THE EFFECTS OF INTELLECTUAL PROPERTY PROTECTION ON GROWTH IN TRANSITION ECONOMIES

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Submitted to the Department of Economics in partial fulfillment of the requirements for the degree of Bachelor of Arts with honors

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May 6, 2005

Acknowledgements

I would like to thank Professor Honig for all his help throughout this endeavor. This paper would not have been possible without his efforts. I would also like to thank Professor Yarbrough and Professor Westhoff for their advice and encouragement. Finally, I'd like to thank Jeanne Reinle whose cheer and enthusiasm brightened the long hours in the economics lab.

Abstract

Recent research has suggested that stronger intellectual property protection affects the composition of foreign direct investment in transition economies but has not addressed the impact that it might have on the per capita growth rate. This paper seeks to answer that question, empirically exploring the effect that stronger intellectual property rights have on the growth rate. First, it estimates the effect of intellectual property protection on the per capita growth rate using panel data from 1994-2004. Next, the paper surveys output in a variety of sectors, in an attempt to explain where the changes in growth take place when IPR protection changes. Stronger IPR protection appears to have a strong positive effect on the economy, with per capita growth rates increasing upwards of 1 percent for a one standard deviation increase in IPR protection. The level of IPR protection also appears to affect the structure of the economy, with high degrees of protection correlated with increased revenues in areas such as petroleum, chemical, and plastic manufacturing.

Introduction

As transition economies become more integrated with the global economy, they experience increasing pressure from the international community to formalize their relationships through membership in the European Union (EU) and the World Trade Organization (WTO). Membership in such groups often requires adopting economic and political measures with uncertain effects. For example, a country may decide that membership in the WTO outweighs the possible harms of becoming a signatory to the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement, but still be unsure of the impact of improving property rights protection on its economy.

This paper seeks to answer the question of whether strong intellectual property protection helps or hurts transition economies by determining empirically whether stronger levels of intellectual property protection increase the per capita growth rate. Traditional thought suggests that strong intellectual property rights (IPRs) help to stimulate the domestic research industry and thereby increase growth rates. This idea hardly seems applicable to transition economies, however, given that most of them lack large research sectors.[1]

On the other hand, the importation of ideas from abroad may be more important than domestic research for growth in transition economies. By this reasoning, countries with weak IPRs could benefit by gaining access to ideas and processes developed abroad without absorbing the cost of licensing fees. This would presumably increase productivity and make the country an attractive place for foreign investors. However, if the country hopes to encourage investment directly from the company that owned the patent, IPR protection is necessary. Manufacturers are unlikely to build plants if they

[1] Of course, the dearth in this area could be the result of their long history of weak IPR protection.

fear that onlookers can simply copy their design and begin competing with them down the street. It is possible, then, that strong IPR protection could foster growth by increasing certain types of investment, increasing horizontal technological spillover, and affecting trade flows.

I choose to focus on transition economies because of their historical and contemporary circumstances. Historically, transition economies were closely associated with the Soviet Union (USSR) and operated under a communist regime that provided very little protection of property rights. Since the USSR's dissolution and these countries' independence, they have had to struggle to create a property rights system that provides fair and appropriate protection. IPRs are amongst the most difficult of property rights to define and enforce, which may lead to greater variation between countries. Further, IPRs have generated significant political debate throughout the world. This debate is especially strong in transition economies, where property rights have not been respected for much of recent history, and makes the question of how strong enforcement of IPRs affects the population even more salient.

Transition economies are also of special interest because they stand to benefit more from higher levels of IPR protection than other developing countries. These countries have traditionally enjoyed a highly educated workforce, which would indicate that they have a greater ability to take advantage of higher levels of IPR protection. An educated workforce is more capable of engaging in research that may result in patents, may prove more attractive to multinationals looking to engage in foreign direct investment (FDI) that requires advanced technological processes, and is better able to reap the benefits of technological spillover.

Transition economies also possess fairly high levels of healthcare and other standard of living indicators despite their poor economic performance. In addition, transition economies inherited distorted economic structures and inefficient production mechanisms from their predecessors and have suffered from social upheaval arising from the collapse of the Soviet Union. These conditions mark transition for a study in their own rights, along with how growth might take place under these conditions.

Limiting the study to transition economies may also allow for the isolation of the effects of IPRs on FDI, which could be important if FDI plays a role in the effects of IPRs on growth. FDI appears to be largely determined by previous investment in the country, limiting the amount that government policy changes can affect investment rates in any particular year. FDI in the Soviet Union was practically zero prior to its dissolution, so the study of these states allows us to examine the effects of government policy with regard to intellectual property protection without worrying about baseline effects because of different degrees of initial FDI.

I find that higher IPRs tend to have a positive effect on growth, with large improvements in intellectual property protection having the capacity to increase a country's per capita growth rate by over 5 percent. Further, the level of IPR protection appears to encourage the development of technology and research intensive sectors of the economy.

The rest of the paper is organized as follows. Section 2 provides a literature review, Section 3 discusses the data, Section 4 describes the empirical methodology, section 5 examines the results, and Section 6 summarizes the findings and draws policy implications.

<u>Section 2:</u> Literature Review

Much of the growth literature stems from empirical estimations of a Cobb-Douglas production function, $Y=AK^{\alpha} L^{1-\alpha}$. Early empirical estimations used observed levels of capital growth and labor growth, subtracting them from the growth rate to yield a measure of total factor productivity (TFP). These studies yielded extremely large residuals, indicating that much of output could not be accounted for simply by measuring capital and labor inputs.

In 1993 Coe and Helpman found, in a study limited to the Organization for Economic Cooperation and Development (OECD) countries, that increased levels of research and development had very strong positive effects on productivity growth. They calculated measures of TFP for each of the countries in their sample, and then regressed cumulative domestic research and development expenditure and a weighted measure of foreign research and development expenditure on TFP. Coe and Helpman found that there is a close link between productivity and research and development expenditures. Their paper is particularly interesting in that it suggests that much of the variation in TFP can be accounted for by technology, which is in turn improved by research and development that IPRs supposedly stimulate.

Barro and Lee (1993) evaluate the factors that distinguish between fast and slow growers. To do so, they measure the per capita growth rate as a function of state variables (including physical and human capital) and control variables (such as government consumption, the fertility rate, the black-market premium, etc). They reform more traditional growth studies by replacing measures of physical capital with those of human capital. Measures of physical capital tend to be unreliable, they argue, and, that for given levels of educational attainment and health, are best reflected by using measures of initial GDP. Barro and Lee introduce measures of schooling and life expectancy in their model. They find that life expectancy has a strong positive effect on growth, explaining that it likely acts as a proxy for other factors, such as better work habits, that are correlated with growth.

Their findings indicate that male and female schooling tend to have different effects on the growth rate. Indeed, the coefficient for female schooling was negative. Barro and Lee explain this by arguing that large differentials in male and female schooling indicate backwardness, which is strongly associated with high growth potential. They also find, however, that female schooling tends to decrease fertility, a factor that often has positive effects on per capita growth. This finding may be of limited applicability in the transition economies, given that they experienced a negative population growth rate for much of the time period in question.

Barro and Lee also include measures of government policy, such as consumption spending, black-market premiums, political stability, and protection of individual rights. However, lacking any overall measure of good governance, Barro and Lee are forced to rely on variables that simply tend to correlate with strong government institutions, rather than use variables that actually measure them.

