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**Closing the gap by securing individual rights: the role of a commitment to individual rights in the economic catching-up process**

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**Abstract**

This paper attempts to contribute to the understanding of how individual rights usually associated with democratic institutions affect economic development. The market process approach to innovation (and entrepreneurship) is combined with the stationary bandit approach to property rights to derive a proposition explaining how the lack of an exogenous commitment to property rights can retard innovation. The main proposition is that such an exogenous commitment to secure property rights through respecting individual rights and especially civil or human rights becomes an important factor in the process of catching up for those countries that are relatively close to the most developed ones in terms of technology and thus income. The proposition is tested on cross-country panel data using two different measures of civil liberties and democracy as a proxy for the commitment to secure individual rights. This argument provides one possible explanation for the fact that there is a strong correlation between democracy and income while the correlation between democracy and growth is weak.

**Key words:** individual rights, innovation, economic growth

**JEL codes:** K11, O43

*Indeed, so long as some countries lead, all the others can follow, although the conditions for spontaneous progress may be absent in them. That even countries or groups that do not possess freedom can profit from many of its fruits is one of the reasons why the importance of freedom is not better understood.*  
(Hayek 1960: 47)

## **1. Introduction: the disputed role of democracy in economic growth**

The correlation between democracy and income is one of the most spectacular features of the cross-country data which researchers of economic growth have been accumulating over the last couple of decades. How to explain this correlation is of course not obvious. First, because when more sophisticated econometric techniques are applied and more explanatory variables are included, this correlation is not so clear, inasmuch as it is the rate of economic growth that is expected to move in step with democracy (Barro 1996, 1999, Torsten and Tabellini 2006, Paldam and Gundlach 2008a, Shirley 2008: 83-87). Secondly, even if it is difficult to deny the correlation between the level of income and democracy, whether the causality runs in one or the other way is not clear (Paldam and Gundlach 2008a).

There are two opposing views as to why this correlation between income and political freedom or democracy can be observed (Paldam and Gundlach 2008a). The mainstream institutional view (Acemoglu et al. 2005, North and Weingast 1989) is that democratic institutions provide a solution for the fundamental problem of economic growth, which is how to create a government which is credibly committed to protect property rights on the one hand, but which does not abuse its power to hurt them on the other.

The recognition of this problem as a fundamental dilemma of good governance is an old insight in political philosophy<sup>1</sup>, but as a fundamental dilemma of the analysis of economic growth it was only much more recently reformulated with the language of modern economics<sup>2</sup> (Olson 1993, 2000, Weingast 1995, Acemoglu 2003 or Djankov et al. 2003). The investigation of how different institutions, including political ones, shape macroeconomic performance has become a separate and respected line of research in growth economics, and

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<sup>1</sup> As James Maddison (1788) in The Federalist No. 52 put it: "In framing a government which is to be administered by men over men, the great difficulty lies in this: you must first enable the government to control the governed; and in the next place oblige it to control itself. A dependence on the people is, no doubt, the primary control on the government; but experience has taught mankind the necessity of auxiliary precautions".

<sup>2</sup> As in his stock-taking article, Nye (2008) shows very clearly, the renewed focus on institutions was paralleled and complemented with a renewed focus on the role of the state: "It seems that economists were rediscovering Hobbes at the same time as they were returning to the core wisdom of Adam Smith" (ibid:70).

has successfully shown that institutions do matter in economic growth, and more specifically that the institutions of property rights are of fundamental importance. These institutions are not the only one of the many factors of economic growth beside physical and human capital, or technology, but one of the deeper factors of economic growth determining how the “proximate” or more direct factors will interact (Acemoglu and Johnson 2005, Acemoglu et al. 2005, Owen et al. 2009). More simply put, the security of property rights has long-run consequences for the development path a country follows. As one of the deep causes of economic growth they are shown to be more important than geographical factors (Easterly and Levine 2003, Rodrik et al. 2004).

