for middle-income countries. Second, the market power effect negatively influences international trade in high- and low-income countries. The general conclusion about link of IPR protection and international trade is that though there is theoretical expectation that strong protection enforces international trade, empirical studies found that this impact is positive, but often insignificant.

Technology Transfer. The issue of strong IPR protection is of great significance for the technology transfer from developed countries to the developing ones. The process of technology transfer is rather complicated, often out of control by the government. As a rule, technology transfer requires a country's capacity to acquire new knowledge (for example, education of population), Barton et al. (2002). However, strong protection of IPR has strong positive link to the R&D investments (Kanwar and Evenson, 2001). Country-level empirical study, done for 23 countries for 1985 and 1990, found positive effect of IPR protection on technological change (R&D investment and expenditure was used as proxy). Kanwar and Everson, 2001, made conclusion, that IPR protection creates incentive for innovation and is

even more important fore technology transfer than other factors like internal funds and availability of skilled workers.

Competition. Competition and IPR protection policies often can be tightly connected. Firms are likely to innovate both in case of strict IPR protection and strong competition environment2. This link is very important in high-technology industries, for which competition policies often rely on their IPR, as a rule patents and copyrights (Farrel and Shapiro, 2004). Nevertheless, the problem of optimal trade-off for the protection level of IPR appears, as far as unreasonably strict protection can lead to the monopolies.

Monopolistic use. Strong IPR protection can create monopolistic behavior. Actually, the question of the protection level is rather complicated. On the one hand, protection of IPR should be strong enough to reward the author for her innovation. On the other hand, too strong protection can create monopoly with no competitors and substitutes (Sherwood, 1990). As well with strong protection, 'sleeping' patents can slow down economic growth within specific sector. The example of 'sleeping patent' can be firms in Russia (Kozyriov, 1997) which make registration of internet pages with the name of international firms that are not operating in Russia. In this case if such a firm decides to enter the Russian market, it should buy the internet address with its name or to use other spelling of internet address in Russia.

Banned Duplication. Strong IPR protection decreases imitation. On micro-level, reduction in imitation can lead to monopolistic use which creates little incentive for future research in this field (Horii and Iwaisako, 2005). At the same time, limited duplication has negative influence on consumers because of the price increase. At country level, countries which are the net importers of technology can suffer tremendous losses in the case of applying TRIPS agreement (Barton et al., 2002). Very often developing countries have enough facilities to adapt new products and technologies for further

[2] OECD Roundtable on Competition Policy and IPR, 1998

duplication (Falvey, Foster and Greenaway, 2004). With strong IPR protection such countries can experience slower GDP growth or even GDP decrease, because of expensive technology (Kanwar and Everson, 2001).

In general, there is no consensus in the literature whether there is impact of strict IPR protection on macroeconomic indicators like economic growth, FDI, international trade. The sign of this impact is also ambiguous. Different conclusions can be explained by the complicated links between IPR protection and macroeconomic indicators.

There is a wide place for research in this area, as far as most of the studies on economic growth and IPR excluded transition countries. In the case when empirical studies do take into account transition economies, they are done at sector- and firm-levels and mainly investigate the impact on FDI or international trade, but not on economic growth. Facts, that transition countries have large IP heritage from Soviet Union times and now are on developing path, make the study on link between IPR protection and GDP growth of large interest for possible policy implications.

Another important conclusion from the reviewed empirical studies is that initial country's conditions are rather important factor for the link between IPR and economic growth. The countries with high-, middle- and low-income can have different original relationship between the IPR protection and economic growth. Therefore, separation into three groups should be done to study possible different effects of strict IPR protection on GDP growth

Chapter 2

METHODOLOGY AND MODEL SPECIFICATION

2.1 Methodology

The traditional approach to explaining economic growth was primary based on macroeconomic foundations. For example, in Solow-Swan growth model endogenous factors which determine economic growth are labor and capital, whereas knowledge enter model exogenously. Despite that the Solow growth model is easy to analyze and understand the model fails to explain long-term/ exponential economic growth.

The new growth theory extends the Solow model introducing endogenous technological growth and arguing for long-term growth in the economy. The distinct characteristic of new growth theory is its both macro- and micro-economic approaches which account for all sources of economic growth.

There are two broad approaches within the new growth theory (Romer, 1996): the first one regards knowledge accumulation as a key factor of endogenous growth, the second pays attention to human capital and its change over time. In general, both approaches try to explain the long-run growth with factors other than simply labor and capital. Actually, in different approaches different microeconomic foundations are taken into account, in the first approach these micro- foundations create basic assumptions on knowledge and information accumulation, in the second approach assumptions are made on human capital and its possible accumulation.

Within first approach, endogenous technological progress, production depends on three factors – amount of technical know-how in the

economy at date t – E, the stock of physical capital – K, and constant stock of human capital – H (with μ - constant share of human capital involved in production of final goods):

$$Y_t = E_t^{\gamma} K_t^{\alpha} [\mu H_t]^{(1-\alpha)}$$

With regard to this specification the impact of IPR protection on GDP works through E – knowledge accumulation.

The second approach, human capital, pays attention to human capital accumulation. It introduces two kinds of capital – physical and human. This approach can be summarized by the following function:

$$Y_t = K_t^{\alpha} H_t^{\beta} [A_t L_t]^{1-\alpha-\beta}$$

where H is the stock of human capital, L – number of workers. A skilled worker can supply both one unit of L and some amount of H.

Human capital accumulation can be measured as skills of labor force (using different proxies), level of education (primary, secondary, tertiary) and others.

Therefore, based on both micro- and macro-economic foundation, the new growth theory gives the necessary theoretical background to study the link between IPR protection and economic growth.

2.2 Model Specification.

The basic statistical model which is used this study is similar to the one used by Falvey, Foster and Greenaway, (2004), in the framework of the new growth theory.

$$\ln Y = \alpha + \beta_1 \ln K + \beta_2 \ln L + \beta_3 LS + \beta_4 EXP + \beta_5 INF + \beta_6 IPR$$

in which Y – level of GDP, K – level of gross capital formation, L – level of population, LS – level of labor skills, EXP – volume of export, INF – inflation rate, IPR – index of IPRs protection.

Expectations about coefficients' signs are as follows: level of capital formation, population, secondary education, and export ratio to GDP should all have positive statistically significant coefficients, while inflation rate should have negative influence on GDP.

Chapter 3

DATA DESCRIPTION

For empirical estimation of the IPR protection on GDP growth the data on 91 countries3 were collected. The basic criteria for including a country in the data set was availability of IPR protection index in Economic Freedom of the World Report, 2005.

Most of the data are taken from the World Development Indicators, 2006, developed by the World Bank. IPR protection index is taken from the Economic Freedom of the World, 2005 Annual Report, Frazer Institute, Gwartney and Lawson, (2004). The indices of IPR protection were available for 1995, 2000-2003 years. Two basic assumptions are used: 1) indices for IPR protection have lagged influence on GDP growth, and 2) indices did not changed significantly from 1995 to 1999. These assumptions are quite reasonable as far as indices among other aspects capture all changes in legislation. However, effects of changed legislation are often lagged, especially if we account for complicated links between IPR protection and economic growth. Indices of IPR protection for the most countries did not changed dramatically from 1995 to 2000. Therefore, in general, indices of IPR protection in 1999 can be proxied by the indices in 1995. Some data were taken from national statistical institutes and Global Competitiveness Report

[3] Algeria, Argentina, Australia, Austria, Bahrain, Bangladesh, Belgium, Bolivia, Botswana, Brazil, Bulgaria, Cameroon, Canada, Chad, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Estonia, Finland, France, Germany, Ghana, Greece, Guatemala, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Latvia, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritius, Mexico, Morocco, Namibia, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Senegal, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, Venezuela RB, Zambia, Zimbabwe

2005-2006 by World Economic Forum (2006). Data for secondary school enrollment for 2003 was also partly taken from Global Competitiveness Report 2005-2006 by World Economic Forum (2006). Data for secondary enrollment for 2004 often were unavailable. Therefore, taking into account that the level of school enrollment does not change significantly each year, it was assumed, that for unreported countries this index stayed the same as for 2003.