Knack and Keefer (1995) attempt to formalize this system, using more standardized measures of institutional quality. They argue that a better measure of institutional quality is an index they create based on the International Country Risk Guide (ICRG). Although the ICRG is still somewhat biased through its survey mechanism, Knack and Keefer attempt to standardize their findings by reformulating ICRG measures to a bell-shaped index. Their findings indicate that institutions that protect property rights are essential for economic growth and encouraging investment.

Barro and Sala-i-Martin (1995) conduct a survey of the literature, determining that the most basic model tends to include a measure of education, the ratio of government consumption to Gross Domestic Product (GDP), the black-market premium, political instability, and the growth rate of the terms of trade. They account for potential endogeneity by lagging these variables. Barro and Sala-i-Martin explain including measures of political stability as a way to control for the decline in property right protection, but never attempt to simply include a property rights variable. They also maintain the separation of male and female schooling rates.

Levine and Renelt (1992) conduct a sensitivity analysis in an attempt to review the variety of factors included in other growth studies. They use the linear form

$$Y = \beta_i I + \beta_m M + \beta_z Z + \mu$$

where I is the set of variables that are always included, M is the variable in question, and Z is a set of variables that other literature has indicated may have significance. Ultimately, they conclude that investment and trade (both as a percentage of GDP) are robust for their effects on GDP growth, but that trade policy, fiscal indicators, and political indicators did not have a robust effect on growth. Although their results question the robustness of a number of variables often used in growth accounting, they indicate that many of those variables should be included for their explanatory effects.

Bleaney and Nishiyama (2002) also tried to synthesize the growth literature, creating a test between the models advanced by Barro (1991 and 1997), Easterly and

Levine (1997), and Sachs and Warner (1997). Only including the log of initial GDP per capita was common to all three models. Although each model focuses on different causes of growth – Barro includes schooling, Easterly and Levine stress ethnolinguistic fractionalization, and Sachs and Warner focus on openness to trade – Bleaney and Nishiyama conclude that the best model encompasses explanatory variables from all three of these papers. In particular, they suggest that human capital, institutions, production of primary products, and terms of trade tend to have significant effects on the growth rate.

The growth literature for transition economies has only emerged recently, and focuses primarily on initial conditions, monetary and fiscal stability policies, and market oriented reform (European Bank for Reconstruction and Development (EBRD) Transition Report 2004). These factors are, of course, highly correlated. Initial conditions seem to be a key determinant for early economic and political reforms, with unfavorable conditions associated with slow economic liberalization. De Melo, Denizer, Gelb, and Tenev (2001) evaluate the interactions between initial condition, political change, reforms, and economic performance. Although adverse conditions retard the adaptation of reforms, they find that when reforms are actually put in place, their effectiveness is not diminished. De Melo, et al. suggest that reforms are slower in economies with unfavorable initial conditions because governments experience more difficulty accepting the short run costs of implementation.

Falcetti, Raiser, and Sanfey shed more light on the issue in their 2002 paper. They argue that the importance of initial conditions decreases over time, while structural reforms become more important. As economies grow further removed from the Soviet

Union in their first years of transition, their prior experiences become less relevant, while policy decisions in the last ten years grow more relevant. The paper also examines the possibility of simultaneity between market-oriented reforms (as measured by the EBRD Transition Indicators) and growth, finding that while the effects of reforms may be overstated because of a simultaneity bias, they are still significant. Falcetti, et al. also find that the effect of reforms on growth is nonlinear in two regards. First, it seems that reforms have a negative effect on growth in the year they are implemented, and a positive effect on growth with a 1-year lag. Second, early reform steps seem to have a greater effect on growth than later reforms.

The Falcetti, et al. paper may help to explain why initial conditions were so important in the decision to make early reforms. The one-year lag in positive consequences (indeed, the negative effects on growth for the first year) would likely make structural change an unpopular move for politicians. Politicians are less capable of making such decisions in weak democracies and, as Falcetti, et al. suggest, countries that were already performing well might experience decreased resistance to reforms and increased access to resources available to compensate losers. This may also imply that countries with previous success in reforms are more likely to undertake more reforms in the future.

Sahay and Fischer (2000) focus on how macroeconomic and structural policies affect the transition process, finding that stabilization policies and structural reforms contribute to growth. They also find that quicker implementation of reforms speeds the growth process. Privatization is singled out as one of the reforms most likely to speed growth. Still, their results may be spurious. Sahay and Fischer note that inflation rates were extremely high in the years initially following independence, coming down to single digits only around 1998. GDP also dropped significantly immediately after dissolution, yet it seems more likely that both the fall in GDP and the high inflation rates were the result of instability than one causing the other.

The literature on policy reform and growth in transition economies has mostly discussed the effects of reforms measured in the EBRD Transition Indicators. Little has been done connecting intellectual property protection directly to growth in transition economies (though Claessens, Stijn, and Laeven [2003] and Lall [2001] explored their effects on growth in a wide sample of countries); instead, results seem to be piecemeal: Smarzynska (2002 and 2004), Lee and Manfield (1996), and Ferrantino (1993) suggest that intellectual property protection affects the composition of foreign direct investment, and Nath (2004), in turn, examines the effect on foreign direct investment on growth in transition economies.

Claessens, et al. look specifically to how property rights influence growth, finding that firms in markets with weak property rights tend to invest more in fixed assets relative to intangible ones. Intellectual property (in the form of patents, trademarks, or copyrights), they point out, is a weak asset that firms have little power to prevent their employees or competitors from using elsewhere. They further examine the view of intellectual property as a weak asset in that of their five indexes of property protection, three measure only intellectual property. The paper finds that weak protection inhibits growth by encouraging firms to allocate resources inefficiently and limiting access to external financing by decreasing foreign direct investment.

Their paper, however, may be of limited use in understanding transition economies. The paper does not include a single transition economy in its sample (given that the data are from 1980-1989 this would have been impossible), and fails to test for differences between developed and developing countries. Moreover, the paper does not control for changes to intellectual property protection within countries during the time period. In fact, for only one of their indexes of property protection is there any overlap with the time period they were studying. Despite the fact that they examined growth rates in the 1980s, most of their property protection variables were measured in the 1990s. Although measures of property protection are unlikely to change very much on a yearly basis, significant changes could very well have occurred over a period of ten years.

The Lall paper may provide more insight for exploring the effects of IPR protection in transition economies. Lall examines the possible mechanisms through which IPRs could affect growth, concluding that the effects of adopting stronger IPR protection differ depending on the level of industrial and technological development that exists within a given country. To benefit from IPR protection, Lall argues, a country must have innovative capabilities, the ability to use knowledge in a productive activity, the ability to disseminate knowledge to other actors, or the capacity to stimulate innovation in other enterprises that now have increased access to scientific information through data provided to the patent office. To benefit from stronger IPR protection, then, a country must first have one of the above four listed traits. These characteristics may be found in transition economies even if they are lacking in other developing countries.

Smarzynska (2004) specifically examines how the strength of intellectual property protection affects the composition of foreign direct investment in transition economies. She finds that weak protection of IPRs deters foreign investors from technology-intensive sectors[2] and encourages investment in distribution facilities rather than local production. Despite these changes in the location and uses of FDI, Smarzynska fails to see any significant impact of intellectual property protection on the overall amount of FDI in transition economies.