The reason for this contradiction between the well documented effects of property rights and the less obvious role of democracy is well articulated by the proponents of the opposite view (Glaeser et al. 2004, 2007, Paldam and Gundlach 2008a). Briefly, they argue that democracy is not a necessary condition for economic growth; rather it is a result of it. Gundlach and Paldam show in several papers (e.g. Paldam and Gundlach 2008b, Gundlach and Paldam 2008) that income is the best explaining factor of democracy, joining for example Barro (1996, 1999) in supporting the Lipset- hypothesis (Lipset 1959) as an explanation of the relationship between development and democracy. Gleaser et al. (2004, 2007) agree but emphasize the role of human capital instead of income as a determining factor. Equally important here is their claim that institutional measures that are used to show the effect of property rights and democracy do not measure institutions directly, rather they measure the result of them. This sceptical view of the role of democratic institutions is supported by the rapid development of those countries which went or are going through a fast development process with an authoritarian regime. Gilson and Milhaupt (2010) also argue that a dictator may be able to credibly commit to secure property rights, once he or she has a strong preference towards growth as opposed to redistribution. A successful growth strategy must reveal these two characteristics.

This critique concerns those authors as well whose works belong to the “institutions matter” tradition. Rodrik (2007:51-54) admits that the institutional literature has only been able to show that different *functions* of institutions such as the security of property rights are good explanatory factors of growth, but not that there is a one-to-one mapping between institutions and the functions they serve. The security of property rights may be ensured by different institutions, thus their security does not require democratic institutions in some circumstances. But the question still remains as to what circumstances make democratic institutions necessary for economic growth.

An important aspect of this debate is the role of human and civil rights in economic development. Blume and Voigt (2007) and Yishay and Betancourt (2009) are two recent contributions to this debate. Yishay and Betancourt (2009) show that second generation human rights outperform a number of possible alternative institutional measures in explaining the level of economic development. Blume and Voigt (2007) show that property rights are the most important in determining growth, while all types of human rights<sup>3</sup> are statistically significant factors in explaining either investment rates or total factor productivity or both. Surprisingly or not, they cannot confirm the hypothesis that civil rights affect economic growth positively.

This paper aims at contributing to this literature by giving an alternative interpretation to why democratic institutions ensuring civil rights are necessary for a country being developed and why convergence may be speeded up by more secure civil rights. The institutions of democracy are interpreted here as exogenous constraints on politicians that prevent them from hurting individual (property) rights<sup>4</sup>. The main proposition of the paper is that the role of the exogenous constraints depends on the technological development of the country, that is, it depends on whether the main driving force of economic growth is innovation or imitation. I will present the argument in three steps. The first, laid down in section 2 is that innovation based growth means a more individual-rights intensive production because of the role transaction costs play in the process of innovation. Section 3 includes the second and the third step of the argument. On the one hand, in a simple model of the stationary bandit (McGuire and Olson 1996) it will be shown that under some circumstances, the stationary bandit without any exogenous constraints will not let innovation occur. Second, I will argue in this section that ensuring civil rights is a credible way to reveal that such exogenous constraints are in place. Section 4 tests the main proposition using a panel of countries in the time span between 1970 and 2005. Section 5 concludes. This argument supports the mainstream institutional view on democracy and economic development as far as democratic institutions are exogenous constraints on those in power protecting individual rights, and as far as democracy is not seen as a necessary condition to develop rapidly but is a necessary condition for joining the club of the richest.

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<sup>3</sup> In addition to estimating the effect of human rights on growth Blume and Voigt (2007) provides a categorization of human rights according to which human rights include (1) basic human rights, (2) property rights, (3) civil rights, and (4) emancipatory rights. That is, in their interpretation human rights are a broader category than property rights.

<sup>4</sup> In my approach these two are not separable theoretically, although the term individual rights refer to a broader set of rights than the term property rights does.