To estimate the effect of IPR protection on GDP in transition countries the basic dataset was divided into two groups. The first includes only transition countries. For the lack of the data, only 13 transition countries4 were included, omitting almost all CIS countries except Russia and Ukraine. It should be mentioned that because of low number of observation within the group, the received results should be treated with cautious. The second dataset includes all other 78 countries from the generalized data set.

Basing on the previous empirical findings (Falway, Foster and Greenaway, 2004, Gould and Gruben, 1996, Thompson and Rushing, 1996), the original dataset was also divided into three groups: countries with high GNI per capita in 2000 (25 countries), with medium (38 countries) and with low (28 countries). (Full list of countries is in Table A1). Low-income countries had GNI per capita in 2000 less than USD 1200, in high-income countries GNI was more than USD 9000. The same division criterion was used for introducing dummies for high- and low- income countries.

Another interesting division used in the research was for countries with low, medium and high protection of IPR. The groups include 17, 44 and 30 countries. (The list of countries is in Table A2). The division was done for 2004 IPR protection index, with meanings 0-4 for low level of protection, 4-6 for medium level and 6-10 for high level. Despite of causality (in general,

[4] Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Ukraine.

countries with high incomes have high IPR protection and countries with low incomes have low IPR protection), there some outliers – like Bulgaria, and Russian Federation, which are in the medium income group, but have low protection of IPR, or Estonia and South Africa, which are in the medium income group but have high protection of IPR.

Table A3 presents summarized statistics for all mentioned groups.

The variables I used in my research are summarized in the following table (Table 1).

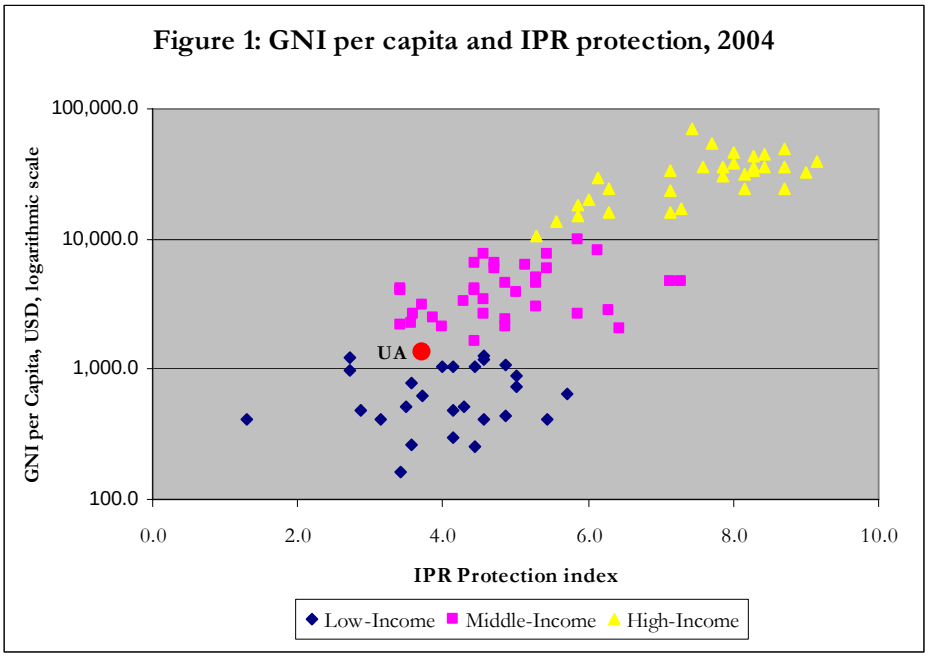
Table 1. Variables Used in the Research

Variable	Data
lnGDP	Natural log of GDP, USD mln
lnK	Natural log of gross capital formation, USD mln
lnN	Natural log of population, mln
SE	School enrollement, secondary (% of gross)
Infyoy	GDP deflator, % yoy
expGDP	Export ratio to GDP, %
IPR	IPR protection index (0-10)

Correlation between variables is presented in Table A4. Large correlation between capital formation and IPR index can be explained by the link between production (and therefore, capital accumulation) and level of protection – in case a country has large production capacities there is more incentive for strong IPR protection. Similar intuition is behind large correlation between IPR protection and level of secondary school enrollment – the larger is country's human capital the more protected is IPR. Large portion of secondary school enrollment intuitively increases the overall level of innovations. Both conclusions are within the new growth theory. The large correlation coefficient between level of capital and level of population can be explained by low level of substitution of the basic production factors.

Before making any empirical research it would be good to look on raw data for any visible trend between IPR protection and economic growth. Figure 1 depicts distribution of countries on income and level of IPR protection, using logarithmic scale. A kind of positive trend between strict IPR protection and the level of GNI per capita can be observed. However this trend is more obvious for high-income countries and more ambiguous for middle- and low- income countries.

Figure 1: GNI per capita and IPR protection, 2004



One more interesting observation from Figure 1 is that Ukraine, though it is in low-income and low IPR protection group, is on the border with medium group both for income and for IPR protection. This fact again stresses importance of the issue for the country, as far as less effort is needed to reach medium protection group in case of positive effect of stronger IPR protection on economic growth

Chapter 4

RESULTS

Primary goal of this study was to estimate impact of the IPR protection on economic growth for the 2000-2004 period including transition countries in the sample of all countries. Major points of the study were associated with the following: 1) to study the effect of the IPR protection for a sample of 91 countries for the 2000-2004 period, including transition countries; 2) to test the importance of transition countries for the analysis of the impact of the IPR protection on economic growth; 3) to analyze the impact of the IPR protection on GDP growth within income and protection groups, and 4) to find marginal effect of the IPR protection on economic growth of transition countries, countries with different income levels and different levels of the IPR protection numerically.

4.1. Comparative Analyses of the Different Groups of Countries

Initially all countries were divided into 9 groups: 1) all countries – 91; 2) transition countries – 13; 3) all countries without transition countries – 78; 4) high-income countries – 28; 5) medium-income countries - 38; 6) low-income countries – 25; 7) countries with high level of the IPR protection – 30; 8) countries with medium level of the IPR protection – 44 and 9) countries with low level of the IPR protection – 17.

In order to statistically estimate the impact of the IPR protection on GDP growth, first, pooled OLS regression for all groups of countries were run. In general, pooled OLS regressions produce positive and statistically significant results of the IPR protection impact on GDP at the significance level less than 10%. On average, improvement of the IPR protection by 1 point gives additional 2-10% of GDP growth. In turn, for the group of

transition countries and for the countries with medium level of the IPR protection, results were statistically insignificant. The results of pooled OLS for 9 different groups of countries are presented in Table A5.

According to the results of Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity, the hypotethis of homoskedasticity was rejected at 5% level of significance for all groups except for transition countries and middle income countries. Such results were expected because real data rarely have constant variance. In addition, the obtained result for the transition countries can be explained by small number of observations. (Test results are presented in Table A9).

To correct for heteroskedasticity, a panel data analyses was used.. Breusch and Pagan Lagrangian multiplier test for random effects showed that for all groups of countries, except for transition countries, the random effect panel data estimation produced appropriate results. (The results of Breusch and Pagan Lagrangian multiplier test for the random effects are in Table A9)

Hausman test for all groups except for transition countries rejected the hypothesis that difference in coefficients was not systematic. Therefore, a fixed effect panel analysis was used to estimate the impact of the IPR protection on GDP growth (Results for Hausman test are presented in Table A9). The results of Hausman test were expected because all countries had some specific initial conditions and factors such as previous economic performance, level of technological development, cultural differences and others which do not change significantly for a country over time, but do change between the countries. Again, the group of transition countries is a kind of exception. Explanation of this fact can be a higher significance of other factors common for transition countries as well as a small number of observations.

Fixed effect panel data regression found a positive and statistically significant impact of strong IPR protection on GDP growth only for low-

income countries, countries with low IPR protection and for all 91 countries, at 10% significance level. For low-income countries and countries with low level of protection, an increase in the IPR protection by 1 point increases GDP growth by 6%, and for all countries – by almost 2%. The results of FE panel data regression are presented in Table A6.

