Economic History and Cliometrics Lab

Working Paper # 18

Do Stronger Intellectual Property Rights Increase Innovation?

CASSANDRA SWEET

DALIBOR ETEROVIC

This Version: 2014

www.ehcliolab.cl

Economic History and Cliometrics Laboratory Working Paper Series

The EH Clio Lab WP series disseminates research developed by lab researchers and students quickly in order to generate comments and suggestions for revision or improvement before publication. They may have been presented at conferences or workshops already, but will not yet have been published in journals.

The EH Clio Lab is a research group that applies economic tools –theory as well as quantitative tools applied in economics- to the study of economic history. The current two main research topics: (i) “The Republic in Numbers” and (ii) papers on more specific historical issues and problems, using data both from the República and other sources. The latter consists in the collection and construction of a large number of statistical series about Chile`s development process during the past two centuries.

The EH Clio Lab receives funding from CONICYT / Programa de Investigación Asociativa (Project SOC 1102), Republic of Chile.

Do Stronger Intellectual Property Rights Increase Innovation?
Cassandra Sweet and Dalibor Eterovic
Economic History and Cliometrics Lab Working Paper #18
2014

Abstract

Do stronger intellectual property rights (IPR) increase innovation? Recent decades have seen a global transformation in IPR standards, underpinned by the theory that stronger IPRs spur increased incentives to innovate. This study tests the impact of ever more rigorous IPR systems on innovation through an index of economic complexity of 94 countries from 1965 to 2005. Our results confirm that stronger intellectual property systems engender higher levels of economic complexity. Nevertheless, only countries with an initial above-average level of development and complexity enjoy this effect.

Keywords: innovation, development, intellectual property rights, economic complexity

JEL Classification Number: 030, 034, P14, Q55, I12

Do Stronger Intellectual Property Rights Increase Innovation?

Dalibor Sacha Eterovic Maggio, Chief Economist, Grupo Security and Adjunct Professor, School of Government, Universidad Adolfo Ibáñez Email: dalibor.eterovic@uai.cl, Address: Diagonal las Torres 2640, Peñalolén, Santiago, Chile,

Cassandra Mehlig Sweet, Assistant Professor, Institute of Political Science, PUC-Chile, Email: csweet@uc.cl (corresponding author) Address: Instituto de Ciencia Politica, Pontificia Universidad Catolica, Av. Vicuña Mackenna 4860, Campus San Joaquín, Macul 7820436 Santiago, Chile, Telephone: (56) 2-2354-7618, Fax: (56) 2-2354-7815

Abstract:

Do stronger intellectual property rights (IPR) increase innovation? Recent decades have seen a global transformation in IPR standards, underpinned by the theory that stronger IPRs spur increased incentives to innovate. This study tests the impact of ever more rigorous IPR systems on innovation through an index of economic complexity of 94 countries from 1965 to 2005. Our results confirm that stronger intellectual property systems engender higher levels of economic complexity. Nevertheless, only countries with an initial above-average level of development and complexity enjoy this effect.

Keywords: innovation, development, intellectual property rights, economic complexity

JEL: 030, 034, P14, Q55, I12

Acknowledgements:

Many generous colleagues and two major funding grants made this work possible. The research was a part of the studies undertaken in the Millennium Nucleus for the Study of Stateness and Democracy in Latin America, Project N° NS100014 where David Altman and Anthony Pezzola provided important inputs. In addition, the work greatly benefitted from the contributions of Francisco Gallego, Jeanne Lefortune, Jose Tessada, Jim Robinson and the financial support of the Economic History and Cliometrics lab funding provided by Conicyt/Programa de Investigación Asociativa Project N° SOC1102. At Emory University, we thank Clifford Carrubba, Tom Clarke and Jeffery Stanton and the members of Emory Unversity's PIM Colloquium. Additional thanks are also due to Dani Rodrik, Ricardo Hausmann and Oeindrila Dube. All the usual caveats apply.

1) INTRODUCTION

This study works to address some of the current gaps and continuing debates in intellectual property rights (IPR) literatures. Our period of interest (1965-2005) is one of increasing intellectual property rigor for both industrialized and developing countries. In contrast to previous studies which have used patent applications, awards or R&D spending as their primary indicator of innovative activity, we build on a database of 94 countries over the period from 1965-2005 to examine the effects of IPR changes on a country's economic complexity (Hausmann et al., 2013). Our approach offers a number of novelties in on-going debates about innovation. First, by focusing on the country's economic complexity measured through its export sophistication, we avoid some of the problems with standard innovation indicators to better capture if more innovative products and processes are being developed and, importantly, applied across an economy as a whole. Second we offer insights on the benefits and costs of increasingly rigorous standards in developing economies. Third, we build on a new wave of research which is working toward unraveling the drivers of economic sophistication and understanding the institutional environments which foster more value-added production in developing countries (Zhu & Fu, 2013).

An abundant and expanding body of research has recently uncovered the importance of export complexity as both a predictor and a driver of future economic development (Anand, Mishra, & Spatafora, 2012; Hausmann, Hwang, & Rodrik, 2007; Lall, Weiss, & Zhang, 2005). This stream of work has shown that a mere quantitative increase in exports does not reflect either current or potential for economic development. It is not how much you export, these scholars argue, but *what* you export that matters (Anand, et al., 2012; Hausmann, et al., 2007). At the same time that literatures in economic development and policy have established the critical role that increasing export sophistication plays as driver of economic development, the global rules governing the ownership of technology and its diffusion—the regulatory framework underlying product innovation—have been radically transformed.

Intellectual property rights (IPR) standards, norms and institutions were at the forefront of debates on productivity in the 1980s and 1990s during the WTO's the Uruguay Round of negotiations. The resulting harmonization of 157 countries' national patent rules to one standard—through the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS)—marked a watershed moment in the global political and economic regulation of innovation. In the wake of global IPR changes, scholars have sought to understand the effects of increasing patent protection on economic development. Studies have worked on the effects of the new standards on patent applications, investment in research and development, technology transfer, productivity growth and inequality.[1] Yet, evidence about optimal levels of patent protection remains inconclusive and some scholars have recently called for research which "better estimates the effects of IPR policy on innovation rates and also structural models that would enable the evaluation of the effects of different policies in equilibrium growth and welfare" (Acemoglu & Akcigit, 2012, p. 40).

Our study addresses this ongoing debate by working to unravel the relationship between export sophistication and increasingly rigorous IPR standards. Our findings yield two broad sets of results. Across a world sample, we show that the higher the intellectual property laws, the more positive impact they have on a country's level of innovation, as measured through export sophistication. However, the positive effect seems to be restricted to countries that start out with an above average level of development and complexity. For developing countries, our results show that IPR has at best a non-significant effect on economic complexity and most often has a negative effect. These findings are in-line with the theory that access to technology and technology transfer are important drivers of innovation and productive output, especially for developing countries playing a global game of technological "catch-up". This research lends urgency to the importance of tailoring national systems to development demands and reassessing literatures on intellectual property.

The paper proceeds in the following structure: Section 2 briefly reviews the literature on IPR institutions and innovation. Section 3 presents the dataset and econometric model used in our analysis. Section 4 discusses our results while section 5 offers conclusions and looks toward future research pathways.