## 2. Innovation and the role of individual rights

One salient feature of the catching-up process that has been observed in the past several decades or so is that countries that began to catch up later are able to catch up faster than those countries that began their catching-up processes earlier (Jones and Romer 2009, Lucas 2000, 2007, Parente and Prescott 2000, Comin et al. 2006, 2008). This fact is important to point out that it is not only the differences of incomes across countries which are to be explained largely by the difference in technology (Hall and Jones 1999, Easterly and Levine 2001, Caselli 2005, Caselli and Feyrer 2007), but also the catching up of poor countries. This is because latecomers are able to apply more developed technology.

On the other hand, it is widely argued – as we have seen in the previous section – that the security of property rights is a necessary condition of development. Olson (2000:183-199) goes as far as to speak about “rights-intensive” production as a characteristic of those societies that are able to develop<sup>5</sup>. In his interpretation it follows from the fact that the transactions that are needed for economic development are not self-enforcing and need “socially-contrived markets”, where rights must be enforced by an impartial third party. In sum, Olson argues that for economic development production must be able to become rights-intensive.

The idea that the production can be more or less intensive in rights is clearly a Coasian one. It suggests that “rights” are similar to other factors of production, and this similarity (or identity) between a right and a factor of production is a general conclusion Coase (1960:43-44) drew from his pioneering work on externalities. As he puts it, a factor of production should be thought of “as a right to perform certain (physical) actions”, and not as a physical entity. Accepting the claim that security of property rights is a factor of production means accepting the fact that production can be more or less property-rights intensive.

To understand the role of property rights in innovation I apply a market process view of innovation developed mainly by Hayek (1945, 1978) and later by Kirzner (1973, 1999). In this interpretation, innovation is a form of entrepreneurial discovery done by entrepreneurs who are “alert” to unnoticed profit opportunities. By discovering and making use of these opportunities the entrepreneurs make production more efficient because they create a wider

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<sup>5</sup> “But many other types of production [those that are not self-enforcing] require valuable assets, such as machines and factories or offices, that cannot be hidden and accordingly are exposed to seizure or confiscation. These types of production are property-rights intensive – the familiar expression capital-intensive obscures the crucial role of enforceable rights. No one would normally engage in capital-intensive production if he or she did not have rights that kept the valuable capital from being taken by bandits, whether roving or stationary” (Olson 2000:186, my note in brackets)

set of production possibilities or because their discoveries eliminate some inefficiencies (Boettke and Coyne 2003). Innovation is one sort of profit opportunity. When such profit opportunities are discovered and realized, the entrepreneur “innovates”. In this view innovation is not scientific discovery or pure technological advance, but the use of such new knowledge and technology to create profit. This is important because the uncertainty of the innovation does not result from the nature of scientific discovery, but from the nature of the market process: innovation is a way of creating market transactions that have never been tried before.

A hypothesis that can be formulated by applying this perspective is that innovation is the most rights-intensive activity of those that are generally acclaimed to be the determinants of economic growth. This hypothesis is based on the fact that for innovation to happen, transaction costs must be low enough. Generally speaking, the role of property rights is to reduce transaction costs (Besley and Ghatak 2010), by which it becomes possible that more beneficial exchanges can happen. A considerable part of these transaction costs result from the fact that the government (those with the monopoly of force) cannot make a credible commitment that the expected income of investments will go to those who made the investments. To apply new technology, investments must be made in highly specific assets, which are very good targets for a holdup from the government.

Consequently, the security of property rights can be thought of as the probability with which the entrepreneur thinks the government will prevent her from appropriating the fruits of the investment she made to use a new technology to generate income. To put it another way, in this entrepreneurial perspective of innovation, the security of property rights is an *ex ante* perceived ability to make transactions that will be enforced, even if some of the consequences of its realization cannot be predicted. A higher level of rights intensitivity means that a reduction of the security of property rights will generate a higher loss of production, because such a reduction increases transaction costs. The extent of this loss of production depends on the extent to which production is rights-intensive. More uncertain property rights will create more harm when production is more rights-intensive.