After control for robustness, obtained results from the fixed effect panel data regression are unbiased and consistent. (The results of regressions with robust standard errors are in Table A7, the comparative results of all regressions for the groups are in Tables A10-A18). As well, after control for robustness, the result for countries with medium level of the IPR protection can be viewed as statistically significant at 15% significance level. Within this group, an improvement in the IPR protection by 1 point adds 2% to GDP growth.

Because of the presence of the fixed effect in almost all groups of countries (except for transition countries), estimation of the impact of the IPR protection on GDP growth can be controlled either for heteroskedasticity or for autocorrelation. After control for autocorrelation, general conclusion is that there is significant autocorrelation in the data. (Results of regressions for all the groups are in Table A8). This result is expected because of the rather large correlation between the data associated with all countries. The obtained results of the IPR protection impact on GDP growth are insignificant, except for the group of countries with high level of the IPR protection. An increase in the IPR protection index by 1 point speeds up GDP growth by 0.7%. However, it has opposite sign compared to the case of the control for robustness. Therefore, a clear conclusion about the sign of the coefficient can not be made. On the other hand, for low-income countries, countries with low and medium IPR protection and for all countries, the coefficients do not change after control for robustness. (Comparative results of all regression within each group of countries are in Tables A10-A18). Hence, it can be concluded that there is positive impact of

the IPR protection on GDP growth for the above-mentioned groups of countries, but its significance is not clear.

General results of the described estimation are presented in the following table

Table 2. Summary of Obtained Estimation Results within Groups

Group of countries	Should be estimated with	Significance (with control for robustness)	Significance (with control for autocorrelation)	Coefficient
All countries	FE	+	-	0.01-0.02
Transition countries	pooled OLS	-	-	-
All countries without transition	FE	-	-	-
High income countries	FE	-	-	-
Medium income countries	FE	-	-	-
Low income countries	FE	+	-	0.05-0.06
- with high protection of IPR	FE	-	+	-
- with medium protection of IPR	FE	+	-	0.01-0.05
- with low protection of IPR	FE	+	-	0.00-0.06

Based on these results, overall conclusion is: In general, the impact of the IPR protection for all countries is definitely positive. For low-income countries and countries with medium and low IPR protection, the influence

of the IPR protection on GDP growth is even larger than for average country. However, a clear conclusion about significance of this impact can not be made, specifically for all countries and for low-income countries and countries with medium and low IPR protection

4.2. Including Dummies into Analysis

Basic intuition behind this analysis is to check whether or not there is significant impact of the IPR protection on GDP growth within different groups of countries such as transition countries, high- and low-income countries, and countries with high and low IPR protection.

The following dummies were introduced into the model (Table 3) :

Table 3. Dummies Description

Dummy	Description of the Dummy
iprlow	equals 1 if country has low IPR protection index - less than 4
iprlow	equals 1 if country has high IPR protection index - more than 6
Dtra	equals IPR index if country is transition, 0 - otherwise
Diprhi	equals IPR index if country is in high-income group, 0 - otherwise
Diprli	equals IPR index if country is in low-income group, 0 - otherwise

The first two dummies capture the effect a of country having certain level of the IPR protection. Replacing the IPR protection index with these two dummies in the model, gives us a possibility to estimate the influence of a change in the level of the IPR protection on GDP growth.

Next dummy captures marginal effect of a strong IPR protection on GDP growth for transition countries. The last two dummies capture marginal effect of the IPR protection in high- and low-income countries.

Estimation procedure was the same as for the analysis without dummies. First, pooled OLS was run. (Results are presented in Table A19). The IPR protection index has positive and significant coefficient in both regressions, with dummies for high- and low-income countries and with dummy for transition countries. Marginal impact of the IPR protection in high income countries is positive and it is negative for low-income countries compared with the medium-income countries. Marginal impact of the IPR protection is negative in transition countries. For these dummies, if a country with a medium level of the IPR protection decreases its protection to a low level, GDP growth declines by almost by 5%. When IPR protection increases to the high level of protection, GDP growth increases by 11%. All results of the pooled OLS regression are significant.

However, after testing for heteroskedasticity with Breusch-Pagan/ Cook-Weisberg test, it is clear that for all specifications pooled OLS results should be controlled for heteroskedasticity. (The results of Breusch-Pagan/ Cook-Weisberg test for regressions with dummies are in TableA23).

Breusch and Pagan Lagrangian multiplier test for random effects showed that random effect panel data regression is more appropriate in this specification. (Results of Breusch and Pagan Lagrangian multiplier test for random effects are presented in Table A23).

Hausman test results showed that for the specified models fixed effect panel data regression are more appropriate. (Results of Hausman test are in Table A23). However, the fixed effect method does not take into account dummies for high and low protection of IPR since these dummies do not change over time. Therefore, it can be concluded that for the model with dummies for high and low protection of IPR their effect is insignificant. For

regressions with multiplied dummies, index of the IPR protection is insignificant as well as dummy for high-income countries. However, marginal impact of strengthening the IPR protection for low income countries and for transition countries is statistically significant: a one point increase in the IPR protection index adds 4% and 5% to GDP growth correspondingly. (Results for fixed effect panel data analyses are presented in Table A20).

Control for robustness and for autocorrelation does not change the results significantly. (Results of regressions with robust standard errors and regressions with AR(1) disturbances are presented in Tables A21,A22). Influence of IPR protection index on GDP growth is insignificant as well as marginal impact for high-income countries. Marginal impact of the IPR protection for low-income countries and for transition countries is positive and statistically significant, with a 4-5% increase in GDP growth for every point increase in the IPR protection index. (Comparative results of all regression within each group of countries are in Tables A24-A25).

On the basis of the obtained results, it can be concluded that marginal impact of the IPR protection is positive and statistically significant for transition and low-income countries even though average effect of the IPR protection is statistically insignificant.

4.3. Suggestions for future research

Of course, a problem of causality should be addressed. All macroeconomic variables are interdependent, and often a decision on the level of the IPR protection is a political decision in order to maintain a high profile of a country. Therefore, it would be interesting to estimate the influence of GDP growth on the IPR protection level.

Another possibility in the analysis of the positive and negative influence of the IPR protection on GDP growth is to estimate real costs and benefits of IPR strengthening.

Finally, the data used in this study were rather poor, especially for the group analysis. Therefore, it would be interesting to compare the obtained results with results based on a longer series of 10-15 years.

CONCLUSIONS

The main purpose of this study was to estimate general impact of the IPR protection on GDP growth taking into account transition countries. The question of whether or not the IPR protection strengthens GDP growth does not have the exact answer. That is why previous research in the field did not come to a definite conclusion. Such a result can be explained by the complexity of the mechanism between the IPR protection and GDP growth.

In this study, in testing for the effect of the IPR protection on economic growth the dataset for 91 countries was used. The data were taken from the World Development Indicators (2006) and Global Competitiveness Report 2005-2006. The index of IPR protection was taken from Economic Freedom Report (2005).

For the purpose of this research and on the basis of the previous studies, all countries were divided into 9 groups. As well some specific dummies to study the impact of the IPR protection were introduced.

After statistical estimation of the impact of the IPR protection index on GDP growth the following general conclusions can be made:

1) There is positive impact of the IPR protection on GDP growth for low-income countries and for countries with medium and low IPR protection. The same effect is observed in average country; however its influence on GDP is lower. However, no conclusion can be made with respect to its significance. No statistically significant results were found for transition countries and for low- and medium-income countries. For transition countries, the obtained results can be explained by a small number of observation. As in the previous studies (Falvey, Foster and Greenaway, 2004), positive effect of a strong IPR protection for low-income countries can be

explained by increased technology transfer and FDI inflows. For medium-income countries, insignificant results can be explained by the negative effects of the IPR protection – banned duplication and monopolistic use. Insignificant results of the impact of the IPR protection on GDP growth for high-income countries (and countries with high IPR protection) is unexpected result. In the previous studies, this effect was found to be positive. However, it should be mentioned that previous studies used data set up to 1995, when there was some tendency for further effective increase of the IPR protection. In this research, new data for the 2000-2004 period were used. Intuitively, it may be the case, that for high-income countries, which on general have higher level of IPR protection, a stronger IPR protection can have negative impact on GDP growth because of monopolistic use.