Nath (2004) examines how FDI impacts growth rates in transition economies, finding that domestic investment is the most important determinant of growth in transition economies, but that FDI still had a significant positive effect on the per capita growth rate. The study also finds that high degrees of export orientation increase the impact of FDI on growth. Finally, Smith (2001) finds that stronger protection of patent rights increases United States affiliate sales and licenses to that country. Results are likely similar for other major economic powers, and an increase in sales and licensing could have important implications for growth.

If strong intellectual property protection increased the amount of FDI it would provide an explanation for why it might also increase growth. Even in the absence of this link, however, there is a strong argument that IPRs can improve growth through their influence on FDI. If strong IPRs alter the composition of FDI, it is likely that this new distribution across sectors is more efficient – that is, following Claessen's results, firms will make appropriate decisions about whether to invest in intangible or fixed assets, rather than only investing in fixed assets that are safer in the absence of strong protection. If some forms of FDI are more efficient than others, then shifting FDI to its efficient uses could increase growth.

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[2] Including drugs, cosmetics and healthcare products, machinery and equipment, and electrical equipment.

Strengthening IPR protection could also help static levels of FDI to increase growth rates by increasing the amount of technological spillover. Smarzynska (2002) notes that countries often expect new technologies to accompany FDI inflows, but that because corporations have an incentive to prevent information leakage that could benefit their competitors technological spillover tends to occur through backward linkages rather than horizontal ones. Stronger intellectual property protection may increase the amount of long-term horizontal spillover by encouraging corporations to apply for patents. Though spillover is limited for the time period specified within the patent, the information is publicly available for use immediately upon the patent's expiration and the patent application itself may provide valuable information for researchers. Although her paper focuses primarily on backward linkages, Smarzynska notes that high degrees of skilled labor in transition economy makes them more capable of manifesting the benefits of technological spillover.

Section 3: Data

The sample for this paper consists of 27 transition countries, as listed by the European Bank for Reconstruction and Development (EBRD). The EBRD puts out an annual Transition Report, which includes a transition score, from 1 to 4+, rating countries across eight[3] measures of transition. I calculated an overall measure of transition by averaging these eight values[4] to create a composite index of transition. The composite

[3] Transition indicators are available for large scale privatization, small scale privatization, governance and restructuring, price liberalization, trade and the foreign exchange system, competition policy, banking reform and interest rate liberalization, and securities markets and non-bank financial institutions.
[4] For the average, each of the eight transition indicators was equally weighted. The "+" and "-" either added or subtracted a third to the value of the indicator. For example, a rating of 4+ was calculated as 4.33, and a rating of 4- was calculated as 3.67.

transition index was calculated for 25 of the transition countries for each year from 1995 to 2004. Bosnia and Herzegovina joined the sample in 1998, and Serbia and Montenegro joined in 2001.

Measures of GDP and tertiary school enrollment were taken from the World Bank's World Development Indicators. Although secondary school enrollment is more commonly used in the growth literature, I chose to use tertiary school enrollment because secondary school enrollment rates were extremely underreported. Measures of savings, inflation and FDI were taken from the EBRD transition reports. FDI is measured as net inflows as a percent of GDP. Data on savings was more readily available than the data on investment, which made it a better choice for inclusion in the regression, even though investment is more standard. Information on membership in the European Union (EU) and World Trade Organization (WTO) was taken directly from membership lists from the organizations' websites. WTO members received a dummy with a value of 1 when they joined the organization. EU members received a dummy with a value of 1 when accession treaties were first signed. Measures of intellectual property protection were derived from the International Intellectual Property Alliance (IIPA) recommendations to the United States Trade Representative (USTR) for their publication of the Special 301 report. USTR is required to annually compile a list of countries whose IPR policies have the greatest adverse impacts on U.S. right holders. Because USTR's placements on this list may be subject to political influence, I chose to use the IIPA's recommendations to the USTR, which are presumably further removed from political pressure and thus provide a less biased rating system.

I assigned values ranging from zero to 4, depending on IIPA's recommendation for list placement. A score of 0 represents the worst rating a country can get, indicating that it should be listed as a Priority Foreign Country. Countries receiving scores of 1 were recommended for placement on the Priority Watch List; countries receiving scores of 2 were recommended for placement on the Watch List; countries receiving scores of 3 were given a Special Mention, indicating that although their IPR protection was not poor enough to warrant placement on the Watch List, these countries should attempt to improve IPR enforcement in the future. I assigned a 4 to countries that were placed on none of these lists. Countries were given ratings for each year from 1995 to 2005.

It is important to note that this rating system is far from perfect. Although IIPA recommendations are a unique measure of IPR protection in that they are relatively unbiased and evaluate both the written law and how well that law is enforced, the ranking itself is subject to some degree of subjectivity, as there is no easily quantifiable measure of intellectual property protection. Moreover, it is impossible to distinguish between countries that were not recommended for placement on a list because they had very strong protection of IPRs from those who were not recommended for placement because the IIPA failed to review them in that year. This problem, however, is mitigated by the fact that the most egregious IPR violations garner IIPA attention and these countries would find their way onto the list.

These problems, to a lesser degree, may also apply to the other data used in this paper. Data collection in transition countries is notoriously difficult. Some measures are very spotty throughout the sample, and even for measures that are available with frequency, there may be reporting biases that diminish accuracy. Table 1 shows the summary statistics for all variables used in this study.

<u>Section 4:</u> Empirical Methodology

This paper attempts to explore the effects of IPRs in two ways. First, it examines the effect of intellectual property protection on the per capita growth rate. Next, the paper surveys growth in a variety of sectors, in an attempt to explain where the changes in growth occur when IPR protection changes.

The Per Capita Growth Rate

The EBRD indicates that growth in transition economies comes primarily from four places: 1) recovery from the transition recession 2) enterprise restructuring, new firms, and structural change 3) labor skills 4) investment and technological advance. Combining these factors with those used in standard growth regressions, I used panel data from 1994 to 2004 to estimate the following model[5]:

$$GYP = Y_0 + IPR + EDU + SAV + LIFE + TRANS + \mu$$

where GYP is the growth rate of GDP per capita, Y_0 is initial income (to control for any catchup effects), IPR is a measure of intellectual property rights protection, EDU is a measure of educational attainment, SAV is the level of savings as a percent of GDP, LIFE is the life expectancy, and TRANS is a measure of achievement of certain reforms in the transition process. Enterprise restructuring, new firms, and structural change are

[5] I chose not to include indexes of time and country in this model because they differ based on the estimation procedure.

captured by TRANS and EDU measures labor skills. Investment and technological change are of particular interest in this paper, as stronger IPR protection may speed the rate of technological advance and increase investment.

I chose to lag the IPR variable by two years for three reasons. First, when the IIPA publishes its recommendations for the USTR's yearly report, it is basing its assessments on IPR in that country in the previous year. In that sense, lagging the measure by one year is simply aligning measures of IPR protection with the year in which they were actually observed. Second, it might take a while for increased enforcement of IPRs to actually have an effect on growth. Regardless of the mechanism, it takes time for investors to choose to allocate more of their resources towards that country or for scientists to begin researching. This delay indicates that changes designed to increase IPR protection cannot have an effect on growth in that year; rather, we would expect to see growth change some time in the future. Finally, lagging the IPR variable helps control for the possibility of endogeneity.

Similar arguments exist for lagging the transition variable, TRANS. While some of the indicators (privatization, price liberalization) may quickly lead to an increase in growth, we would expect others (governance, banking reform) to exert their influence on the growth rate at some point in the future. There is a potential endogeneity problem because countries with higher GDP may be more likely to choose policies that achieve higher transition ratings. I chose to lag the transition variable by one year.