2) INTELLECTUAL PROPERTY INSTITUTIONS AND ECONOMIC COMPLEXITY

One of the primary mechanisms in intellectual property systems is the patent.[2] A patent confers a set of monopoly ownership privileges to an inventor for a finite period of time, thus protecting the inventor from apropriability by other firms at a significantly lower cost. The period of protection rewards inventors for their investment in the innovation producing activities. In turn, society sacrifices immediate access to the new technology in exchange for the benefits conveyed through the incentive to innovate. This trade-off has been described as the "patent bargain" (Jensen, Johnson, Lorenz, & Lundvall, 2007) and it is at the center of research of intellectual property systems.

An early stream of theoretical work examining this trade-off attempted to develop a model for "optimal" patent levels (Horowitz & Lai, 1996; O'Donoghue & Zweimuller, 2004). One flank of scholars has described the relationship between IPRs and their benefits as comprising an inverted-U curve in which IPR norms reach a peak point of rigidity from which the trade-off between the positive aspects of IPR for owners (higher returns from monopoly rights, more resulting capacity for R&D) are eclipsed by the negative aspects (reduced diffusion, reduced competition, higher transaction costs from licensing). The inverted U-curve relationship however has been questioned by researchers who doubt that beneficial outcomes taper-off (Kanwar & Evenson, 2003) and suggest that innovation not only increases relative to IPR strength, but that does so in an ever amplified manner (Kanwar, 2007; Schneider, 2005). This school of thought predicted that application of the North's intellectual property standards would be hugely beneficial for the global South and provide an impetus for bridging the global technological divide (Lai & Qiu, 2003). The TRIPS agreement codified these cheerful IPR views into global trade law: from 1996 onwards all members of the WTO agreed to implement IPR systems respecting a patent life of 20 years.[3]

In the wake of the implementation of TRIPS norms, many scholars in political economy have worked to empirically assess their impact.[4] Some researchers have argued that the agreement has increased innovation (Abrams, 2009) and facilitated diffusion, as inventors are more apt to share their ideas when their ownership rights are protected Moser (2011). However, a contrasting, less sanguine view of ever-stronger IPRs has gained strength as more studies examine the different effects of the treaty on countries across varying levels of economic development. McCalman (2001) has shown how increased IPRs result in wealth transfers from developing countries to their industrialized counterparts. A recent study by Hudson and Minea (2013) employs a unified econometric approach analyzing the impact of IPR through both initial IPR and per capita GDP. They find that global IPR homogeneity is sub-optimal, as "the same level of IPR has a different impact on richer countries than poorer ones" (Hudson & Minea, 2013). These works build on a stream of evidence indicating that different intellectual property institutions may be more conducive for both firm learning and the processes of technological catch-up (Acha, Marsili, & Nelson, 2004; Bell & Pavitt, 1993). This idea posits that IPR standards should be "development appropriate," and draws the notion that innovation is an incremental, cummulative process requiring access and adaptability of technological knowledge (Acemoglu, Gancia, & Zilibotti, 2012).

(a) Getting a grip on innovation: patents and R&D spending

The majority of studies working to gauge the impact of IPR institutions on innovation have done so by measuring "innovation" through one of two proxies: patents granted or disbursements on R&D. Both these data sources present problems as accurate representations of innovative activity.[5] The first problem with patents is that innovation is an incremental process, taking place through both "tacit" and "explicit" knowledge accumulation; measures of patents granted capture only the explicit side of technological innovation (Nelson, 2005). Along these lines, there is important evidence that many countries lack a "culture of patenting" which is dominant in the US and other western nations but less prevalent in other societies. This is a particular challenge for cross-country studies where important changes in a country's innovative activity may not be captured by patent applications or awards (Varsakelis, 2001). Setting aside concerns about tacit knowledge or culture, patents offer a number of advantages and have been a popular indicator; they are easily accessible, replicable and standardized.

Yet recent trends in the use of patents raises another question regarding their ability to serve as an indicator of cross-national levels of innovation. So-called "strategic patenting" by firms has resulted in "patent thickets," or clusters of patents contrived for the sole purposes of commercialization.[6] In this scenario, firms colloquially referred to as "patent trolls" acquire and bundle vast collections of patents with the singular aim of extracting licensing fees from firms which may draw from their patent area (Glass, 2013; Shapiro, 2001). Most products currently depend on multiple technologies and innovations; by some estimates, one smartphone is affected by 250,000 patents (Masnick, 2012). The proliferation in patenting has been accompanied by a weakening in patent standards. The result has been an explosion in patenting activities which are, according to some scholars, more reflective of trends in corporate strategy than a veritable boom in innovative activities. Finally, in contrast to the hyper-patenting activities of some firms, another body of evidence indicates that many firms engaged in high-level innovative activities are choosing not to patent their inventions due to the cost of both applying for and enforcing patent rights (B. H. Hall, Helmers, Rogers, & Sena, 2013). These combined trends diminish the reliability of patent applications as an indicator of innovative activity.

Another traditional measurement of innovation is research and development. In contrast to patents, disbursement on R&D offers a more micro-level view into firm strategy and the focus of innovative activities. Yet the effectiveness of R&D as an indicator of innovation has been increasingly questioned (Kleinknecht, Van Montfort, & Brouwer, 2002). In short, the same inputs can be used more or less efficiently depending on institutional environment and firm management. Spending on research may serve as a gauge of the process, but statistics on R&D are weak predictors of real innovative advances. Firms utilize R&D resources with varying levels of competence, fixed investments in R&D over time are not accounted for, and the data is skewed toward large firms, missing much of the innovative investments and advances achieved by small and medium players. One particularly damming survey on the Netherlands showed that data on R&D only represented a quarter of total product innovation expenditure (Brouwer & Kleinknecht, 1997). For researchers interested in development, an important limitation with R&D surveys is that the data on poor countries is scattered and inconsistent. As a recent survey on R&D data collection in developing countries indicates, we are a long way from having reliable contemporary data and numerous institutional challenges to creating standard data collection systems persist (UNESCO, 2010).

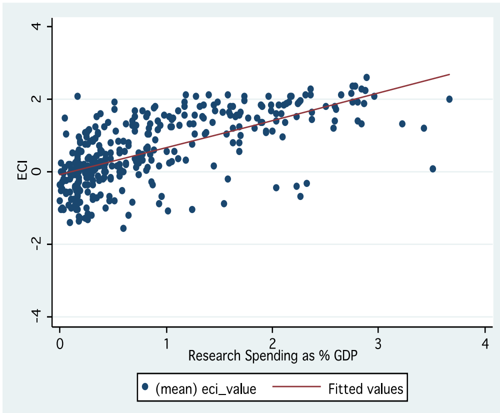
(b) Innovation through productive knowledge: the ECI indicator

In light of the limitations encountered in traditional indicators of innovation, we explore the relationship between increasingly rigid IPR norms and its effects on innovation through measurement of a country's export sophistication as described in the "economic complexity index" (ECI). The ECI provides a number of advantages as proxy for a country's innovative output, giving us insight into a country's a) capacity to generate innovation which is relevant to its productive structure and b) ability to apply those innovations (be they incremental and tacit, or formal and codified). At the center of the calculation of the ECI index, two concepts characterize the complexity of an economy: diversity and ubiquity (Hausmann et al, 2013). Diversity describes the number of distinct products that a country makes. Larger product diversity reflects a greater amount of embedded knowledge and the ability of a country to apply tacit and explicit bundles of innovation across its productive structure. Ubiquity represents the number of countries that make a particular product. Since products that demand large volumes of knowledge are feasible only in the few places where all the requisite technology and know-how is available, the more complex the product, the less ubiquitous it is expected to be. Medical imaging, for example, is a product exported by a few countries (the United States and Germany being the leaders) and therefore is a product which is rare, compared with low-technological products such as lumber, which is exported by dozens of countries. At the same time, both Germany and the United export a wide diversity of products. Mapping out the ubiquity and diversity of a country's exports allows insights into its ability to push beyond the naturally endowed factors “recombine and recreate more competitive products” through organizational innovations. In short, while measurements of patents reveal how inventors are strategically choosing to protect their legal rights to inventions and R&D reveals patterns in of firm resource allocation, the ECI shows us if a country is expanding the frontiers of its production capacity and innovating in a way that is relevant to its economic development (Hausmann, et al., 2013).