What I propose here is that this rights-intensive nature of production is enhanced when the main driving force of development becomes innovation and not imitation or capital accumulation. The reason for this is twofold. The first is that innovation is uncertain and highly unpredictable by nature, while imitation and capital accumulation brings less radical novelty. One of the most important features of innovation is its unexpected nature. As such it is different from other activities, because the uncertainty in this case is “radical”; as Hayek

(1960: 24) put it, “the mind can never foresee its own advance”. Inasmuch as innovation is considered as an advance of the mind as opposed to what is only an application of a “state of the mind” to solve different problems, the uncertainty in the innovation process is unique and inherent. As Cooter (2005) emphasizes, this novelty together with the non-excludable nature of information creates a hold-up problem between the innovator and the possible investors. This is just another reason which shows that the nature of innovation magnifies the problem caused by transaction costs in any contractual relations. Thus transaction costs are higher when the subject about which the contract is made is innovative activity. Innovation here differs from imitation, too. Imitation is the application of a known technology. Thus – to use Cooter’s (2005) phrase – technology to be imitated is public knowledge before the contract is made. That is why the relationship between the investor and the entrepreneur is not as asymmetric as it is in the case of innovation.

The second reason for the rights-intensive nature of innovation is that innovation is a way of making use of a higher specialization of resources and knowledge, and the new methods are found by trial and error. Innovation must be implemented through making transactions between resource owners, entrepreneurs and consumers, and these transactions will be novel in some sense. Whether these transactions will be profitable or not is not known in advance. Entrepreneurs make errors and these errors can serve as a basis for other entrepreneurial discoveries (Holcombe 2003). This also means that innovation is a process of trial and error, since the “market test” is the only way to know whether the innovation is “efficient”. The information that is needed for this decision is simply not available before the innovation was taken place and it cannot be collected only through the price system (Hayek 1945, Mises 1990/1920). The more transactions are tried the more probable it is that entrepreneurs will find an efficient way of applying a new technology, since there is no fixed recipe for it. The fundamental feature of imitation is that there is a recipe as to what to do and how to do it. This is a reason why innovation is more property-rights intensive than imitation: low transaction costs are crucial for the trial and error process.

The bottom line of the argument presented in this section is that innovation is finding out a new way of organizing human activities which will lead to a higher level of specialization and a more transaction-intensive way of doing things. As innovation also means something which is relatively new, the new kinds of transacting must be found by trial and error. Since “[l]iberty is essential in order to leave room for the unforeseeable and unpredictable” (Hayek 1960:29), and since innovation is by nature unforeseeable and unpredictable, the security of property rights contributes more to a higher standard of living when the progress of the latter

is based on innovation as compared to the case with imitation and capital accumulation. Using a more technical term, a switch to an innovation driven development path makes production more intensive in individual rights.

### **3. The limits of endogenous enforcement of property rights**

One important implication of the individual-rights intensive nature of innovation-driven production that is emphasized here is that with a rising insensitivity of production in individual rights the importance of exogenous constraints on those in power also increases. Exogenous constraints here mean constraints that cannot be changed or ignored even if the income-maximizing behaviour of the government would wish to do so. Without such constraints on the government the process of innovation will be stopped. This implication can help formulate hypotheses concerning the relationship between economic growth and democratic institutions.

To understand this changing role of property rights protection, the question should be raised as to why property rights are (or were) protected in the first place. One answer is that they were secured because that is the interest of the ruler. This view was most famously termed as the concept of stationary bandit by Olson (1993, 2000). According to him, when a roving bandit monopolizes force and has good reasons to make decisions over an “indefinitely long planning horizon” (Olson 1993:571), he becomes a stationary bandit, which brings gain to both the bandit and the population. The advantage of this long term monopoly over force is that it gives the stationary bandit an encompassing interest in the territory, which makes him behave very differently.