2) Introducing dummies into analyses, it was found that whereas IPR protection has no significant impact on GDP growth for average country, for transition and for low-income countries marginal effect of IPR protection is positive and significant.

Based on the received results, the following policy implication arises: in general, it is highly efficient for low-income countries to introduce a higher level of the IPR protection. Since for transition countries marginal impact of a strong IPR protection is positive, stronger IPR protection should be introduced. In particular for Ukraine, adoption of TRIPS agreement and as a consequence stronger IPR protection will have positive results both for GDP growth and for the country's image.

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APPENDIX A

Table A1. Countries Grouped by the Income Level

	Low-Income	Medium-Income	High-Income
1	Bangladesh	Algeria	Australia
2	Bolivia	Argentina	Austria
3	Cameroon	Botswana	Bahrain
4	Chad	Brazil	Belgium
5	China	Bulgaria	Canada
6	Ghana	Chile	Denmark
7	Honduras	Colombia	Finland
8	India	Costa Rica	France
9	Indonesia	Croatia	Germany
10	Kenya	Czech Republic	Greece
11	Madagascar	Dominican Republic	Hong Kong, China
12	Malawi	Ecuador	Iceland
13	Mali	Egypt, Arab Rep.	Ireland
14	Morocco	El Salvador	Israel
15	Nicaragua	Estonia	Italy
16	Nigeria	Guatemala	Japan
17	Pakistan	Hungary	Luxembourg
18	Philippines	Jamaica	Malta
19	Senegal	Jordan	Netherlands
20	Sri Lanka	Latvia	New Zealand
21	Tanzania	Lithuania	Norway
22	Uganda	Malaysia	Portugal
23	Ukraine	Mauritius	Slovenia
24	Zambia	Mexico	Spain
25	Zimbabwe	Namibia	Sweden
26		Panama	Switzerland
27		Paraguay	United Kingdom
28		Peru	United States
29		Poland	
30		Romania	
31		Russian Federation	
32		Slovak Republic	
33		South Africa	
34		Thailand	
35		Tunisia	

Table A1. Countries Grouped by the Income Level (Continued)			
	Low-Income	Medium-Income	High-Income
36		Turkey	
37		Uruguay	
38		Venezuela, RB	

Table A2. Countries Grouped by the IPR Protection Level			
	Low IPR protection	Medium IPR protection	High IPR protection
1	Algeria	Argentina	Australia
2	Bangladesh	Bahrain	Austria
3	Bolivia	Botswana	Belgium
4	Bulgaria	Brazil	Canada
5	Chad	Cameroon	Denmark
6	Ecuador	Chile	Estonia
7	Guatemala	China	Finland
8	Malawi	Colombia	France
9	Nicaragua	Costa Rica	Germany
10	Pakistan	Croatia	Hong Kong, China
11	Paraguay	Czech Republic	Iceland
12	Peru	Dominican Republic	Ireland
13	Russian Federation	Egypt, Arab Rep.	Israel
14	Uganda	El Salvador	Italy
15	Ukraine	Ghana	Japan
16	Venezuela, RB	Greece	Jordan
17	Zambia	Honduras	Luxembourg
18		Hungary	Malaysia
19		India	Netherlands
20		Indonesia	New Zealand
21		Jamaica	Norway
22		Kenya	Portugal
23		Latvia	Slovenia
24		Lithuania	South Africa
25		Madagascar	Spain
26		Mali	Sweden
27		Malta	Switzerland
28		Mauritius	Tunisia
29		Mexico	United Kingdom
30		Morocco	United States
31		Namibia	
32		Nigeria	
33		Panama	
34		Philippines	
35		Poland	
36		Romania	

Table A2. Countries Grouped by the IPR Protection Level (Continued)			
	Low IPR protection	Medium IPR protection	High IPR protection
37		Senegal	
38		Slovak Republic	
39		Sri Lanka	
40		Tanzania	
41		Thailand	
42		Turkey	
43		Uruguay	
44		Zimbabwe	

Table A3. Summary Statistics			
Variable	Obs	Mean	Std.Dev.
All countries			91
Export ratio to GDP, %	455	41,42	26,44
GDP, USD mln	455	360 742,60	1 232 734,71
GNI per capita, USD	455	9 292,31	12 020,02
Gross capital formation to GDP, %	448	21,92	5,34
GDP deflator, % yoy	455	8,61	23,42
Population, mln	455	58,16	174,10
School enrollement, secondary (% of gross)	440	81,88	32,09
IPR protection index	455	4,96	2,03
Transition countries			13
Export ratio to GDP, %	65	53,98	15,01
GDP, USD mln	65	73 432,11	108 465,29
GNI per capita, USD	65	4 578,62	2 797,15
Gross capital formation to GDP, %	65	24,50	3,96
GDP deflator, % yoy	65	7,92	8,89
Population, mln	65	23,15	38,26
School enrollement, secondary (% of gross)	65	95,45	6,96
IPR protection index	65	4,22	1,23
All countries without transition			78
Export ratio to GDP, %	390	39,32	27,35
GDP, USD mln	390	408 627,68	1 324 964,43
GNI per capita, USD	390	10 077,92	12 767,31
Gross capital formation to GDP, %	383	21,48	5,42
GDP deflator, % yoy	390	8,73	25,05
Population, mln	390	64,00	186,81
School enrollement, secondary (% of gross)	375	79,52	34,11
IPR protection index	390	5,09	2,11

Table A3. Summary Statistics (Continued)			
Variable	Obs	Mean	Std.Dev.
High income countries			28
Export ratio to GDP, %	140	50,91	35,93
GDP, USD mln	140	949 935,97	2 084 061,65
GNI per capita, USD	140	25 126,93	9 976,01
Gross capital formation to GDP, %	134	21,28	3,24
GDP deflator, % yoy	140	2,43	2,85
Population, mln	140	31,41	57,81
School enrollement, secondary (% of gross)	140	111,85	21,02
IPR protection index	140	7,37	1,26
Medium income countries			38
Export ratio to GDP, %	190	42,62	21,34
GDP, USD mln	190	92 222,35	142 942,04
GNI per capita, USD	190	3 345,74	1 580,58
Gross capital formation to GDP, %	190	22,40	4,68
GDP deflator, % yoy	190	8,52	9,94
Population, mln	190	27,90	39,43
School enrollement, secondary (% of gross)	189	81,56	15,31
IPR protection index	190	4,29	1,21
Medium income countries			25
Export ratio to GDP, %	125	28,96	12,51
GDP, USD mln	125	108 996,81	312 502,66
GNI per capita, USD	125	596,32	342,60
Gross capital formation to GDP, %	124	21,87	7,60
GDP deflator, % yoy	125	15,68	41,90
Population, mln	125	134,12	311,19
School enrollement, secondary (% of gross)	111	44,62	24,65
IPR protection index	125	3,28	1,01

Table A3. Summary Statistics (Continued)			
Variable	Obs	Mean	Std.Dev.
Countries with high protection of IPR			30
Export ratio to GDP, %	150	51,73	36,09
GDP, USD mln	150	890 800,77	2 025 139,92
GNI per capita, USD	150	22 820,00	12 239,20
Gross capital formation to GDP, %	144	21,73	3,50
GDP deflator, % yoy	150	2,50	2,69
Population, mln	150	31,76	55,83
School enrollement, secondary (% of gross)	150	108,89	22,78
IPR protection index	150	7,40	1,09
Countries with medium protection of IPR			44
Export ratio to GDP, %	220	39,65	18,52
GDP, USD mln	220	118 635,30	261 365,72
GNI per capita, USD	220	3 170,41	3 031,44
Gross capital formation to GDP, %	219	21,92	5,22
GDP deflator, % yoy	220	11,97	32,55
Population, mln	220	83,51	241,94
School enrollement, secondary (% of gross)	205	71,93	25,44
IPR protection index	220	4,18	0,92
Countries with low protection of IPR			17
Export ratio to GDP, %	85	27,79	13,65
GDP, USD mln	85	51 976,49	93 412,31
GNI per capita, USD	85	1 264,82	1 032,48
Gross capital formation to GDP, %	85	22,21	7,74
GDP deflator, % yoy	85	10,71	9,43
Population, mln	85	39,16	48,94
School enrollement, secondary (% of gross)	85	58,18	27,88
IPR protection index	85	2,67	0,71