There is also the possibility that business cycle effects influence the results. I tried to account for this in several ways. Regressions included variables such as the inflation and the savings rate, which should move with the business cycle. I also included measures of US GDP growth and EU GDP growth. These variables would capture the worldwide business cycle, in addition to an increase in growth caused by investment from or trade with other countries experiencing strong growth. At times, US GDP growth and EU GDP growth were averaged to form the variable USEUGROWTH. Business cycle effects that were not correlated with the EU growth rate were likely also not correlated amongst the countries in the sample, which would imply that any effects would simply show themselves in the error term, thus not biasing coefficient estimates.

Additionally, I tried averaging over several years to mitigate the effects of the business cycle. In growth accounting these averages are typically computed over 10 year periods. In this case, this was somewhat prohibitive in that there is only ten years of data available for the transition economies. In essence, the between-effects regression functions in the same way averaging would.

I also explored breaking the sample into two 5 year periods and breaking it into three 3 year periods. Each of these attempts was expected to mitigate the effects of the business cycle, without removing them entirely. Finally, I computed a 3 year moving average. This approach mitigates business cycle effects without greatly diminishing the number of observations included in the study.

Section 5: Results

The Per Capita Growth Rate

As is common in the literature for transition economies, I begin with pooled OLS estimations and show results in Table 2. Column 5 shows the general estimation as described by the equation on page 15. Most coefficients for IPR range from 0.779

(column 3) to 1.31 (column 7), with exceptions for columns 1 and 2, which do not include education, and column 6, which includes inflation. Overall, IPR tends to have a significant positive effect on growth.

Including time trend variables and yearly dummies did not appear to alter the sign or magnitude of the IPR coefficients.[6] Although growth rates did increase with time during the period observed, these results indicate that the increase in growth rates are largely explained by other factors. EU and WTO dummies also had a negligible effect on the results.

Higher levels of IPR protection seem to have a positive effect on growth. One theory indicated that stronger IPRs could affect growth by increasing the amount of FDI and by changing the composition of FDI (Smarzynska 2001), presumably to a system of more efficient FDI use. An interaction variable between FDI and IPR failed to have any significance of its own and did not alter the magnitude or coefficient of the IPR variable, indicating that stronger IPR protection does not change the impact of FDI on growth.

Education, on the other hand, can change IPRs effects on growth. Although both IPR and education (as measured by tertiary school enrollment) tend to have a positive effect on growth, an interaction term between these two variables tends to have a negative effect on growth and increases the significance of the IPR variable (see columns 7 and 8). Higher levels of education, then, tend to diminish the positive effects that IPR protection normally has on growth.

Although the results for the interaction term are insignificant, the negative coefficient is surprising – it would seem that countries with higher levels of education

[6] In the yearly dummy analysis, Stata automatically dropped several of the years from the estimation because of high degrees of collinearity.

would be better able to take advantage of higher levels of IPR protection because they would be best equipped to engage in research and development and utilize highly skilled technologies brought into the country through FDI.

One possible explanation for the negative sign of the interaction term would look to a country's ability to steal technology from abroad. Copying technological advancements used in other countries may only be an option with high levels of education; it requires highly trained scientists to reverse engineer complicated products. It may be that highly educated countries benefit from technology developed abroad, while countries with lower education levels do not have the capacity to imitate these technological advancements.

Without the ability to reproduce technology through their own research, less educated countries may stand to benefit more from the increase in technology inflows that occurs at higher levels of IPR protection. Countries that could already use this technology through imitative products, however, may stand to lose from stronger IPR protection because they then have to pay licensing fees to foreign firms.

Also of interest is that TRANS, the measure of degree of implementation of EBRD transition reforms, appears to have a positive effect on growth when lagged by a year, confirming the work of Falcetti et al. (2004). Similarly, Sahay and Fischer's results were also confirmed by the negative sign and high significance of inflation (column 6) had on growth. Including inflation in the regression tended to decrease the magnitude and significance of the IPR variable, though it did remain positive.

Much of the growth literature has suggested that there is a catch up effect, allowing countries with previously lower GDPs to experience higher growth rates. I used three different measures to try to account for this, though none were significant. First, I included “gpc90”, a measure of GDP per capita in 1990 for each of the countries, the earliest year for which data was available for 23 of the countries in the study. I also tried using the log of gpc90. This measure concerned me both because it excluded four countries from the sample and because of the unique growth pattern in transition economies. Transition economies have experienced U-shaped growth, with growth rates declining tremendously in the post-transition period, only becoming positive again around 1998. Because different countries GDPs fell at different rates and to different degrees, studying their GDP per capita in 1990 may have said little about how much potential they had to grow in 1999. To account for this, I introduced the variable “gpclow”, which measured the lowest GDP per capita from 1989-2003, and used that as a catch-up point. These results were also insignificant. Finally, I created “catchup”, an indicator that simply took GDP per capita three years prior to the year in question. Here, too, it seems that there was not a significant catch-up effect.

GPClow, a measure of the lowest GDP per capita over the period observed, tended to have the highest significance on the GDP per capita growth rate. Even still, its effects on growth hovered close to zero. The catchup effect may be unobservable in transition economies because they are all in the process of adjustment. Convergence should only apply if the different countries in the sample are in different stages of development. Given that countries were selected for the sample on the basis of membership in a particular group at a specific point in development, it would make sense that there would be little variation in the growth potential of the different countries.

Further, even if a catchup effect does exist it may be undermined by Falcetti et al.'s results indicating that better initial conditions tend to improve growth rates by easing the transition process. Though countries with lower GDP per capita may have a greater potential for growth, they may also be less capable of implementing reforms that would speed growth.

One concern challenging the validity of the IPR results was the construction of the IPR index. Because IPR cannot be measured in absolute terms, it was unclear if the difference between a 1 and a 2 or a 3 and a 4 was linearly defined. More importantly, I was concerned that improvements in IPR protection may not have a linear effect on growth. To test these concerns I estimated results using dummy variables for each IPR value and estimated results using a spline, still lagging the observations by two years. The magnitudes of the coefficients did not follow the expected patterns (i.e., for the dummy variables, the coefficient for an IPR value of 4 was not four times the coefficient for the dummy for an IPR value of 1). However, in both of these tests the coefficients failed to have any significance.

These results most likely stem from the way the IPR index was constructed. A measure of 4 did not necessarily represent strong IPR protection, but could also mean that a country was not reviewed for the list. Even a 3, which indicated placement in the Special Mention category, could have indicated that those countries deserved a special mention not because of a systematic level of IPR protection, but because of one or two noteworthy processes. Finally, although the IIPA is significantly less biased than USTR, it is still based in the United States and its studies may evaluate IPR protection in these countries from a U.S. perspective (that is, by how much United States industry is hurt).

While stronger IPRs are generally reflected by higher values on the IPR index, breaking it down by each measure may be less valuable. This factor may have also decreased the significance of the results.