In what follows I will examine the consequences of the hypothesis I developed in section 2 in a reinterpretation of the simple model of the stationary bandit put forth by McGuire and Olson (1996). This model is modified here in two ways. First, I assume, in accordance with my hypothesis in section 2, that production becomes more “sensitive” to transaction costs caused by the insecurity of property rights. The new technology means a new production function not only with a higher level of productivity but with a higher loss of output as a result of higher transaction costs. Second, I assume that the government does not necessarily follow constitutional rules (provided that any exist); as a result the entrepreneurs (the innovators) will see it as an event with a positive probability that the government will behave as a stationary bandit without any exogenous constraints.

Some further assumptions must be made to make the model more specific and able to describe the fundamental dilemma of the protection of property rights (Djankov et al. 2003). Accordingly, I assume that government intervention can either increase or decrease the level of security of property rights. On the one hand, by increasing the volume of intervention it increases the level of public rent-seeking and thus the risk of expropriation. On the other hand, the government can provide a public good to reduce private rent seeking. Let us denote the probability of public expropriation by  $t$ ,  $0 \leq t \leq 1$ . The social loss caused by the risk of expropriation is described by the function  $r(t)$  (applying the notations of McGuire and Olson 1996), which is the ratio of actual output and potential output as a function of the expropriation risk. That is,  $1-r(t)$  share of the potential output is lost as a result of a  $t$ -level public rent-seeking. The expected income of the government from public rent seeking is  $tr(t)$  share of potential output.

This income may be used to finance the government's activity to reduce private rent-seeking. One simple way to model this is to suppose that there is one public good provided by the government, the increase of which raises production with a diminishing return. Let  $p(G)$  be the output at the  $G$  level of public goods not considering the effect of public rent seeking.

One important result in McGuire and Olson (1996) is that redistributive democracy can be modelled as a stationary bandit,  $F$  share of whose income originates from the market. Thus the stationary bandit receives  $S(t) = [F + (1 - F)t]r(t)$  share of the potential output. This situation can be given a different interpretation. According to this, the constitutional state is a Leviathan (Brennan and Buchanan 1980:13-33), which is constrained by the rules laid down by the citizens. I assume that these constitutional rules are devised to make the government act optimally. The alternative of the constitutional state is the autocratic state which does not respect such constraints and behaves as a pure stationary bandit.

In this alternative interpretation  $F$  can only have two values: in the case of the autocratic government  $F=0$ , while  $F=F^c$  if the government is constrained, where  $F^c$  is the value associated by an "encompassing interest" that is lower than 1, and the bandit with an encompassing interest applies the optimal policy (McGuire and Olson 1996: 89-93). Private players of the economy are not perfectly confident as to whether the government will follow the constitutional rules. I assume that the innovator (entrepreneur) believes that there is a non-negative probability ( $\pi$ ) that the government will act as a stationary bandit.

The private player is the entrepreneur whose only decision is whether to innovate or not. If she innovates, productivity will be multiplied by a number of  $A$ ,  $A > 1$ . Taking all the

assumptions into consideration, the actual income as a function of the risk of (public) expropriation and the level of the public good is

$$r_o(t)p_o(G) \quad (1)$$

under the old technological regime, while it is

$$r_n(t)p_n(G)A \quad (2)$$

under the new technological regime where o (old) and n (new) refer to the assumptions that in the case of a new regime the production will react differently to a change in expropriation risk.