Table A4. Correlation between Variables Used in the Analyses						
All countries						
	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.6177	1				
se	0.5430	-0.1422	1			
infyoy	-0.1832	0.0332	-0.2001	1		
expgdp	-0.0740	-0.4616	0.2389	-0.1082	1	
ipr	0.5094	-0.1554	0.6549	-0.1741	0.2859	1
Transition countries						
	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.8073	1				
se	0.0751	-0.1459	1			
infyoy	0.2905	0.5217	-0.4166	1		
expgdp	-0.3740	-0.4921	0.0929	-0.3248	1	
ipr	-0.1458	-0.5921	0.3727	-0.3486	0.5491	1
No transition countries						
	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.6058	1				
se	0.5781	-0.1264	1			
infyoy	-0.2002	0.0082	-0.1990	1		
expgdp	-0.0492	-0.4499	0.2163	-0.1012	1	
ipr	0.5444	-0.1444	0.7219	-0.1732	0.3144	1
High-income countries						
	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.9704	1				
se	0.1881	0.1750	1			
infyoy	-0.2835	-0.2393	0.1170	1		
expgdp	-0.4836	-0.5459	-0.2499	-0.154	1	
ipr	0.4591	0.3470	0.4169	-0.2102	-0.1934	1

Table A4. Correlation between Variables Used in the Analyses (Continued)

Medium-income countries

	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.9011	1				
se	0.3146	0.1523	1			
infyoy	0.1524	0.2517	-0.0993	1		
expgdp	-0.1706	-0.3671	0.0503	-0.2014	1	
ipr	-0.0376	-0.1720	0.1928	-0.343	0.4277	1

Low-income countries

	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.9305	1				
se	0.4433	0.2721	1			
infyoy	-0.1903	-0.1514	-0.0603	1		
expgdp	0.0885	-0.0258	0.4750	-0.004	1	
ipr	0.2057	0.1835	-0.0695	0.1116	0.1939	1

Countries with high IPR protection

	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.8629	1				
se	0.2572	0.0481	1			
infyoy	-0.2469	-0.1295	0.0609	1		
expgdp	-0.3885	-0.4604	-0.2822	-0.192	1	
ipr	0.3982	0.1441	0.4735	-0.1922	-0.2116	1

Countries with medium IPR protection

	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.7948	1				
se	0.3395	-0.1782	1			
infyoy	-0.1646	0.0173	-0.1817	1		
expgdp	-0.3112	-0.5741	0.2913	-0.1278	1	
ipr	0.0443	-0.2109	0.2539	-0.1033	0.277	1

Countries with low IPR protection

	LNk	LNn	se	infyoy	expgdp	ipr
LNk	1					
LNn	0.7215	1				
se	0.5118	0.0893	1			
infyoy	0.0690	0.0756	-0.0278	1		
expgdp	0.2157	-0.0323	0.6289	0.2126	1	
ipr	-0.0229	-0.0578	0.0182	0.1112	0.2377	1

Table A5. Results of Pooled OLS Regression for Groups of Countries

	all countries	transition	no transition	h/i countries	m/i countries	l/i countries	h/ipr countries	m/ipr countries	l/ipr countries
LNk	0.8774	0.8733	0.8788	0.8214	0.7973	0.6830	0.9535	0.8234	0.7714
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.1052	0.1394	0.0962	0.1685	0.2097	0.2846	0.0634	0.1101	0.2354
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
se	0.0034	0.0093	0.0038	0.0007	0.0025	0.0076	0.0010	0.0056	0.0087
	0.0000	0.0000	0.0000	0.3180	0.0060	0.0000	0.0830	0.0000	0.0000
infyoy	0.0023	0.0005	0.0023	-0.0042	0.0005	0.0019	0.0014	0.0018	0.0076
	0.0000	0.7940	0.0000	0.3910	0.7420	0.0000	0.7590	0.0000	0.0060
expgdp	-0.0010	-0.0030	-0.0006	0.0002	-0.0025	-0.0043	-0.0001	-0.0041	-0.0072
	0.0180	0.0050	0.1980	0.6130	0.0000	0.0510	0.7510	0.0000	0.0050
ipr	**0.0480**	**-0.0065**	**0.0400**	**0.0609**	**0.0214**	**0.0748**	**0.0747**	**0.0085**	**0.1065**
	0.0000	0.7390	0.0000	0.0000	0.0690	0.0030	0.0000	0.6480	0.0040
_cons	1.9164	1.5628	1.9367	2.5779	2.6372	2.6827	1.2219	2.5172	2.0588
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ad.R-sq.	0.9879	0.9936	0.9887	0.9938	0.9848	0.9821	0.9944	0.9836	0.9776
# obs	433	65	368	134	189	110	144	204	85

Table A6. Results of Fixed Effect Panel Data Regression for Groups of Countries

	all countries	transition countries	no transition countries	h/i countries	m/i countries	l/i countries	h/ipr countries	m/ipr countries	l/ipr countries
LNk	0.6692	0.7053	0.6027	0.6160	0.6898	0.5898	0.8273	0.6283	0.5876
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.6708	-2.4217	1.3677	3.2574	-0.4468	1.0071	2.2247	-0.4233	-0.3481
	0.0200	0.1690	0.0000	0.0000	0.1990	0.1690	0.0000	0.3910	0.4250
se	0.0051	0.0136	0.0018	0.0047	0.0090	0.0004	0.0023	0.0112	0.0030
	0.0150	0.0240	0.4200	0.0880	0.0010	0.9560	0.2260	0.0020	0.4960
infyoy	-0.0011	0.0011	-0.0013	-0.0039	0.0004	-0.0015	-0.0062	-0.0007	-0.0011
	0.0080	0.6570	0.0020	0.2870	0.6960	0.0190	0.0280	0.1030	0.4790
expgdp	-0.0014	-0.0009	-0.0028	-0.0001	-0.0007	-0.0040	0.0008	-0.0095	0.0116
	0.2270	0.7750	0.0280	0.9440	0.6700	0.1810	0.4590	0.0000	0.0000
ipr	**0.0190**	**0.0289**	**0.0117**	**-0.0072**	**0.0162**	**0.0622**	**-0.0089**	**0.0236**	**0.0641**
	0.0660	0.2210	0.3030	0.6720	0.1730	**0.0340**	0.4060	**0.1230**	**0.0050**
_cons	2.4106	8.0363	1.4734	-1.8568	4.6388	1.2967	-2.1022	5.4705	5.3735
	0.0000	0.0540	0.0470	0.1990	0.0000	0.5610	0.0110	0.0000	0.0000
R-sq (overall)	0.8841	0.5595	0.6868	0.9595	0.5401	0.9467	0.8658	0.4505	0.7
# obs	433	65	368	134	189	110	144	204	85
# groups	91	13	78	28	38	25	30	44	17
sigma_u	0.7496	3.7286	1.8552	4.9876	1.0329	0.9334	3.1774	1.1829	0.9424
sigma_e	0.0970	0.0758	0.0976	0.0846	0.0734	0.1341	0.0570	0.1008	0.0787
rho	0.9835	0.9996	0.9972	0.9997	0.9950	0.9798	0.9997	0.9928	0.9931