To minimize the problems associated with specific IPR index values, I split the sample into two groups, creating a dummy with a value of 1 for IPR index values of 3 or 4 (again, lagged by two years). These results are shown in Table 3. The coefficient for the IPR dummy is positive, ranging from 1.857 (column 3) to 3.61 (column 7) once the basic specifications are included, and nearly always significant. As expected, the magnitude of the coefficient for the IPR dummy is larger than the magnitude of the coefficient for the IPR values when they are each taken separately. Like the results from Table 1, including initial GDP per capita and the FDI interaction term did not have any noticeable impact on the results. The coefficient for the transition variable was again positive, though it still lacked significance. The interaction term between tertiary schooling and IPR remained negative and insignificant, but including it increased the size of the IPR coefficient. Inflation was again negative and significant.

A leverage-versus-residual-squared plot[7] on the regression described in Table 2, column 8 indicated that Estonia had high degrees of leverage on the overall model. I repeated the estimation without Estonia and found that results were not significantly changed. The new coefficient for IPR was 1.47, as compared to 1.11, and was significant at the 1-percent level. This value for IPR is well within the range of estimations for IPR included in this paper. Dropping Estonia from the model had no significant impact on any of the other explanatory variables. I also constructed a residual-versus-fitted plot[8], a

[7] Command "lvr2plot" in Stata
[8] Command "rvfplot" in Stata.

graph of the residuals against the fitted values, and determined that autocorrelation was not present.

I was also concerned about business cycle effects influencing my results, which was somewhat unclear. Including EU growth and US growth did not affect the results. The savings rate also did not appear to affect the magnitude of the IPR coefficients, though including it did tend to decrease the significance of the IPR results. To further control for business cycle effects while maintaining a high number of observations, I created a 3-year moving average. The results of this analysis appear in Table 4.

In the moving average estimation, IPR has a positive and significant impact on growth, with the coefficient ranging from 1.149 (column 3) to 1.941 (column 7), when standard regressors are included. As expected, tertiary school enrollment was positive and extremely significant (at the 1 percent level). An interesting change from the yearly estimations is that the savings rate has increased in significance. Inflation, meanwhile, has lost some of its significance, though it retains a negative coefficient. Life expectancy, US growth, EU growth, the budget balance, and FDI all fail to have a significant effect on the growth rate.

The interaction term between tertiary school enrollment and IPR remains negative in the moving average, although it fails to increase the size or significance of the IPR coefficient. TRANS is negative in these estimations, but lacks any significance. Decreased significance for many variables in the moving average approach can be explained by fewer observations and by less variation between observations.

The catchup effect appears to be strong in the moving-average approach, with coefficients ranging from -0.803 to -2.849 that are often significant. The presence of the catchup effect in the moving average approach but not in the yearly method may be explained in part to the high variability of the yearly growth rate and other explanatory factors, such as savings and inflation.

Table 5 shows the results of the moving-average approach when replacing the IPR index with the lagged IPR dummy. The IPR coefficient ranges from 1.11 (column 3) to 2.865 (column 6) and is significant at the 5 percent level in columns 4-7. As expected, and like the results from the yearly pooled OLS, replacing the IPR index with an IPR dummy raises the coefficient for the variable. Neither FDI nor the FDI*IPR interaction variable appears to have an effect on growth, and including a time trend has no serious effect on the results.

We again see that inflation has a strong negative effect on growth, once again confirming Sahay and Fischer's finding that macroeconomic stabilization is a key component of growth in transition economies. The moving average approach in this case casts some doubt on Falcetti's findings because the coefficient for the TRANS variable is negative. However, this result is not significant and should not be considered strongly, especially since other tests yielded a positive coefficient for this variable. The interaction term between tertiary schooling and IPR is again negative in columns 4 and 5, but turns positive in column 6 when logGPC90 is included. This positive coefficient, however, is extremely insignificant and should be discounted.

Much as with the IPR index, the catchup effect is much stronger in the moving average approach. Here, the coefficient for logGPC90 at –3.7 and significant at the 1 percent level. This is an interesting difference between the moving average and yearly approach. I also tested GPC90 and GPClow for the moving average, and though the results were not as significant (at the 5 percent and 10 percent level, respectively) it appears that the catchup effect is demonstrated regardless of what specification is used.

I next broke the sample into three 3-year periods.[9] Results are shown in Table 6. In the three year periods, IPR is only positive and significant when the Tertiary*IPR interaction variable is included. In those cases, it ranges from 1.324 (column 7) to 2.228 (column 8) and is significant at the 5 percent level. That the IPR coefficient is only significant when the interaction term is included further suggests that the effect of IPR on growth depends on the educational attainment of the country and time in question. Results from the 3-year averages are also different from the yearly results in that the interaction term is significant, in addition to being negative. This increased significance of the interaction term may explain why IPR loses its significance when the term is not included.

Measures of FDI, the budget balance, a time trend, and a catchup effect did not affect the results. In the 3-year averages, the TRANS variable gains significance and ranges in coefficient from 2.849 (column 7) to 3.239 (column 6). This increase in significance between the 3-year averages and yearly approach suggests that a one-year lag may not be long enough to allow for transition-oriented reforms to have an effect on growth. Indeed, a lag of any set number of years may not capture the full effect of transition on growth, as it is likely that different reforms take different amounts of time to affect the growth rate. Because the TRANS index is a composite of nine different types of reforms, this possibility is worthy of future study. While TRANS is already lagged for a year[10], averaging the index and the growth rates further minimizes the time relationship,

[9] 1995-1997, 1998-2000, 2001-2003
[10] Such that the average observations for 1995-1997 will use TRANS values for 1994-1996.

such that TRANS's effect on growth can be studied over a longer time period. The significance of these results (at the 5 percent level, in most cases) tends to confirm Falcetti et al.'s studies.

The savings rate tends to have a negative effect on growth, contrary to my expectations. Increased savings, however, likely comes at the expense of consumption. While higher savings rates may provide for better long-term growth, it may have a negative effect in any particular year.

While in the yearly estimations USEUGROWTH did not have a significant effect on growth, in the 3-year averages it is consistently negative and significant. Breaking this average into its components (column 7) indicates that US growth tends to have a negative effect on transition economies while EU growth tends to have a positive effect on growth in transition economies. The transition economies are likely more integrated with the EU economy due to their proximity, which would explain the greater positive effect that EU growth has.

Dummies for each of the IPR index values and a spline failed to yield significant results. A single IPR dummy also lacked significance. Coefficients for the IPR dummy were negative, though none of them had any significance.

Results for the 5-year averages[11] are included in Table 7. The coefficient for IPR tends to be negative, becoming positive only when the interaction term between tertiary education and IPR is included. IPR is never significant, though this may be partially due to the low number of observations necessitated by this approach (ranging from 50-54). Measures of a catchup effect have no effect on growth. Savings and inflation remain significant and negative. FDI tends to have a positive effect on growth, though the

[11] Five year averages were taken from 1995-1999 and 2000-2004.

interaction between FDI and IPR remains insignificant. TRANS tends to have a negative effect on growth using the IPR index in the 5-year averages, but has a positive effect in the 5-year averages when the IPR dummy is used. The IPR dummy was both negative and insignificant in the 5 year averages.

I then used a between-effects estimator, which functions in the same way a simple 10-year average would in this case because the sample includes only 10 years of data. Results are shown in Table 8. The coefficient for the IPR index and for the IPR dummy are positive across specifications. It never achieves signifiacance, but this is likely due to the extremely small number of observations, because there are only 27 countries in the sample. The t-statistic is largest in column 1, where there are the greatest degrees of freedom, which further confirms this hypothesis.