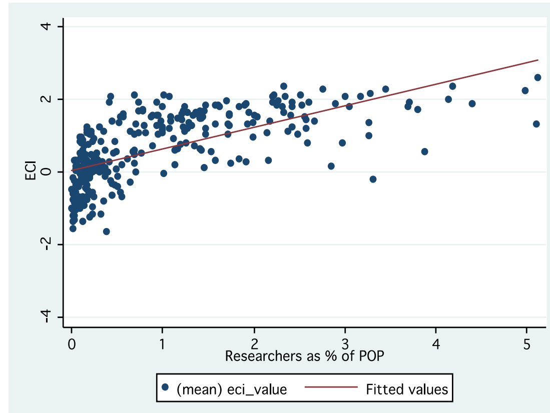
The ECI relies on international trade data, which presents 3 constraints. First, it uses the UN COMTRADE database, which includes data on exports, not production. Second, the data includes only goods and not services. Finally, the data does not include information on non-tradable activities. It is interesting to note that while ECI offers a view into if a country is expanding its productive frontier and effectively producing and exporting new products, it is strongly correlated with traditional innovation metrics. Figure 1 illustrates the relationship between ECI and research spending (as a % of GDP), researchers (as a % of population) and patent applications at the USTD for the period 1965-2000. [7]

Figure 1: ECI and Traditional Innovation Metrics

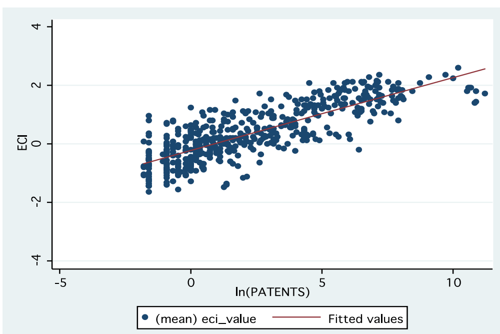
(a)



(b)



(c)



(d)

Correlations	ECI	Research (%GDP)	Patents (logs)	Researchers (% POP)
ECI	1.0000			
Research	0.6454	1.0000		
Patents	0.8165	0.7411	1.0000	
Researchers	0.6414	0.8116	0.7439	1.0000

Source: Authors calculations. Red line is a linear fit.

The simple correlation between ECI and research spending (as % of GDP) is 0.64, the same as with the number of researcher (per capita), while the correlation of ECI with the number of patents reaches 0.81. The ECI allows us to build on these traditional metrics and is able to capture not just the tangible innovative outputs (measured by patents) or inputs (measured by scientists or investment in R&D) but the intangible inputs and technological innovations exhibited in the advancement of their product frontier: “what countries make reveals what they know.” (Hausmann et al, 2011: 22). Complex economies are able to weave vast quantities of relevant knowledge together, across large networks of people, to generate a diverse mix of knowledge-intensive products. On the other hand, simpler economies have a narrow base of productive knowledge and produce fewer products, which require smaller webs of interaction and lower levels of innovation.

3) DATA AND THE EMPIRICAL MODEL

To measure the strength of the IPR institutions we rely on the Ginarte and Park (1997) and Park (2005) Intellectual Property Rights Index. The index of patent rights was developed for 110 countries for 1965–1990 later extended to 2005 (broken down into 5 years intervals). The index is the unweighted sum of five separate scores for: coverage (inventions that are patentable); membership in international treaties; duration of protection; enforcement mechanisms; and restrictions (for example, compulsory licensing in the event that a patented invention is not sufficiently exploited). This index was designed to provide an indicator of the strength of patent protection, not the quality of patent systems. Some simple descriptive data allows us to examine these variables and their interplay over time. For example, Figures 2 and 3 illustrate the evolution of the ECI and IPR index since 1965. Notably, in Figure 2, the average complexity of the countries in the sample remains stable while there are important changes in the dispersion of the ECI. The mass of the distribution (75% and 25%) becomes increasingly more concentrated around the center of the distribution while the top performer increases its level of sophistication over time. On the other hand, lowest performing countries do not show a clear trend. In Figure 3, the average of the IPR index of the countries in the sample shows a dramatic increase after the Uruguay round. This is consistent with the global increase in standards. Additionally, the mass of the distribution of the sample narrows, indicating that most of the countries in the sample experienced an increase in intellectual property rights protection.

Figure 2: Economic Complexity over time

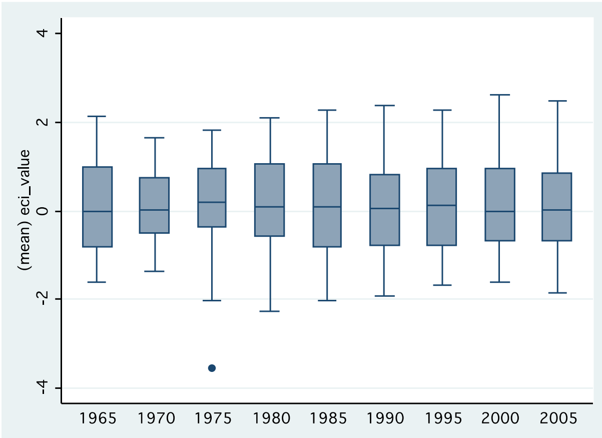
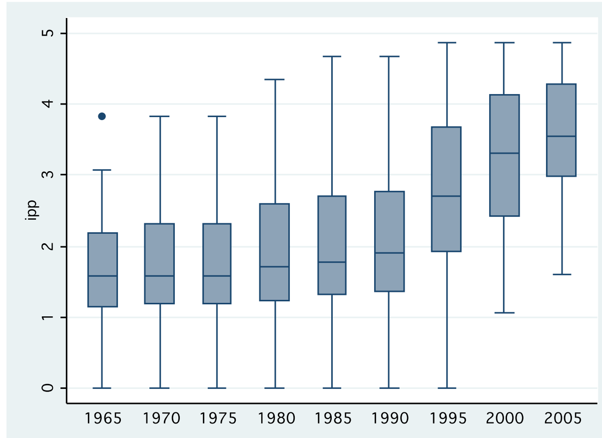


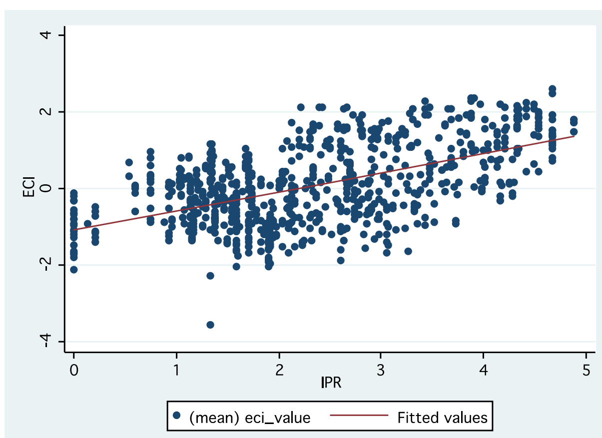
Figure 3: Intellectual Property Rights over time



Note: Authors' calculations.