Table A7. Results of Regression with Robust Standard Errors for Groups of Countries									
	all countries	transition countries	no transition countries	h/i countries	m/i countries	l/i countries	h/ipr countries	m/ipr countries	l/ipr countries
LNk	0.6692	0.7053	0.6027	0.6160	0.6898	0.5898	0.8273	0.6283	0.5876
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.6708	-2.4217	1.3677	3.2574	-0.4468	1.0071	2.2247	-0.4233	-0.3481
	0.0320	0.3270	0.0000	0.0000	0.2070	0.0640	0.0000	0.4110	0.4760
se	0.0051	0.0136	0.0018	0.0047	0.0090	0.0004	0.0023	0.0112	0.0030
	0.0100	0.0510	0.3110	0.0860	0.0030	0.9250	0.2820	0.0010	0.4670
infyoy	-0.0011	0.0011	-0.0013	-0.0039	0.0004	-0.0015	-0.0062	-0.0007	-0.0011
	0.3880	0.6460	0.3070	0.6360	0.6550	0.3120	0.0200	0.4650	0.5890
expgdp	-0.0014	-0.0009	-0.0028	-0.0001	-0.0007	-0.0040	0.0008	-0.0095	0.0116
	0.6220	0.7990	0.3940	0.9120	0.7260	0.6700	0.3240	0.0090	0.0140
ipr	**0.0190**	**0.0289**	**0.0117**	**-0.0072**	**0.0162**	**0.0622**	**-0.0089**	**0.0236**	**0.0641**
	0.0710	0.1900	0.2800	0.5780	0.2310	**0.0120**	0.3540	**0.1190**	**0.0160**
_cons	1.7980	7.6255	0.3730	-4.4713	5.1209	0.2690	-3.4494	6.2209	5.6231
	0.1370	0.1560	0.7380	0.0390	0.0000	0.9200	0.0230	0.0000	0.0030
R-sq.	0.9979	0.9967	0.9981	0.9984	0.9977	0.9958	0.9992	0.9969	0.9979
# obs	433	65	368	134	189	110	144	204	85

Table A8. Results of Fixed Effect Regression with AR(1) Disturbances for Groups of Countries

	all countries	transition countries	no transition countries	h/i countries	m/i countries	l/i countries	h/ipr countries	m/ipr countries	l/ipr countries
LNk	0.6254	0.8016	0.5495	0.5271	0.7041	0.5766	0.7576	0.6081	0.6000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	1.7949	-2.6146	2.7997	7.9415	-0.4967	1.6469	1.3390	0.8540	0.5555
	0.0020	0.2170	0.3090	0.4340	0.0000	0.5560	0.0800	0.5170	0.0000
se	0.0015	-0.0018	0.0009	0.0008	0.0062	-0.0063	0.0005	0.0036	-0.0075
	0.5580	0.8020	0.3270	0.2200	0.7260	0.1050	0.2820	0.8410	0.7350
infyoy	-0.0054	0.0030	-0.0058	-0.0046	0.0003	-0.0072	-0.0034	-0.0049	-0.0009
	0.0000	0.1020	0.0000	0.5400	0.0210	0.8090	0.0000	0.3790	0.0000
expgdp	0.0042	0.0015	0.0027	0.0001	0.0020	0.0131	-0.0003	-0.0026	0.0187
	0.0040	0.7900	0.3340	0.0000	0.9620	0.3690	0.0000	0.6780	0.0860
ipr	**0.0119**	**0.0090**	**0.0057**	**0.0085**	**-0.0018**	**0.0520**	**0.0070**	**0.0093**	**0.0029**
	0.2180	0.4400	0.4720	0.8870	0.4370	0.8580	0.0430	0.5740	0.6010
_cons	-0.0061	9.0139	-1.9970	-10.6503	4.8379	-0.9252	0.9330	2.6121	3.1178
	0.9940	0.2800	0.0410	0.0160	0.0000	0.0000	0.6820	0.0290	0.0250
R-sq	0.6691	0.5912	0.5485	0.9496	0.4021	0.9089	0.8933	0.8872	0.8738
# obs	342	52	290	106	151	85	114	160	68
# groups	90	13	77	28	38	24	30	43	17
rho_ar	0.4247	0.5593	0.4012	0.6879	0.5060	0.2198	0.6367	0.3815	0.3715
sigma_u	2.4084	3.8959	4.0260	12.9471	1.1071	1.8836	1.7154	1.0893	0.5359
sigma_e	0.0809	0.0552	0.0810	0.0474	0.0614	0.1023	0.0407	0.0812	0.0636
rho_fov	0.9989	0.9998	0.9996	1.0000	0.9969	0.9971	0.9994	0.9945	0.9861

Table A9. Tests Results for Group of Countries									
	all countries	transition countries	no transition countries	h/i countries	m/i countries	l/i countries	h/ipr countries	m/ipr countries	l/ipr countries
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity									
Het-city	+	-	+	+	-	+	+	+	+
chi2	60.54	0.49	4.99	47.36	1.54	18.34	4.99	19.09	3.64
Prob>chi2	0.0000	0.4830	0.0255	0.0000	0.2153	0.0000	0.0255	0.0000	0.0563
Breusch and Pagan Lagrangian multiplier test for random effects									
RE	+	-	+	+	+	+	+	+	+
chi2	399.89	2.22	325.83	69.74	219.29	71.74	121.84	177.46	61.85
Prob>chi2	0.0000	0.1365	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman test for fixed effects									
FE	+	-	+	+	+	+	+	+	+
chi2	70.97	11.69	52.84	33.63	15.44	18.62	37.49	25.37	37.92
Prob>chi2	0.0000	0.0692	0.0000	0.0000	0.0171	0.0049	0.0000	0.0003	0.0000

Table A10. Results of Run Regressions for the Group of All Countries					
	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.8774	0.7880	0.6692	0.6692	0.6254
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.1052	0.1865	0.6708	0.6708	1.7949
	0.0000	0.0000	0.0200	0.0320	0.0020
se	0.0034	0.0066	0.0051	0.0051	0.0015
	0.0000	0.0000	0.0150	0.0100	0.5580
infyoy	0.0023	-0.0002	-0.0011	-0.0011	-0.0054
	0.0000	0.6480	0.0080	0.3880	0.0000
expgdp	-0.0010	-0.0001	-0.0014	-0.0014	0.0042
	0.0180	0.8800	0.2270	0.6220	0.0040
ipr	**0.0480**	**0.0326**	**0.0190**	**0.0190**	**0.0119**
	0.0000	0.0000	0.0660	**0.0710**	**0.2180**
_cons	1.9164	2.3310	2.4106	1.7980	-0.0061
	0.0000	0.0000	0.0000	0.1370	0.9940
R-squared	0.9879	0.9856	0.8841	0.9979	0.6691
# obs	433	433	433	433	342
# groups		91	91		90

Table A11. Results of Run Regressions for the Group of Transition Countries					
	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.8733	0.8348	0.7053	0.7053	0.8016
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.1394	0.1725	-2.4217	-2.4217	-2.6146
	0.0000	0.0000	0.1690	0.3270	0.2170
se	0.0093	0.0092	0.0136	0.0136	-0.0018
	0.0000	0.0000	0.0240	0.0510	0.8020
infyoy	0.0005	0.0007	0.0011	0.0011	0.0030
	0.7940	0.7080	0.6570	0.6460	0.1020
expgdp	-0.0030	-0.0030	-0.0009	-0.0009	0.0015
	0.0050	0.0310	0.7750	0.7990	0.7900
ipr	**-0.0065**	**0.0100**	**0.0289**	**0.0289**	**0.0090**
	0.7390	0.6160	0.2210	**0.1900**	**0.4400**
_cons	1.5628	1.7744	8.0363	7.6255	9.0139
	0.0000	0.0000	0.0540	0.1560	0.2800
R-squared	0.9936	0.9940	0.5595	0.9967	0.5912
# obs	65	65	65	65	52
# groups		13	13		13

Table A12. Results of Run Regressions for the Group of Countries without Transition

	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.8788	0.7845	0.6027	0.6027	0.5495
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.0962	0.1821	1.3677	1.3677	2.7997
	0.0000	0.0000	0.0000	0.0000	0.3090
se	0.0038	0.0072	0.0018	0.0018	0.0009
	0.0000	0.0000	0.4200	0.3110	0.3270
infyoy	0.0023	-0.0002	-0.0013	-0.0013	-0.0058
	0.0000	0.6110	0.0020	0.3070	0.0000
expgdp	-0.0006	0.0003	-0.0028	-0.0028	0.0027
	0.1980	0.6780	0.0280	0.3940	0.3340
ipr	**0.0400**	**0.0282**	**0.0117**	**0.0117**	**0.0057**
	0.0000	0.0050	0.3030	0.2800	0.4720
_cons	1.9367	2.3685	1.4734	0.3730	-1.9970
	0.0000	0.0000	0.0470	0.7380	0.0410
R-squared	0.9887	0.9865	0.6868	0.9981	0.5485
# obs	368	368	368	368	290
# groups		78	78		77