TRANS tends to have a large positive and significant effect on growth in this estimation, suggesting that a lot of the difference in the effect of transition reforms on growth takes place across, rather than within, countries. Savings has a negative and significant effect on growth, education tends to increase growth, and life expectancy has a positive effect on growth. There does not appear to be a catchup effect. The interaction term between tertiary school enrollment and IPR has no effect on the model.

Growth Within Industries

In addition to examining the effect of IPR protection on the per capita growth rate, I also explored the effect that increasing IPR protection had on specific industries. To do this, I used the Amadeus database to aggregate data from 15 Eastern European countries[12] across 15 industries, as measured by North American Industry Classification

[12] Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Serbia and Montenegro, Slovak Republic, Slovenia, Ukraine

System (NAICS) 2002 codes. Because Amadeus employs firm-specific data, industry growth rates were not accessible. Instead, I used a measure of total revenue in the industry for each country for 2003. Then, to make these numbers directly comparable across countries, I computed the revenue from each industry as a percent of the total. I then calculated the correlation coefficient between the percent of revenue in that industry and the IPR measure for 2005. Table 9 presents the results. Chart 1 graphs the correlation between the three most notable sectors.

Of particular note are the three manufacturing sections (Manufacturing 1, Manufacturing 2, and Manufacturing 3 at –0.01, 0.49, and 0.11 respectively). Ostensibly, manufacturing is manufacturing and factors that encourage manufacturing would be unlikely to distinguish between the different types of products. These results imply otherwise. Manufacturing 1, which is primarily food and beverage products, shows no correlation with the degree of intellectual property protection. This makes sense, in that higher IPRs would hardly be expected to increase the amount of food production. Manufacturing 2, however, which includes petroleum, chemicals, plastics, and rubber shows a very high degree of correlation (0.49) with intellectual property protection. Manufacturing 3, which varies in its products from metals and furniture to computer equipment, shows only a small correlation of 0.11. This result is expected because we would expect no correlation from some categories within Manufacturing 3 (primary metals and furniture) while we would expect a high correlation from others (computer equipment).

Also of note is the extreme negative correlation with mining (-0.45). This correlation could suggest a shift away from mining in favor of other activities as intellectual property protection increases. It could also suggest that countries with significant reserves of natural resources are less willing to engage in reforms and grant their citizens property rights. Countries with higher revenues from mining and larger natural resource endowments may find the implementation of reforms and adopting intellectual property protection less necessary for growth, and in fact may find that protection of those rights decreases governmental revenue. Also as expected, there was a high correlation (0.27) for the Professional and Scientific Services. Included in that category is computer programming and scientific research, both industries we would expect to be larger in a country with higher degrees of intellectual property protection.

The data source tends to limit the reliability of these results. Numbers were self-reported to Amadeus, and there may be a reporting bias by industry. This data set includes only the Eastern European transition economies. The results themselves are limited in their explanatory power because they are mere correlations, but they still provide an interesting starting point for future research.

Section 6: Conclusions

The results indicate that higher IPRs tend to have a positive impact on growth. A one standard deviation increase of the IPR index (where the standard deviation of the index is 1.15) tends to have between a 0.685 and a 1.49 percent increase in the growth rate. Moving from extremely low intellectual property protection (an index value of 0) to very good protection (an index value of 4) should increase the growth rate by 2.38 to 5.2 percent, or more if one controls for the effects of schooling. The negative coefficient for the interaction term between tertiary school enrollment and the IPR index suggests that IPR has less of a positive effect on the growth rate as school enrollment increases.

Including the interaction term was necessary to achieve significant results for the three, five, and ten year averages. This is partially due to fewer observations, but mixed results are also consistent with the theory surrounding IPR protection. While stronger IPRs likely increase growth rates by encouraging greater levels of research and development and added technological spillover, they also have the potential to hurt an economy by diminishing its ability to freely imitate technology developed in other countries. The negative coefficient for the interaction term suggests that countries with the highest schooling levels are best equipped to reverse engineer technology developed abroad.

Although these results suggest significance in the yearly and moving average observations, the study would benefit tremendously from increased access to data over a longer period of time. As transition countries continue to develop and more data becomes available, this question should be readdressed. More data would make extended time periods (the 5 and 10 year averages) easier to study and would allow the effects of IPRs to be more closely examined without worrying possible business cycle effects.

In addition to increasing the overall growth rate, it appears that the level of IPR protection can affect the composition of industries within the economy. Research intensive sectors, such as chemical and plastic manufacturing, tend to generate a much larger percentage of total revenue in countries with higher levels of IPRs. These correlations should be further explored using a model that controls for exogenous variables.

The results in this paper indicate mixed benefits to adopting higher levels of IPR protection. Countries with low levels of education seem to benefit greatly, while those with higher levels of education benefit to a lesser degree. As IPRs become a more politicized issue in the international community, however, even countries with extremely high levels of education may be wary of imitating products developed abroad because of the likely trade sanctions imposed by the country that first developed the technology. This would suggest that nearly all the transition economies would stand to benefit from increasing their level of IPR protection.

Table 1: Summary Statistics

Variable	Obs.	Mean	Median	Standard Deviation	Min.	Max.
GDP per capita growth	241	4.536274	4.554971	7.690746	-17.861	79.70898
IPR	269	2.821561	3	1.151629	0	4
Tertiary	186	31.43083	29.59833	13.04357	9.381615	68.3734
Savings, %GDP	256	13.35051	15.97466	12.93857	-48.7118	41.71304
Life Expectancy	234	69.84374	69.92318	2.760813	61.67317	75.01707
TRANS	261	2.784104	2.79125	0.607842	1.125	3.87375
Inflation	329	158.4021	14	372.0994	-8.5	1892
Net FDI inflows, %GDP	242	4.38E-02	3.27E-02	5.44E-02	-5.93E-03	4.61E-01
Budget Balance, %GDP	238	-8.10E-10	-1.48E-10	1.53E-09	-1.04E-08	4.78E-10
GDP per capita, 1990	253	2511.356	2039.931	1541.03	557.4719	5432.315
GDP per capita, lowest	297	1865.873	1359.074	1823.982	198.6372	8710.57
EU dummy	297	0.23569	0	0.425146	0	1
WTO dummy	297	0.387205	0	0.487933	0	1
US GDP growth	270	3.267933	3.691805	1.209796	0.253482	4.471915
EU GDP growth	270	2.035219	2.289757	0.91183	0.461168	3.503375

Table 2: Pooled OLS

Dependent variable: GDP per capita growth

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
IPR	-0.013	0.263	0.779	1.009	0.867	0.423	1.31	1.11	0.968
	(0.04)	(0.75)	(1.34)	(1.61)	(1.66)	(0.81)	(2.11)**	(2.09)**	(2.14)**
Savings (%GDP)		0.051	0.039	0.012	0.569				
		(1.50)	(0.67)	(0.18)	(0.97)				
Tertiary			0.044	0.081	0.107	0.123	0.082	0.105	0.093
			(0.98)	(1.56)	(2.45)**	(3.04)***	(1.66)*	(2.46)**	(2.61)**
FDI (%GDP)						-9.647	-5.191	-1.933	-2.035
						(1.18)	(0.64)	(0.27)	(0.29)
Balance (%GDP)							8.71E+08	5.87E+08	6.18E+08
							(2.07)**	(1.60)	(1.71)*
TRANS					-0.422			0.681	0.752
					(0.34)			(0.63)	(0.71)
GPC (lowest)						0	-0.001	-0.001	-0.001
						(0.44)	(1.71)*	(1.53)	(1.85)*
LogInflation						-0.843			
						(2.14)**			
Tertiary*IPR							-0.006	-0.006	
							(0.45)	(0.52)	
Life Expectancy				0.321	0.255	0.049			
				(1.40)	(1.13)	(0.23)			
Constant	5.006	3.363	-0.416	-24.692	-20.379	-2.638	0.021	-2.786	-2.521
	(4.74)***	(2.49)**	(0.15)	(1.48)	(1.37)	(0.17)	(0.01)	(0.86)	(0.79)
Observations	189	182	105	81	77	78	102	100	100
R-squared	0	0.01	0.03	0.08	.08	0.19	0.11	0.13	0.13