In a simple exercise in correlation, Figure 4 illustrates the scatter plot of Economic Complexity Index (ECI) in the y-axis and Intellectual Property Index (IPR) in the x-axis. The linear fit shows a positive relation between both variable.

Figure 4



Note: Authors' calculations.

To further study the relationship between intellectual property and economic complexity, we estimate a set of panel data models for ECI for consecutive, non-overlapping, 5-year periods, from 1965 to 2005. Our empirical framework can be summarized as follows:

$$1)\ ECI_{i,t} = \alpha_i + n_t + \beta_1 IPR_{i,t} + X_{i,t}^{control}\gamma + \varepsilon_{i,t}$$

Where $ECI_{i,t}$ stands for the economic complexity index of country i for the 5 year period t and $IPR_{i,t}$ is the level of strength of intellectual property rights institutions for country i at the beginning of the 5 year period t. The set of control variables is represented by the vector X of economic, political and demographic variables. Following the literature on the subject (Hausmann et al, 2007 and Anand et al, 2012), we control for other potential determinants of economic complexity including: (1) GDP per capita (GDPCH): The initial income per capita captures the level of development of the economy and potential convergence effects. Data on this variable is from the Penn World Table Version 6.2 (PWT). (2) Human Capital (Lyr_sch): As a proxy for the stock of human capital in the economy we use the total years of schooling available in the Barro and Lee (2010) database. (3) Political institutions (POLITY2): we take into consideration the institutional quality of the country using the Polity IV index developed by Marshall and Jaggers (2007). The index ranges from -10 for autocratic states to 10 for fully democratic regimes and has been used extensively in the academic literature as a measure of quality of the political system (Rodrik and Wagziarg, 2004; Papaioannou and Siourounis, 2008 and Aidt and Eterovic, 2011 among others) (4) Trade openness (OPENC): openness to international trade could be associated with higher productivity and economic complexity as countries that are more open might benefit more from technology diffusion (Edwards, 1997). (5) Government Size (CG): Government spending might benefit knowledge productivity through the provision of public goods such as public schooling, public order and efficient legal systems.

However, it is also likely that an excessively large government might hurt economic complexity due to government inefficiencies (Barro, 1991). (6) Population (POP): This variable accounts for the possibility of increasing returns to scale in exports productivity. Data on the previous variables is sourced from PWT 6.2. (7) Country land area (CtryArea): This variable accounts for the potential availability of natural resources in the economy. Data on this variable is from the World Bank World Development Indicators.

In all our regressions, we control for country (α_i) and time (n_t) effects and include a trend. With the exception of ECI and IPR, all variables are in logarithms. To estimate equation 1 we use two alternative econometric techniques. Our first approach is to estimate a static model using OLS to study the long run relation between intellectual property rights and economic complexity. The model includes country and time fixed effects to reduce the risk of omitted variables bias. It also implies we are using *within* variation (i.e., variation in IPR within a given country over time) to identify the impact of intellectual property rights on economic complexity.

Since one problem with estimating a dynamic model with OLS is introducing a dynamic panel bias due to the inclusion of the lagged dependent variable, our second empirical approach is to estimate a dynamic panel by using a system-GMM estimator. The Arellano and Bond (1991), GMM estimator exploits all the linear moment restrictions, resting on the assumption of no serial correlation in the error term in an equation which contains individual effects, lagged dependent variable and no strictly exogenous variables. Arellano and Bover (1995), argue that the main weakness of the original Arellano-Bond estimator is that lagged levels are poor instruments for first differences if the variables are close to a random walk. To solve this problem, they propose to add the original equation in levels to the system, so the additional instruments can be brought to increase efficiency. This version of the model, later on fully developed by Blundell and Bond (1998), is known as "System GMM" (Roodman 2009). Specifically, we estimate a two-step robust "System GMM" regression using Windmeijer's (2005) correction for finite samples and report tests for autocorrelation, which is applied to the differenced residuals in order to purge the unobserved and perfectly auto correlated residuals.

4) RESULTS

The results of the different specifications for the OLS model are presented in Table 1.[8] The broader picture that emerges from the regression analysis is one where IPR strength is positively related to economic complexity (ECI). This finding is remarkably robust to all the specifications presented. The magnitude of the effects ranges from 0.234 to 0.082 points in the ECI index. Taking into consideration that the ECI's sample mean is 0.129 and its standard deviation is 1.024, the effect is substantial.

TABLE 1 TO APPEAR HERE

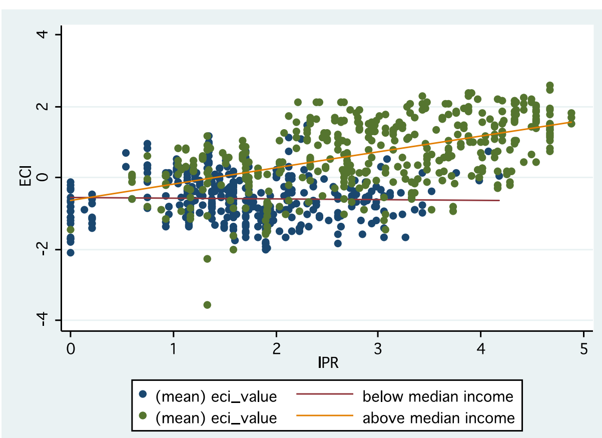
Table 2 presents the results from the dynamic model using system GMM. The results confirm the existence of a positive relation between IPR and ECI. Controlling for endogeneity between IPR and ECI slightly reduces the magnitude of the effect to the lower bound we found when using the static OLS model (between 0.055 and 0.081).

TABLE 2 TO APPEAR HERE

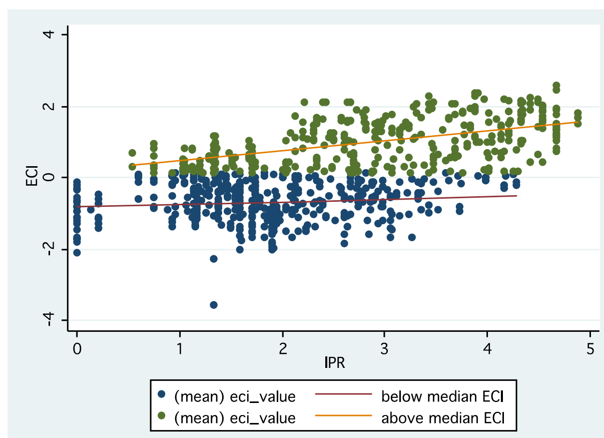
The results presented in Table 1 and 2 are indicative of the existence of a positive effect of IPR on economic complexity. But is the effect of IPR similar across level of income and development? Figure 5 presents a scatter plot between ECI and IPR. Panel A divides the sample between countries with GDP per capita below and above mean income while panel B divides the sample between countries with ECI below and above mean ECI. The linear fits in both panels are indicative of a stronger positive relation between ECI and IPR in countries with above mean income per capita and above mean ECI. In countries below mean income and below mean ECI, the positive relation between ECI and IPR disappears.

Figure 5: ECI and IPR

Panel (A) Separated by Mean Income



Panel (B) Separated by Mean ECI



Note: Authors’ calculations.