According to what was said in section 2, I assume that under the new technological regime the production is more intensive in property rights which is now formalized as

$$r_o(t) > r_n(t) \text{ and } |r'_o(t)| < |r'_n(t)|, \quad (3a)$$

$$\text{where } 0 < r_i(t) < 1, r'_i(t) < 0, r''_i(t) < 0, i \in \{o, n\}, 0 \leq t \leq 1, \quad (3b)$$

and

$$p_o(G) > p_n(G) \text{ and } p'_n(G) > p'_o(G), \quad (3c)$$

$$\text{where } p'_i(G) > 0, p''_i(G) < 0, i \in \{o, n\}, G \geq 0, \quad (3d)$$

and primes refer to derivatives. These assumptions say that with the same level of expropriation risk, a smaller share of the (otherwise larger) potential output will be produced under the new technological regime. In addition, they imply that the returns of an increase in the security of property rights are higher under the new technology than under the old one, and as a result the loss from the increase of expropriation risk is also higher (as a share of potential output). Thus, increasing the risk of expropriation will reduce the actual output at an increasing rate. This results from the fact that a higher risk of expropriation means a higher level of rent seeking, the returns of which are increasing (Murphy et al. 1993).<sup>6</sup>

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<sup>6</sup> Murphy et al. (1993:409) provide several reasons for this, but their main argument is that rent-seeking is reducing the returns on productive activities that will attract fewer resources as a consequence. This means that the returns of rent-seeking are increasing in a relative and global sense, even if it has decreasing returns from the perspective of the individual. Interpreting this in the framework of the model developed here this means that the higher the value of  $t$ , the higher is the return of rent-seeking activities, and the more people are engaged in rent-seeking the lower the returns are of productive activities. When an increase in the expropriation risk raises the return on rent-seeking it will cause a reduction in output the size of which depends on this increase as compared to the return on productive activities. But this return is lower the higher the volume of rent-seeking activities. As a result, the higher the level of rent-seeking the more is the extent to which an increase in it will cause a reduction in output.

### 3.1. Constitutional versus autocratic government

Under the above assumptions the government will solve the following problem:

$$\text{Max}_{G,t} \{S_i^j(t)r_i(t)p_i(G)Y_i - G\} \text{ such that } S_i^j(t)r_i(t)p_i(G)Y_i \geq G, \quad (4)$$

where  $S_i^j = F_i^j + (1 - F_i^j)t_i^j$ ,  $i \in \{o, n\}$ ,  $j \in \{a, c\}$ ,  $Y_o = 1$ ,  $Y_n = A$ , and,  $F_o^a = F_c^a = 0$ .

$F_i^j$  is the share of income the stationary bandit receives from the market under different technological and political regimes. As was indicated before I model the constitutional case as a situation in which the government behaves as if it earned a share of income from the market equal to that of the encompassing interest, while the autocratic government gets no income from the market. Accordingly, the difference between the constitutional<sup>7</sup> and the autocratic cases is that in the constitutional case  $F_i^j = F_i^c$ ,  $i \in \{o, n\}$  while in the autocratic case  $F_o^a = F_n^a = 0$ .

Let us denote the solutions of this problem by  $t_i^j$  and  $G_i^j$ , where  $j \in \{a, c\}$  refers to the constitutional (c) or the autocratic (a) solution, and  $i \in \{o, n\}$ , as before

Two important implications of these solutions are that<sup>8</sup>

$$t_o^j > t_n^j \quad (5)$$

and

$$t_o^j r_o(t_o^j) > t_n^j r_n(t_n^j), \quad j \in \{a, c\}. \quad (6)$$

That is, the expropriation risk will be lower under the new technological regime both under constitutional and autocratic government, provided that the innovation occurs and is applied. The second result (equality (6)) is important because it shows that a stationary bandit will not necessarily provide more public good under an income-enhancing innovation. More precisely:

$$\text{if } A > \frac{t_o^a r_o(t_o^a)}{t_n^a r_n(t_n^a)}, \text{ then } G_n^a > G_o^a. \quad (7)$$

<sup>7</sup> In such a simple model the constitutional rule must be simple as well. In this case this may mean two things. First, the rule can introduce a maximum rate of expropriation where this maximum is the social optimum. A second interpretation is limiting the tax base as a  $S_i^*/t_i^c$  share of income, where  $S_i^* = F_i^* + (1 - F_i^*)t_i^c$ .