Absolute value of t statistics in parentheses

Table 3: Pooled OLS with IPR Dummy

Dependent variable: GDP per capita growth

	1	*2*	*3*	*4*	*5*	*6*	*7*
IPR	-0.642	-0.005	1.857	2.776	2.357	2.49	3.608
	(0.82)	(0.01)	(1.28)	(1.78)*	(1.83)*	(1.87)*	(2.22)**
Savings (%GDP)		0.042	0.039	0.021	0.085	0.09	-0.075
		(1.24)	(0.67)	(0.32)	(1.06)	(1.11)	(1.18)
Tertiary			0.045	0.084	0.156	0.155	0.106
			(1.00)	(1.62)	(3.57)***	(3.52)***	(2.00)**
Tertiary*IPR							-0.02
							(1.40)
Balance (%GDP)							1.00E+09
							(2.16)**
Life Expectancy				0.408	0.484	0.464	
				(1.73)*	(1.95)*	(1.83)*	
TRANS						0.703	
						(0.45)	
FDI (%GDP)					-1.53	-1.63	
					(1.62)	(1.67)	
GPC (1990)					0	-0.001	
					(0.78)	(0.90)	
Inflation					-0.01	-0.009	
					(2.44)**	(2.22)**	
Log Inflation							
Constant	5.376	4.281	0.619	-29.915	-36.536	-36.803	1.597
	(8.66)***	(4.75)***	(0.28)	(1.74)*	(2.07)**	(2.07)**	(0.72)
Observations	189	182	105	81	73	73	102
R-squared	0	0.01	0.03	0.09	0.29	0.29	0.1

Absolute value of t statistics in parentheses

Table 4: 3 year moving average

Dependent variable: GDP per capita growth

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
IPR	-0.103	-0.161	1.149	1.488	1.371	1.484	1.941	1.953
	(0.32)	(0.49)	(2.26)**	(2.85)***	(2.67)**	(1.78)*	(2.39)**	(2.36)**
LogGPC (1990)		-0.903	-0.803	-1.838	-2.9	-2.849	-1.61	-1.325
		(1.88)*	(1.13)	(2.11)**	(2.52)**	(2.36)**	(1.73)*	(0.91)
Tertiary			0.132	0.132	0.148	0.156	0.166	0.168
			(3.37)***	(3.49)***	(3.83)***	(2.55)**	(2.75)***	(2.72)**
Savings (% GDP)				0.121	0.207	0.202	0.103	0.096
				(1.91)*	(2.84)***	(2.50)**	(1.51)	(1.29)
TRANS								-0.355
								(0.26)
Tertiary*IPR						-0.004	-0.016	-0.018
						(0.17)	(0.73)	(0.76)
LogInflation					-0.614	-0.623		
					(1.21)	(1.20)		
Life Expectancy								
Constant	5.231	12.259	1.516	6.716	14.812	14.258	4.105	3.088
	(5.10)***	(3.06)***	-0.29	-1.18	(1.70)*	-1.51	-0.61	-0.39
Observations	135	115	39	39	36	36	39	39
R-squared	0	0.03	0.29	0.36	0.45	0.45	0.37	0.37

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: 3-year moving average with IPR Dummy

Dependent variable: GDP per capita growth

	1	*2*	*3*	*4*	*5*	*6*	*7*
IPR	-0.407	0.502	1.111	2.705	2.83	2.865	2.405
	(0.52)	(0.62)	(1.09)	(2.21)**	(2.19)**	(2.54)**	(2.44)**
Savings (%GDP)		0.062	0.065	0.054	0.063	0.205	0.243
		(2.19)**	(1.58)	(1.32)	(1.27)	(2.60)**	(3.39)***
Tertiary			0.016	0.062	0.072	0.096	0.093
			(0.54)	(1.78)*	(1.74)*	(2.63)**	(2.92)***
LogGPC (1990)						-3.757	-3.743
						(2.90)***	(3.23)***
LogInflation							-0.739
							(2.37)**
Life Expectancy					0.053	0.48	0.229
					(0.33)	(2.64)**	(1.17)
Tertiary*IPR				-0.021	-0.014	0.003	
				(2.23)**	(1.31)	(0.27)	
Constant	5.186	3.624	1.941	1.223	-4.308	-9.799	9.296
	(8.58)***	(4.29)***	(1.36)	(0.86)	(0.36)	(0.92)	(0.74)
Observations	135	134	78	78	54	50	48
R-squared	0	0.04	0.06	0.12	0.16	0.31	0.4

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: 3 year averages

Dependent variable: GDP per capita growth

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
IPR	0.784	0.296	0.222	0.14	0.187	2.211	1.324	2.228
	(1.08)	(0.54)	(0.37)	(0.21)	(0.29)	(2.36)**	(1.35)	(2.33)**
GPC (1990)		0	0	0.001	0		0	
		(0.21)	(0.35)	(1.59)	(0.61)		(0.66)	
Savings (% GDP)			-0.021	-0.181	-0.13	-0.131	-0.168	-0.135
			(0.32)	(2.61)**	(1.63)	(2.57)**	(2.81)***	(2.31)**
Life Expectancy					0.297			
					(1.25)			
Tertiary				0.09	0.101	0.182	0.126	0.184
				(1.87)*	(2.08)**	(2.90)***	(1.79)*	(2.83)***
TRANS						3.239	2.849	3.15
						(3.23)***	(2.20)**	(2.57)**
Tertiary*IPR						-0.046	-0.027	-0.047
						(2.15)**	(1.13)	(2.03)**
USEUGROWTH						-1.991		-2
						(3.10)***		(3.07)***
USgrowth							-4.204	
							(2.25)**	
EUgrowth							2.373	
							(1.23)	
Constant	2.192	2.957	3.295	0.7	-20.25	-6.327	0.707	-6.129
	(0.95)	(1.53)	(1.49)	(0.24)	(1.19)	(1.72)*	(0.13)	(1.53)
Observations	81	69	69	55	55	60	55	60
R-squared	0.01	0	0.01	0.16	0.19	0.37	0.45	0.37