To formally investigate the possibility of a discontinuity in the relation between ECI and IPR, in Table 3 we dissect our results by dividing the sample using two alternative metrics. First, we divide the countries into low and high-income using the sample mean per capita income as the cut off (USD 8742). Second, we divide the sample into low and high economic complexity using the sample mean ECI as the cut off. Then, we run a set of static and dynamic models. A number of interesting results emerge.[9] First, the impact of intellectual property rights on economic complexity remains positive and highly significant for above mean income countries and for above mean ECI countries. Second, the positive relationship between IPR and ECI breaks down for below mean income countries and for below mean ECI countries. For these countries one can say that IPR has at best a non-significant effect on economic complexity and might even have a negative effect on these countries' ECI.

TABLE 3 TO APPEAR HERE

Richer and more sophisticated countries enjoy positive returns in terms of economic complexity from increasing levels of intellectual property rights while poorer and less sophisticated countries hurt their possibilities of increasing complexity by increasing IPR. A crucial question then arises: Which is the specific transmission mechanism in which IPR standards affect economic complexity? To shed light on this question in Table 4 we present a set of regressions including IPR interacted with a selected group of economic, demographic and political variables. We focus on dynamic system GMM estimations considering lagged ECI, income per capita, IPR and the IPR interacted as endogenous variables. We find that the interaction term only yields significant for FDI as % of GDP (fdi) and for the total years of schooling (lyr_sch).[10] However, of the multiple interactions presented, only the regression with total years of schooling appears consistent with the IPR directional impact being contingent on the level of development we have found so far. Specifically, regression (35) shows that IPR has an independent negative effect on ECI but has a positive effect on economic complexity when interacted with the level of human capital. Regressions (36) and (37) divide the sample using the sample average years of schooling (6.18 years). Again the results confirm the previous findings. Increases in IPR standards tend to hurt economic complexity in countries with low levels of human capital and benefit countries with high levels of human capital.

TABLE 4 TO APPEAR HERE

How can these results be interpreted? Extant theory on the impact of intellectual property rights points to a trade-off between innovation and diffusion of technology. Human capital is likely to be one of the center determinants in this trade-off. Countries with higher human capital are likely to benefit from higher standards in intellectual property as they are able to engage in innovative endeavors more efficiently and productively than countries with lower levels of human capital. This means that for countries with high levels of human capital, the positive outcomes of higher innovation overcome the negative effects of lower diffusion.

This is likely not the case in countries with lower levels of human capital. Countries with lower human capital find more difficult to innovate as they are probably already quite far from the technological frontier. Without sufficient scientists and experts they are unable to reap the theoretical benefits of increased incentives to innovate. For countries with low levels of human capital, the positive outcomes of higher innovation do not overcome the negative effects of lower diffusion of technology due to stricter IPR standards.

The regressions reported contain a number of control variables which themselves are interesting determinants of economic complexity. We confirm for example that GDP per capita is positively related to economic complexity. Richer countries manufacture more technologically complex goods than poorer ones. In addition, our results indicate that government spending is negatively related to economic complexity. This suggests, consistent with mainstream literatures, that an excessively large government might hurt economic complexity due to government inefficiencies (Barro, 1991). However, it should be noted that our measure of government spending concentrates on consumption and not public investment that would be more likely to affect economic complexity. Another result from these regressions is that the level of human capital does not directly affect the economic complexity of the country. Although as pointed out in the previous section, human capital seems to have an indirect effect on ECI once interacted with intellectual property rights therefore helping to explain why some countries benefit from increases in IPR standards while others do not. Finally, in light of important debates regarding the quality of political institutions and development, we do not find evidence of political institutions significantly affecting economic complexity.

5) CONCLUSION

In this work we examine the relationship between the protection of intellectual property rights and innovation, analyzing the impact of increasingly rigorous IPR standards on the level of economic complexity. For a world sample, we find that stronger intellectual property laws have a positive impact on a country's ability to expand its productive frontier and apply tacit and explicit innovative advances. However, this effect is restricted to countries with an above average level of development and complexity. For developing countries, our results show that IPRs have at best a non-significant effect on economic complexity and might even have a negative effect on these countries' ECI. A country's level of human capital seems to be pivotal. Consistent with a stream of empirical work which points to a close relationship between human capital and innovation (Dakhli & De Clercq, 2004) we find that countries with higher levels of human capital enjoy higher innovation overcomes. Poorer countries, with lower levels of sophistication and low levels of human capital are not able to overcome the negative effects of IPRs: lower diffusion.

Advances have been made over the last decade to try to point researchers interested in innovation and science toward more comprehensive measurements of innovative activity (Grupp & Mogee, 2004). In this vein, our paper addresses the current problems with traditional measurements of innovation, (in particular for developing countries), and employs a novel indicator of export sophistication to examine the effects of IPRs. Future research could work to unravel the interaction between IPRs and human capital, focusing on domestic productivity or more specifically on intra-industry diffusion. How are technologies shared between developing firms when monopoly periods are extended and intellectual property regulation is increasingly rigid? How have the elimination of policies such as Bolar rights affected the introduction of new products across industries in the developing world? At a policy level, this research builds on a number of studies which suggest that local policy should be more closely tailored to development levels of (Acemoglu & Akcigit, 2012). This line of work goes against arguments that the benefits from higher levels of IPRs are positive and linear (Kanwar & Evenson, 2003; Schneider, 2005). Instead, the results suggest that the outcomes of increasingly rigid IPRs, while engendering some positive effects at a global level, have nevertheless replicated and reinforced global productive inequality.

6) BIBLIOGRAPHY

Abrams, D. S. (2009). Did TRIPS Spur Innovation? An Empirical Analysis of Patent Duration and Incentives to Innovate. *SSRN eLibrary*. doi: 10.2139/ssrn.1443412

Acemoglu, D., & Akcigit, U. (2012). Intellectual property rights policy, competition and innovation. *Journal of the European Economic Association, 10*(1), 1-42.

Acemoglu, D., Gancia, G., & Zilibotti, F. (2012). Competing engines of growth: Innovation and standardization. *Journal of Economic Theory, 147*(2), 570-601.e573. doi: 10.1016/j.jet.2010.09.001

Acha, V., Marsili, O., & Nelson, R. (2004). What do we know about innovation? *Research Policy, 33*(9), 1253-1258. doi: 10.1016/j.respol.2004.09.001

Allred, B. B., & Park, W. G. (2007). Patent rights and innovative activity: Evidence from national and firm-level data. *Journal of International Business Studies, 38*(6), 878-900.

Anand, R., Mishra, S., & Spatafora, N. (2012). Structural Transformation and the sophistication of production. *IMF Working Paper, 12*.

Anton, J. J., & Yao, D. A. (1994). Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights. *The American Economic Review, 84*(1), 190-209.

Arora, A. (1997). Patents, licensing, and market structure in the chemical industry. *Research Policy, 26*(4,Äì5), 391-403. doi: 10.1016/s0048-7333(97)00014-0

Bell, M., & Pavitt, K. (1993). Technological Accumulation and Industrial Growth: Contrasts Between Developed and Developing Countries. *Industrial and Corporate Change, 2*(2), 157-210.

Bhattacharya, S., & Guriev, S. (2006). PATENTS VS. TRADE SECRETS: KNOWLEDGE LICENSING AND SPILLOVER. [10.1162/JEEA.2006.4.6.1112]. *Journal of the European Economic Association, 4*(6), 1112-1147.