Table A13. Results of Run Regressions for the Group of High-Income Countries					
	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.8214	0.7727	0.6160	0.6160	0.5271
P>t	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.1685	0.2318	3.2574	3.2574	7.9415
P>t	0.0000	0.0000	0.0000	0.0000	0.4340
se	0.0007	0.0019	0.0047	0.0047	0.0008
P>t	0.3180	0.1100	0.0880	0.0860	0.2200
infyoy	-0.0042	-0.0060	-0.0039	-0.0039	-0.0046
P>t	0.3910	0.1080	0.2870	0.6360	0.5400
expgdp	0.0002	0.0006	-0.0001	-0.0001	0.0001
P>t	0.6130	0.4240	0.9440	0.9120	0.0000
ipr	**0.0609**	**0.0245**	**-0.0072**	**-0.0072**	**0.0085**
P>t	0.0000	0.1110	0.6720	0.5780	0.8870
_cons	2.5779	3.0734	-1.8568	-4.4713	-10.6503
P>t	0.0000	0.0000	0.1990	0.0390	0.0160
R-squared	0.9938	0.9932	0.9595	0.9984	0.9496
# obs	134	134	134	134	106

Table A14. Results of Run Regressions for the Group of Medium-Income Countries					
	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.7973	0.7133	0.6898	0.6898	0.7041
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.2097	0.2856	-0.4468	-0.4468	-0.4967
	0.0000	0.0000	0.1990	0.2070	0.0000
se	0.0025	0.0044	0.0090	0.0090	0.0062
	0.0060	0.0030	0.0010	0.0030	0.7260
infyoy	0.0005	0.0005	0.0004	0.0004	0.0003
	0.7420	0.6040	0.6960	0.6550	0.0210
expgdp	-0.0025	-0.0011	-0.0007	-0.0007	0.0020
	0.0000	0.2880	0.6700	0.7260	0.9620
ipr	**0.0214**	**0.0089**	**0.0162**	**0.0162**	**-0.0018**
	0.0690	0.3940	0.1730	0.2310	0.4370
_cons	2.6372	3.0383	4.6388	5.1209	4.8379
	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.9848	0.9842	0.5401	0.9977	0.4021
# obs	189	189	189	189	151
# groups		38	38		38

Table A15. Results of Run Regressions for the Group of Low-Income Countries					
	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.6830	0.6531	0.5898	0.5898	0.5766
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.2846	0.3122	1.0071	1.0071	1.6469
	0.0000	0.0000	0.1690	0.0640	0.5560
se	0.0076	0.0074	0.0004	0.0004	-0.0063
	0.0000	0.0000	0.9560	0.9250	0.1050
infyoy	0.0019	-0.0003	-0.0015	-0.0015	-0.0072
	0.0000	0.5340	0.0190	0.3120	0.8090
expgdp	-0.0043	-0.0036	-0.0040	-0.0040	0.0131
	0.0510	0.1270	0.1810	0.6700	0.3690
ipr	**0.0748**	**0.0606**	**0.0622**	**0.0622**	**0.0520**
	0.0030	0.0060	0.0340	0.0120	0.8580
_cons	2.6827	2.9097	1.2967	0.2690	-0.9252
	0.0000	0.0000	0.5610	0.9200	0.0000
R-squared	0.9821	0.9797	0.9467	0.9958	0.9089
# obs	110	110	110	110	85
# groups		25	25		24

Table A16. Results of Run Regressions for the Group Countries with High Level of IPR Protection.

	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.9535	0.9313	0.8273	0.8273	0.7576
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.0634	0.0967	2.2247	2.2247	1.3390
	0.0000	0.0010	0.0000	0.0000	0.0800
se	0.0010	0.0027	0.0023	0.0023	0.0005
	0.0830	0.0140	0.2260	0.2820	0.2820
infyoy	0.0014	-0.0042	-0.0062	-0.0062	-0.0034
	0.7590	0.1700	0.0280	0.0200	0.0000
expgdp	-0.0001	0.0004	0.0008	0.0008	-0.0003
	0.7510	0.5210	0.4590	0.3240	0.0000
ipr	**0.0747**	**0.0163**	**-0.0089**	**-0.0089**	**0.0070**
	0.0000	0.1410	0.4060	0.3540	0.0430
_cons	1.2219	1.6152	-2.1022	-3.4494	0.9330
	0.0000	0.0000	0.0110	0.0230	0.6820
R-squared	0.9944	0.9933	0.8658	0.9992	0.8933
# obs	144	144	144	144	114
# groups		30	30		30

Table A17. Results of Run Regressions for the Group Countries with Medium Level of IPR Protection.

	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.8234	0.7066	0.6283	0.6283	0.6081
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.1101	0.1961	-0.4233	-0.4233	0.8540
	0.0000	0.0000	0.3910	0.4110	0.5170
se	0.0056	0.0092	0.0112	0.0112	0.0036
	0.0000	0.0000	0.0020	0.0010	0.8410
infyoy	0.0018	-0.0003	-0.0007	-0.0007	-0.0049
	0.0000	0.5290	0.1030	0.4650	0.3790
expgdp	-0.0041	-0.0058	-0.0095	-0.0095	-0.0026
	0.0000	0.0000	0.0000	0.0090	0.6780
ipr	**0.0085**	**0.0068**	**0.0236**	**0.0236**	**0.0093**
	0.6480	0.6210	0.1230	0.1190	0.5740
_cons	2.5172	3.1657	5.4705	6.2209	2.6121
	0.0000	0.0000	0.0000	0.0000	0.0290
R-squared	0.9836	0.9809	0.4505	0.9969	0.8872
# obs	204	204	204	204	160
# groups		44	44		43

Table A18. Results of Run Regressions for the Group Countries with Low Level of IPR Protection.

	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.7714	0.6382	0.5876	0.5876	0.6000
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.2354	0.3708	-0.3481	-0.3481	0.5555
	0.0000	0.0000	0.4250	0.4760	0.0000
se	0.0087	0.0049	0.0030	0.0030	-0.0075
	0.0000	0.0320	0.4960	0.4670	0.7350
infyoy	0.0076	0.0001	-0.0011	-0.0011	-0.0009
	0.0060	0.9460	0.4790	0.5890	0.0000
expgdp	-0.0072	0.0089	0.0116	0.0116	0.0187
	0.0050	0.0000	0.0000	0.0140	0.0860
ipr	**0.1065**	**0.0433**	**0.0641**	**0.0641**	**0.0029**
	0.0040	0.0540	0.0050	0.0160	0.6010
_cons	2.0588	2.7740	5.3735	5.6231	3.1178
	0.0000	0.0000	0.0000	0.0030	0.0250
R-squared	0.9776	0.9618	0.7000	0.9979	0.8738
# obs	85	85	85	85	68
# groups		17	17		17

Table A19. Tests Results for Pooled OLS Regressions with Dummies

	ME of h/i and l/i countries	ME of transition countries	with dummies for IPR
LNk	0.8017	0.8786	0.8946
	0.0000	0.0000	0.0000
LNn	0.1907	0.1007	0.0882
	0.0000	0.0000	0.0000
se	0.0028	0.0041	0.0035
	0.0000	0.0000	0.0000
infyoy	0.0023	0.0023	0.0024
	0.0000	0.0000	0.0000
expgdp	-0.0003	-0.0006	-0.0012
	0.4420	0.1660	0.0090
ipr	0.0292	0.0349	
	0.0020	0.0000	
Diprhi	0.0380		
	0.0000		
Diprli	-0.0504		
	0.0000		
Dtra		-0.0391	
		0.0000	
iprlow			-0.0496
			0.0880
iprhigh			0.1162
			0.0000
_cons	2.4663	1.9290	2.0113
	0.0000	0.0000	0.0000
Adj R-squared	0.9892	0.9888	0.9874
# obs	433	433	433