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: 5 year averages

Dependent variable: GDP per capita growth

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
IPR	0.214	-0.173	-0.232	-0.262	-0.358	0.596	0.668	0.807
	(0.28)	(0.20)	(0.29)	(0.32)	(0.77)	(0.66)	(0.75)	(0.93)
Savings (%GDP)		-0.073	-0.181	-0.164	-0.035	-0.035		
		(1.07)	(2.42)**	(2.08)**	(0.67)	(0.67)		
Tertiary			0.068	0.066	0.079	0.132	0.128	0.106
			(1.20)	(1.17)	(2.32)**	(2.41)**	(2.36)**	(1.97)*
Life Expectancy				0.19	0.193	0.175	0.231	0.188
				(0.74)	(1.06)	(0.96)	(1.44)	(1.20)
TRANS					-2.286	-2.026	-2.468	-1.959
					(1.68)	(1.48)	(2.07)**	(1.64)
FDI (%GDP)					18.279	18.137	18.369	16.640
					(1.73)*	(1.72)*	(1.76)*	(1.63)
Inflation					-0.028	-0.027	-0.028	-0.023
					(3.91)***	(3.67)***	(4.11)***	(3.02)***
Tertiary*IPR						-0.023	-0.023	-0.021
						(1.22)	(1.23)	(1.14)
USEUGROWTH								-1.532
								(1.86)*
Constant	3.993	6.151	5.282	-8.103	-3.896	-5.936	-9.157	-3.755
	(1.64)	(1.94)*	(1.47)	(0.44)	(0.33)	(0.51)	(0.86)	(0.35)
Observations	54	54	52	52	50	50	50	50
R-squared	0	0.02	0.11	0.12	0.41	0.43	0.42	0.47

Absolute value of t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Between Effects Estimation (10 year average)
Dependent variable: GDP per capita growth

	1	*2*	*3*	*4*	*5*	*6*	*7*
IPR	1.432	0.692					
	(1.67)	(0.86)					
IPR dummy			2.976	1.174	0.554	1.113	1.903
			(1.37)	(0.50)	(0.15)	(0.59)	(0.80)
Savings (%GDP)		-0.183		-0.117	-0.278	-0.164	-0.236
		(2.06)*		(1.85)*	(2.39)**	(2.36)**	(2.07)*
Tertiary		0.159			0.163	0.134	0.144
		(2.43)**			(1.44)	(2.21)**	(2.09)*
Life Expectancy		0.398			0.957	0.415	0.413
		(1.31)			(2.20)**	(1.50)	(1.30)
TRANS		3.81				4.174	4.967
		(2.16)**				(2.96)***	(2.13)**
GPC (1990)		0					0.001
		(0.40)					(0.70)
Log Inflation							0.833
							(0.66)
Constant	0.51	-41.329	2.889	5.517	-65.615	-40.78	-46.947
	(0.20)	(1.97)*	(2.12)**	(2.83)***	(2.07)*	(2.23)**	(1.95)*
Observations	240	114	241	232	126	121	112
Number of code	27	23	27	27	27	25	23
R-squared	0.1	0.69	0.07	0.19	0.43	0.65	0.69

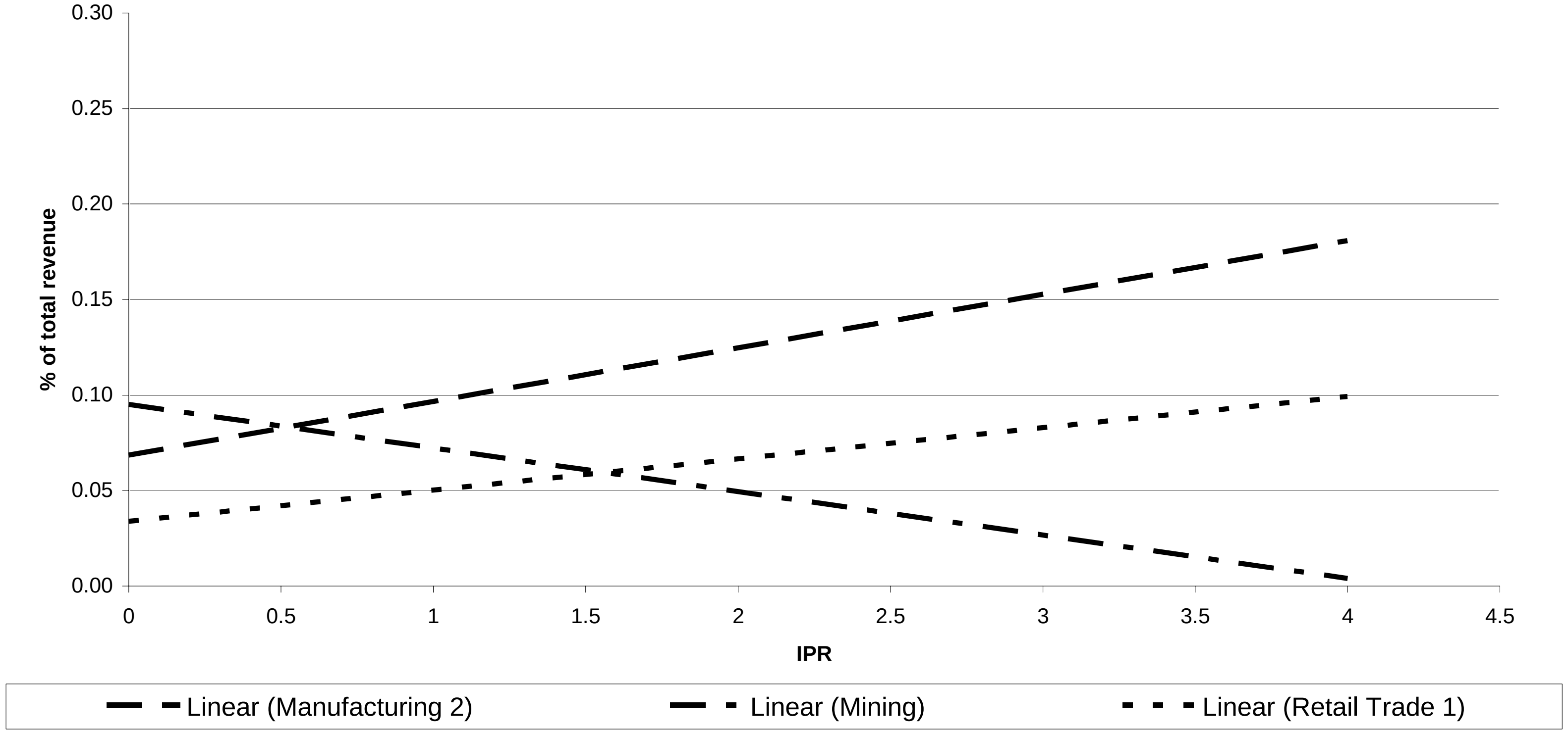
Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Correlations between IPR and selected industries

Industry	**Correlation**	**Industry**	**Correlation**
Agriculture, Forestry, Fishing	0.13	Retail Trade 1[a]	0.46
Mining (except oil and gas)	-0.45	Retail Trade 2[b]	0.36
Utilities	-0.41	Transportation & Warehousing	0.40
Construction	0.10	Information	-0.15
Manufacturing 1[c]	-0.01	Finance and Insurance	-0.36
Manufacturing 2[d]	0.49	Real Estate, Rental, and Leasing	0.10
Manufacturing 3[e]	0.11	Professional and Scientific Services	0.27
Wholesale Trade	-0.27	Transportation & Warehousing	0.40

[a] Includes motor vehicles, furniture, electronics, building material, food and beverage, health and personal care, clothing, and gas stations.
[b] Includes sporting goods, general merchandise, and miscellaneous items.
[c] Includes food, beverage and tobacco, textiles, apparel, and leather.
[d] Includes wood, paper, printing, petroleum, chemicals, plastics and rubber, and nonmetallic minerals.
[e] Includes primary metals, fabricated metals, machinery, computer and electronic products, electrical equipment, transportation equipment, and furniture.

Chart 1: Correlations between IPR and selected industries



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