Brouwer, E., & Kleinknecht, A. (1997). Measuring the unmeasurable: a country's non-R&D expenditure on product and service innovation. *Research Policy, 25*(8), 1235-1242. doi: http://dx.doi.org/10.1016/S0048-7333(96)00902-X

Dakhli, M., & De Clercq, D. (2004). Human capital, social capital, and innovation: a multi-country study. *Entrepreneurship & Regional Development, 16*(2), 107-128. doi: 10.1080/08985620410001677835

Glass, I. (2013). When Patents Attack...Part Two. *This American Life, 496*(May). Retrieved from

Griliches, Z. (1998). Patent Statistics as Economic Indicators: A Survey. In Z. Griliches (Ed.), *R&D and Productivity: The Econometric Evidence* (pp. 287-343). Chicago: University of Chicago Press.

Grupp, H., & Mogee, M. E. (2004). Indicators for national science and technology policy: how robust are composite indicators? *Research Policy, 33*(9), 1373-1384. doi: http://dx.doi.org/10.1016/j.respol.2004.09.007

Hall, B., Helmers, C., Rogers, M., & Sena, V. (2012). The Choice Between Formal and Informal Intellectual Property: A Literature Review. *NBER Working Paper, 17983*(April).

Hall, B. H., Helmers, C., Rogers, M., & Sena, V. (2013). The Importance (or not) of Patents to UK Firms. *National Bureau of Economic Research Working Paper Series, No. 19089*.

Hausmann, R., Hidalgo, C., Bustos, S., Coscia, M., Chung, S., Jimenez, J., . . . Yildirim, M. (2013). *The Atlas of Economic Complexity: Mapping Paths to Prosperity*. Boston, MA: Macro Connections Media Lab, Center for International Development at Harvard University.

Hausmann, R., Hwang, J., & Rodrik, D. (2007). What You Export Matters. *Journal of Economic Growth, 12*(1), 1-25.

Horowitz, A. W., & Lai, E. L. C. (1996). Patent Length and the Rate of Innovation. *International Economic Review, 37*(4), 785-801. doi: 10.2307/2527311

Hudson, J., & Minea, A. (2013). Innovation, Intellectual Property Rights and Economic Development: A Unified Emprical Investigation. *World Development, 46*, 66-78.

Jawara, F., & Kwa, A. (2003). *Behind the Scenes at the WTO*. London: Zed Books.

Jensen, M. B., Johnson, B., Lorenz, E., & Lundvall, B. A. (2007). Forms of knowledge and modes of innovation. *Research Policy, 36*(5), 680-693.

Kanwar, S. (2007). Business enterprise R&D, technological change, and intellectual property protection. *Economics Letters, 96*(1), 120-126.

Kanwar, S., & Evenson, R. (2003). Does intellectual property protection spur technological change? *Oxford Economic Papers, 55*(2), 235-264.
Kleinknecht, A., Van Montfort, K., & Brouwer, E. (2002). The Non-Trivial Choice between Innovation Indicators. *Economics of Innovation and New Technology, 11*(2), 109-121. doi: 10.1080/10438590210899
Kortum, S., & Lerner, J. (1999). What is behind the recent surge in patenting? *Research Policy, 28*(1), 1-22. doi: http://dx.doi.org/10.1016/S0048-7333(98)00082-1
Lai, E. L. C., & Qiu, L. D. (2003). The North's intellectual property rights standard for the South? *Journal of International Economics, 59*(1), 183-209. doi: http://dx.doi.org/10.1016/S0022-1996(02)00090-9
Lall, S., Weiss, J., & Zhang, J. (2005). Sophistication of Exports': A New Measure of Product Characteristics. [Oxford University]. *Queen Elizabeth House Working Paper, 132*.
Lederman, D., & Saenz, L. (2005). Innovation Around the World, 1969-2000. *World Bank Working Paper Series, 3774*.
Masnick, M. (2012, 10/18/12). There are some 250,000 active patents that impact smartphones; Representing one in six active patents today.
McCalman, P. (2001). Reaping what you sow: an empirical analysis of international patent harmonization. *Journal of International Economics, 55*(1), 161-186. doi: 10.1016/s0022-1996(01)00091-5
Moser, P. (2011). Do Patents Weaken the Localization of Innovations? Evidence from the World's Fairs. *The Journal of Economic History, 71*(02), 363-382.
Nelson, R. (2005). *Technology, Instituitons and Economic Growth*. Cambridge, MA: Harvard University Press.
O'Donoghue, T., & Zweimuller, J. (2004). Patents in a Model of Endogenous Growth. *Journal of Economic Growth, 9*(1), 81-123. doi: 10.1023/B:JOEG.0000023017.42109.c2
Schneider, P. H. (2005). International trade, economic growth and intellectual property rights: A panel data study of developed and developing countries. *Journal of Development Economics, 78*(2), 529-547. doi: http://dx.doi.org/10.1016/j.jdeveco.2004.09.001
Shapiro, C. (2001). Navigating the patent thicket: cross licenses, patent pools, and standards setting. In A. Jaffe, J. Lerner & S. Stern (Eds.), *Innovation Policy and the Economy* (Vol. 1, pp. 119-150). Cambridge, MA: MIT Press.
UNESCO. (2010). Measuring R&D: Challenges faced by developing countries. *Unesco Institute for Statistics, 4*.
Varsakelis, N. C. (2001). The impact of patent protection, economy openness and national culture on R&D investment: a cross-country empirical investigation. *Research Policy, 30*(7), 1059-1068. doi: http://dx.doi.org/10.1016/S0048-7333(00)00130-X
Zhu, S., & Fu, X. (2013). Drivers of Export Upgrading. *World Development, 51*(0), 221-233. doi: http://dx.doi.org/10.1016/j.worlddev.2013.05.017

7) TABLES

Table 1: Economic Complexity (ECI) and Intellectual Property Index (IPP) - OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
VARIABLES	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI†
lrgdpch			0.149**	-0.016	0.112	0.165**	0.184**	0.149**	0.420***	0.120	0.127*
			(0.074)	(0.069)	(0.072)	(0.075)	(0.076)	(0.075)	(0.050)	(0.081)	(0.073)
Ipr	0.234***	0.104***	0.090***	0.116***	0.085***	0.082***	0.083***	0.090***	0.125***	0.072***	0.077***
	(0.028)	(0.028)	(0.028)	(0.029)	(0.028)	(0.027)	(0.028)	(0.028)	(0.026)	(0.028)	(0.027)
Openc				0.002**					-0.000	0.001	
				(0.001)					(0.001)	(0.001)	
Cg					-0.025***				-0.018***	-0.025***	-0.024***
					(0.007)				(0.007)	(0.007)	(0.007)
lyr_sch						-0.242***			-0.020	-0.190**	-0.233***
						(0.086)			(0.065)	(0.091)	(0.086)
polity2							0.000		0.005	-0.000	
							(0.004)		(0.004)	(0.004)	
Lpop								0.006	0.250***	0.141	
								(0.148)	(0.047)	(0.162)	
lcountryarea									-0.148***	-0.035	
									(0.038)	(0.103)	
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Observations	775	767	767	767	767	758	745	767	736	736	758
Number of id	94	94	94	94	94	94	94	94	92	92	93
R-squared	0.4636	0.9167	0.9175	0.9147	0.920	0.918	0.920	0.9175	0.6809	0.9232	0.9200
R-squared within	0.0231	0.0569	0.0670	0.0612	0.0940	0.0784	0.0703	0.0670	0.0798	0.1134	0.1040