Table A20. Tests Results for FE Panel Data Regressions with Dummies

	ME of h/i and l/i countries	ME of transition countries	with dummies for IPR
LNk	0.6689	0.6598	0.6812
	0.0000	0.0000	0.0000
LNn	0.5290	0.8126	0.8244
	0.0720	0.0070	0.0030
se	0.0049	0.0050	0.0050
	0.0190	0.0170	0.0180
infyoy	-0.0012	-0.0011	-0.0010
	0.0040	0.0070	0.0130
expgdp	-0.0015	-0.0017	-0.0012
	0.1950	0.1590	0.3060
ipr	0.0099	0.0115	
	0.4930	0.3040	
Diprhi	-0.0072		
	0.7570		
Diprli	0.0406		
	0.0610		
Dtra		0.0468	
		0.0860	
_cons	2.8378	2.1470	0.6364
	0.0000	0.0020	0.0020
R-sq.overall	0.8939	0.8448	0.8428
# obs	433.0000	433.0000	433.0000
# groups	91	91	91
sigma_u	0.6359	0.9526	0.9912
sigma_e	0.0966	0.0967	0.0973
rho	0.9774	0.9898	0.9904

Table A21. Tests Results Regressionswith Robust SE with Dummies

	ME of h/i and l/i countries	ME of transition countries
LNk	0.6689	0.6598
	0.0000	0.0000
LNn	0.5290	0.8126
	0.0850	0.0080
se	0.0049	0.0050
	0.0140	0.0110
infyoy	-0.0012	-0.0011
	0.3520	0.3810
expgdp	-0.0015	-0.0017
	0.5910	0.5720
ipr	0.0099	0.0115
	0.4830	0.2900
Diprhi	-0.0072	
	0.7220	
Diprli	0.0406	
	0.0810	
Dtra		0.0468
		0.0810
_cons	2.3381	1.4411
	0.0450	0.2220
R-squared	0.9979	0.9979
# obs	433	433

Table A22. Tests Results Regressions with AR(1) Process with Dummies

	ME of h/i and l/i countries	ME of transition countries	with dummies for IPR
LNk	0.6317	0.6169	0.7889
	0.0000	0.0000	0.0000
LNn	1.5565	2.0814	0.1856
	0.0070	0.0010	0.0000
se	0.0012	0.0014	0.0058
	0.6330	0.5790	0.0000
infyoy	-0.0056	-0.0054	0.0001
	0.0000	0.0000	0.7570
expgdp	0.0047	0.0038	-0.0005
	0.0010	0.0100	0.5050
ipr	-0.0090	0.0041	
	0.4820	0.6990	
Diprhi	0.0353		
	0.1260		
Diprli	0.0507		
	0.0140		
Dtra		0.0406	
		0.0880	
iprlow			-0.0908
			0.0790
iprhigh			0.2261
			0.0000
_cons	0.5522	-0.6512	2.5071
	0	0	0
R-sq	0.7021	0.6348	0.9857
# obs	342	342	433
# groups	90	90	91
rho_ar	0.4207	0.4214	0.4259
sigma_u	2.0547	2.8486	0.1626
sigma_e	0.0800	0.0805	0.1072
rho_fov	0.9985	0.9992	0.6968

Table A23. Tests Results for Regressions with Dummies			
group of countries/ test results	ME of h/i and l/i countries	ME of transition countries	with dummies for IPR
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity			
heteroscedasticity	+	+	+
chi2	58.88	61.2	67.85
Prob>chi2	0	0	0
Breusch and Pagan Lagrangian multiplier test for random effects			
RE is better that OLS	+	+	+
chi2	386.08	377.48	429.93
Prob>chi2	0	0	0
Hausman test for fixed effects			
FE is better than RE	+	+	+
chi2	109.85	251.46	81.62
Prob>chi2	0	0	0

Table A24. Results of Run Regressions for the Model with Dummies for High- and Low-Income Countries

	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.8017	0.7560	0.6689	0.6689	0.6317
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.1907	0.2248	0.5290	0.5290	1.5565
	0.0000	0.0000	0.0720	0.0850	0.0070
se	0.0028	0.0053	0.0049	0.0049	0.0012
	0.0000	0.0000	0.0190	0.0140	0.6330
infyoy	0.0023	-0.0002	-0.0012	-0.0012	-0.0056
	0.0000	0.6820	0.0040	0.3520	0.0000
expgdp	-0.0003	0.0000	-0.0015	-0.0015	0.0047
	0.4420	0.9600	0.1950	0.5910	0.0010
ipr	**0.0292**	**0.0186**	**0.0099**	**0.0099**	**-0.0090**
	0.0020	0.0830	0.4930	0.4830	0.4820
Diprhi	0.0380	0.0409	-0.0072	-0.0072	0.0353
	0.0000	0.0000	0.7570	0.7220	0.1260
Diprli	-0.0504	-0.0192	0.0406	0.0406	0.0507
	0.0000	0.1480	0.0610	0.0810	0.0140
_cons	2.4663	2.6245	2.8378	2.3381	0.5522
	0.0000	0.0000	0.0000	0.0450	0.4900
R-squared	0.9892	0.9878	0.8939	0.9979	0.7021
# obs	433	433	433	433	342
# groups		91	91		90
rho_ar					0.4207
sigma_u		0.1634	0.6359		2.0547
sigma_e		0.0966	0.0966		0.0800
rho		0.7410	0.9774		0.9985

Table A25. Results of Run Regressions for the Model with Dummies for Transition Countries

	OLS	RE	FE	with robust se	FE with AR(1)
LNk	0.8786	0.7916	0.6598	0.6598	0.6169
	0.0000	0.0000	0.0000	0.0000	0.0000
LNn	0.1007	0.1792	0.8126	0.8126	2.0814
	0.0000	0.0000	0.0070	0.0080	0.0010
se	0.0041	0.0068	0.0050	0.0050	0.0014
	0.0000	0.0000	0.0170	0.0110	0.5790
infyoy	0.0023	-0.0001	-0.0011	-0.0011	-0.0054
	0.0000	0.7210	0.0070	0.3810	0.0000
expgdp	-0.0006	0.0001	-0.0017	-0.0017	0.0038
	0.1660	0.8430	0.1590	0.5720	0.0100
ipr	**0.0349**	**0.0319**	**0.0115**	**0.0115**	**0.0041**
	0.0000	0.0000	0.3040	0.2900	0.6990
Dtra	-0.0391	-0.0400	0.0468	0.0468	0.0406
	0.0000	0.0010	0.0860	0.0810	0.0880
_cons	1.9290	2.3194	2.1470	1.4411	-0.6512
	0.0000	0.0000	0.0020	0.2220	0.4290
R-squared	0.9888	0.9871	0.8448	0.9979	0.6348
# obs	433	433	433	433	342
# groups		91	91		90
rho_ar					0.4214
sigma_u		0.1666	0.9526		2.8486
sigma_e		0.0967	0.0967		0.0805
rho		0.7480	0.9898		0.9992

Table A26. Results of Run Regressions for the Model with Dummies for High- and Low IPR Protection				
	OLS	RE	FE	with robust se
LNk	0.8946	0.7756	0.6812	0.7889
	0.0000	0.0000	0.0000	0.0000
LNn	0.0882	0.1983	0.8244	0.1856
	0.0000	0.0000	0.0030	0.0000
se	0.0035	0.0062	0.0050	0.0058
	0.0000	0.0000	0.0180	0.0000
		-	-	
infyoy	0.0024	0.0002	0.0010	0.0001
	0.0000	0.6730	0.0130	0.7570
	-	-	-	
expgdp	0.0012	0.0004	0.0012	-0.0005
	0.0090	0.5640	0.3060	0.5050
	-	**-**		
iprlow	**0.0496**	**0.1066**		**-0.0908**
	0.0880	0.0670		0.0790
iprhigh	0.1162	0.2362		0.2261
	0.0000	0.0000		0.0000
_cons	2.0113	2.5681	0.6364	2.5071
	0.0000	0.0000	0.0020	0.0000
R-squared	0.9874	0.9851	0.8428	0.9857
# obs	433	433	433	433
# groups		91	91	91
rho_ar				0.4259
sigma_u		0.1821	0.9912	0.1626
sigma_e		0.0973	0.0973	0.1072
rho		0.7777	0.9904	0.6968