Notes: All regressions include a trend. † Stepwise general to specific specification. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2: Economic Complexity (ECI) and Intellectual Property Index (IPP) – System GMM

VARIABLES	(1) ECI†	(2) ECI†	(3) ECI‡	(4) ECI‡	(5) ECI††	(6) ECI††
L.ECI	0.873***	0.871***	0.854***	0.857***	0.851***	0.857***
	(0.024)	(0.025)	(0.028)	(0.032)	(0.039)	(0.041)
lrgdpch	0.036**	0.036**	0.090***	0.087***	0.066**	0.060*
	(0.017)	(0.017)	(0.026)	(0.032)	(0.030)	(0.031)
ipr	0.080***	0.081***	0.073***	0.077***	0.055*	0.058*
	(0.026)	(0.026)	(0.024)	(0.029)	(0.032)	(0.034)
openc			0.000	0.000	0.001*	0.001
			(0.000)	(0.000)	(0.001)	(0.001)
cg			-0.009***	-0.009***	-0.020***	-0.020***
			(0.003)	(0.003)	(0.005)	(0.006)
lyr_sch			-0.048*	-0.047	-0.031	-0.033
			(0.027)	(0.032)	(0.055)	(0.055)
polity2			0.000	-0.000	0.006	0.005
			(0.003)	(0.003)	(0.005)	(0.005)
	1-step	2-step	1-step	2-step	1step	2-step
# of Instruments	87	87	107	107	112	112
Hansen test (p-value)	0.171	0.171	0.723	0.723	0.768	0.768
AR 1 test (p-value)	0.001	0.001	0.001	0.001	0.001	0.001
AR 2 test (p-value)	0.161	0.161	0.290	0.290	0.302	0.302
Observations	686	686	663	663	663	663
Number of id	94	94	91	91	91	91

Notes: System-GMM estimations for dynamic panel-data models. Sample period: 1960-2005. † IPP and l.ECI were treated as endogenous. Their lagged values used as instruments in the first difference equations and their lagged first-differences were used in the levels equations. ‡ IPP, lrgdpch and l.ECI were treated as endogenous. Their lagged values used as instruments in the first difference equations and their lagged first-differences were used in the levels equations. †† All variables were treated as endogenous. Their lagged values used as instruments in the first difference equations and their lagged first-differences were used in the levels equations. Two-step results using robust standard errors corrected for finite samples (using Winmeijer's, 2005, correction). t-statistics are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; 5%, and *, 10%.

Table 3: Economic Complexity (ECI) and Intellectual Property Index (IPP) sample divided by Income and Level of Complexity

	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
	LI	HI	LI	HI	LI	HI	LECI	HECI	LECI	HECI	LECI	HECI
Method	OLS	OLS	SGMM†	SGMM†	SGMM‡	SGMM‡	OLS	OLS	SGMM†	SGMM†	SGMM‡	SGMM‡
VARIABLES	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI	ECI
L.ECI			0.801***	0.840***	0.684***	0.700***			0.874***	0.718***	0.623***	0.862***
			(0.072)	(0.062)	(0.070)	(0.068)			(0.085)	(0.054)	(0.100)	(0.083)
Lrgdpch	0.120	0.259*	0.073	-0.032	0.157***	0.053	0.010	0.216**	0.013	-0.007	0.083	-0.088
	(0.119)	(0.132)	(0.076)	(0.053)	(0.056)	(0.086)	(0.104)	(0.096)	(0.051)	(0.034)	(0.057)	(0.061)
Ipr	0.015	0.085**	-0.081*	0.184***	-0.167*	0.150**	0.011	0.087**	-0.097*	0.182***	-0.112	0.095*
	(0.044)	(0.039)	(0.046)	(0.062)	(0.086)	(0.062)	(0.035)	(0.037)	(0.053)	(0.051)	(0.070)	(0.051)
Openc	-0.002	0.000	-0.000	0.001*	-0.002	0.001	-0.001	0.003**	0.000	0.001**	-0.002	0.002***
	(0.002)	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Cg	-0.032***	-0.015	-0.009**	-0.013**	-0.011	-0.026**	-0.026***	0.013	-0.011**	-0.006	-0.011	-0.009
	(0.010)	(0.011)	(0.004)	(0.005)	(0.007)	(0.013)	(0.009)	(0.010)	(0.005)	(0.006)	(0.011)	(0.010)
lyr_sch	-0.431***	0.136	0.096**	-0.029	0.207	0.573**	-0.272**	-0.148	0.103*	-0.093	0.178	0.007
	(0.139)	(0.167)	(0.039)	(0.089)	(0.142)	(0.260)	(0.107)	(0.149)	(0.054)	(0.071)	(0.146)	(0.191)
polity2	-0.003	-0.005	0.001	0.000	-0.015	-0.012	-0.006	-0.001	-0.001	-0.001	0.013*	0.012
	(0.006)	(0.006)	(0.005)	(0.004)	(0.010)	(0.008)	(0.005)	(0.005)	(0.003)	(0.003)	(0.007)	(0.012)
# of Instruments			46	60	50	65			56	56	62	62
Hansen test (p-value)			0.468	0.240	0.805	0.700			0.199	0.137	0.591	0.807
AR 1 test (p-value)			0.002	0.011	0.011	0.016			0.002	0.000	0.007	0.005
AR 2 test (p-value)			0.208	0.607	0.173	0.779			0.760	0.126	0.964	0.275
Observations	341	395	300	363	300	363	398	338	359	304	359	304
R-squared	0.818	0.939					0.728	0.927				
Number of id	50	60	50	60	50	60			57	58	57	58

Notes: LI: below mean income, HI: above mean income, LECI: below mean ECI and HECI: above mean ECI. System-GMM estimations for dynamic panel-data models. Sample period: 1960-2005. † IPP, lrgdpch and l.ECI were treated as endogenous. Their lagged values used as instruments in the first difference equations and their lagged first-differences were used in the levels equations. ‡ All variables were treated as endogenous. Their lagged values used as instruments in the first difference equations and their lagged first-differences were used in the levels equations. Principal Components (PCA) were used to keep number of instruments close to the number of panels. Two-step results using robust standard errors corrected for finite samples (using Winmeijer's, 2005, correction). t-statistics are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; 5%, and *, 10%.

Table 4: Transmission Mechanism - Economic Complexity, IPR and IPR interacted

VARIABLES	(30) ECI	(31) ECI	(32) ECI	(33) ECI	(34) ECI	(35) ECI	(36) ECI LHC	(37) ECI HHC
Ipr	0.086**	0.108***	0.098**	0.087**	0.082*	-0.153**	-0.147**	0.106**
	(0.036)	(0.034)	(0.046)	(0.043)	(0.047)	(0.066)	(0.069)	(0.046)
ipr Interacted	0.006	-0.011**	-0.001	-0.432	-0.004	0.110***		
	(0.025)	(0.005)	(0.004)	(0.344)	(0.007)	(0.033)		
Openc	0.001							
	(0.001)							
Fdi		0.020						
		(0.013)						
Cg			-0.006					
			(0.010)					
polity2				0.016**				
				(0.007)				
Lpat					0.074**			
					(0.030)			
lyr_sch						-0.065		
						(0.059)		
# of Instruments	93	86	93	85	70	91	52	52
Hansen test (p-value)	0.258	0.300	0.323	0.228	0.255	0.211	0.280	0.223
AR 1 test (p-value)	0.002	0.000	0.002	0.002	0.115	0.001	0.015	0.000
AR 2 test (p-value)	0.138	0.381	0.156	0.326	0.236	0.139	0.690	0.150
Observations	686	582	686	671	434	678	266	420
Number of id	94	88	94	92	71	93	55	78

Notes: System-GMM estimations for dynamic panel-data models. Sample period: 1960-2005. IPR, lrgdpch, l.ECI and the interaction variable were treated as endogenous. Their lagged values used as instruments in the first difference equations and their lagged first-differences were used in the levels equations. Principal Components (PCA) were used to keep number of instruments close to the number of panels. Two-step results using robust standard errors corrected for finite samples (using Winmeijer's, 2005, correction). t-statistics are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; 5%, and *, 10%. IPR Interacted is IPR interacted with the other main term. LHC: below mean lyr_sch, HHC: above mean lyr_sch.

[1] For a full review of these literatures, see Allred and Park (2007).

[2] Other instruments within IPR institutions include copyright and industrial design. Firms may rely on these or other alternative strategies to confront the problem of appropriability. A discussion of why firms select (or not) formal IPR rights can be found in Hall, Helmers, Rogers and Sena (2012), supported by empirical evidence (Anton & Yao, 1994; Bhattacharya & Guriev, 2006) and in case studies at the industry level (Arora, 1997).

[3] It is important to note that at the time the US' patent standard was 17 years and that many of the countries adhering to the new rules did not have patents for products such as pharmaceuticals. For an account of the political process underlying the negotiation of the agreement see Jawara & Kwa (2003).

[4] Implementation of new IP norms has occurred in a staggered time sequence, commencing in 1996, on the heels of TRIPS approval. Countries such as Brazil amended their local rules to be consistent with the international norms within a year. India, by contrast, negotiated a transition time concluding in 2005. This June (2013), a further extension of treaty flexibilities was granted for a set of "least developed countries" until 2021. In this sense, while the shift has been unitary in direction, timing has been heterogeneous.

[5] For a broader discussion of the pros and cons of patent data, see Griliches (1998).

[6] An interesting review of emerging patenting patterns is presented in Kortum & Lerner (1999).

[7]Data on patent applications, number of researchers and research spending is from the World Bank World Development Indicators.

[8] As robustness check we re-run all the regressions in Table 1 controlling for autocorrelation of order 1. The results from these regressions are broadly similar to the ones presented in the paper. The details are available upon request.

[9] Since dividing the data using average income and average ECI might be considered somehow arbitrary we also rely on cluster analysis to look for alternative groupings of the data. Formally, we use k-means cluster analysis on our three main variables: ECI, IPR and GDP per capita. The Calinski/Harabasz pseudo-F test indicates the presence of 2 or 3 clusters in the data. The results from the clustered regressions are broadly similar to the ones presented in the paper. The details are available upon request.

[10] FDI is inward foreign direct investment from the World Bank World Development Indicators. Lpat is the logarithm of the total number of patents granted by the USPTO by year for each country. Data from Lederman and Saenz (2005).

ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER SERIES

CERDA, RODRIGO: "THE IMPACT OF GOVERNMENT SPENDING ON THE DURATION AND THE INTENSITY OF ECONOMIC CRISES: LATIN AMERICA 1900-2000". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #1, 2009.

GALLEGO, FRANCISCO; WOODBERRY, ROBERT: "CHRISTIAN MISSIONARIES AND EDUCATION IN FORMER AFRICAN COLONIES: HOW COMPETITION MATTERED". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #2, 2009.

MATTA, JUAN JOSÉ: "EL EFECTO DEL VOTO OBLIGATORIO SOBRE LAS POLÍTICAS REDISTRIBUTIVAS: TEORÍA Y EVIDENCIA PARA UN CORTE TRANSVERSAL DE PAÍSES". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #3, 2009

COX, LORETO: "PARTICIPACIÓN DE LA MUJER EN EL TRABAJO EN CHILE: 1854-2000". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #4, 2009

GALLEGO, FRANCISCO; WOODBERRY, ROBERT: "CHRISTIAN MISSIONARIES AND EDUCATION IN FORMER COLONIES: HOW INSTITUTIONS MATTERED". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #5, 2008.

BRUHN, MIRIAM; GALLEGO, FRANCISCO: "GOOD, BAD AND UGLY COLONIAL ACTIVITIES: DO THEY MATTER FOR ECONOMIC DEVELOPMENT". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #6, 2009.

GALLEGO, FRANCISCO: "HISTORICAL ORIGINS OF SCHOOLING: THE ROLE OF DEMOCRACY AND POLITICAL DECENTRALIZATION". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #7, 2009.

GALLEGO, FRANCISCO; RODRÍGUEZ, CARLOS; SAUMA, ENZO: "THE POLITICAL ECONOMY OF SCHOOL SIZE: EVIDENCE FROM CHILEAN RURAL AREAS". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #8, 2010.

GALLEGO, FRANCISCO: "SKILL PREMIUM IN CHILE: STUDYING SKILL UPGRADING IN THE SOUTH". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #9, 2010.

GALLEGO, FRANCISCO; TESSADA JOSÉ: "SUDDEN STOPS, FINANCIAL FRICTIONS, AND LABOR MARKET FLOWS: EVIDENCE FROM LATIN AMERICA". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #10, 2010.

BRUHN, MIRIAM; GALLEGO, FRANCISCO; ONORATO, MASSIMILIANO: "LEGISLATIVE MALAPPORTIONMENT AND INSTITUTIONAL PERSISTENCE". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #11, 2010.

GONZÁLEZ, FELIPE: "LAND REFORM AND GOVERNMENT SUPPORT: VOTING INCENTIVES IN THE COUNTRYSIDE". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #12, 2010.

LAFORTUNE, JEANNE: "MAKING YOURSELF ATTRACTIVE: PRE-MARITAL INVESTMENTS AND THE RETURNS TO EDUCATION IN THE MARRIAGE MARKET". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #13, 2012.

LAFORTUNE, JEANNE; TESSADA, JOSÉ: "SMOOTH(ER) LANDING? THE DYNAMIC ROLE OF NETWORKS IN THE LOCATION AND OCCUPATIONAL CHOICE OF IMMIGRANTS". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #14, 2012.

LAFORTUNE, JEANNE; TESSADA, JOSÉ; GONZÁLEZ-VELOSA, CAROLINA: "MORE HANDS, MORE POWER? ESTIMATING THE IMPACT OF IMMIGRATION ON OUTPUT AND TECHNOLOGY CHOICES USING EARLY 20TH CENTURY US AGRICULTURE". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #15, 2013.

BEYER, HARALD; GALLEGO, FRANCISCO: "EDUCATION AND PRODUCTIVITY: SOME NEW EVIDENCE AND IMPLICATIONS FOR CHILE". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #16, 2013.

CUESTA, JOSÉ IGNACIO; GALLEGO, FRANCISCO A.; GONZÁLEZ, FELIPE A.: "LOCAL IMPACTS OF ECONOMIC LIBERALIZATION: EVIDENCE FROM THE CHILEAN AGRICULTURAL SECTOR". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #17, 2013.

SWEET, CASSANDRA; ETEROVIC, DALIBOR: "DO STRONGER INTELLECTUAL PROPERTY RIGHTS INCREASE INNOVATION?". ECONOMIC HISTORY AND CLIOMETRICS LAB WORKING PAPER #18, 2014.