<sup>8</sup> See the *Appendix* for proofs of these ((5), (6), (7)) propositions.

### 3.2. Constitutional constraints and innovation

In this model the higher the probability that the government will not follow the constitutional rules, the more probable it is that a productive innovation will not be introduced. Since the entrepreneur is the only other player in addition to the government, its income is the total income reduced by the expected value of expropriation. Supposing that the entrepreneur is risk neutral, she will innovate if

$$\begin{aligned} & \pi(1 - t_n^a)r_n(t_n^a)p_n(G_n^a)A + (1 - \pi)(1 - t_n^c)r_n(t_n^c)p_n(G_n^c)A > \\ & > \pi(1 - t_o^a)r_o(t_o^a)p_o(G_o^a) + (1 - \pi)(1 - t_o^c)r_o(t_o^c)p_o(G_o^c) \end{aligned} \quad (8)$$

which can be written as

$$A > \frac{(1 - t_n^c)r_n(t_n^c)p_n(G_n^c)}{(1 - t_o^c)r_o(t_o^c)p_o(G_o^c)} \times \frac{\pi\Omega_o + 1 - \pi}{\pi\Omega_A + 1 - \pi}, \quad (9)$$

where

$$\Omega_o = \frac{(1 - t_o^a)r_o(t_o^a)p_o(G_o^a)}{(1 - t_o^c)r_o(t_o^c)p_o(G_o^c)}, \quad \Omega_n = \frac{(1 - t_n^a)r_n(t_n^a)p_n(G_n^a)}{(1 - t_n^c)r_n(t_n^c)p_n(G_n^c)}, \quad (10)$$

and  $\pi$  is the probability the entrepreneur associates with the chance that the government will behave as a stationary bandit.

To make the solution simpler it is useful to make some further assumptions. It seems to be reasonable to suppose that in a “perfectly constitutional” situation, that is, when people believe with certainty that the government will follow the rules ( $\pi = 0$ ), an innovation which enhances potential output always occurs. This means that when  $A > 1$ , the entrepreneur in such a perfectly constitutional regime will always believe that innovating pays off. Briefly, when  $\pi = 0$ , the inequality in (8) should always hold. A natural way to incorporate this situation into the model is to suppose that the rules of the perfectly constitutional economy will let the entrepreneur increase her income by the same rate as the rate at which the innovation she made increased potential income. To suppose that the entrepreneur’s income will be multiplied by  $A$  is to suppose that the first ratio in the right hand side of (9) is equal to 1.

To suppose that the entrepreneur’s income will be multiplied by  $A$  is to suppose that the first ratio in the right hand side of (9) is equal to 1. Consequently, in this perfectly constitutional state, the entrepreneur’s income under the new technological regime is as large a share of the potential income as it was under the old one.

To see that there exists an increase in productivity which will not be introduced if  $\pi > 0$ , we have to show that the right hand side of (9) can be higher than 1. Bearing in mind the assumptions just made, this means that

$$\Omega_o > \Omega_n. \quad (11)$$

Because of the definitions in (10) this is equivalent with

$$(1 - t_o^a) r_o(t_o^a) p_o(G_o^a) > (1 - t_n^a) r_n(t_n^a) p_n(G_n^a), \quad (12)$$

since the denominators of  $\Omega_o$  and  $\Omega_n$  are equal by the assumption made in the previous paragraph. To show that (12) is possible, assume that (7) does not hold:

$$A \leq \frac{t_o^a r_o(t_o^a)}{t_n^a r_n(t_n^a)}.$$

In this case the level of public good provided by the autocratic government will not be necessarily higher under the new technology. Such a situation is possible even if  $A > 1$  because of the following. Write (12) as

$$\frac{(1 - t_o^a) r_o(t_o^a) p_o(G_o^a)}{(1 - t_n^a) r_n(t_n^a) p_n(G_n^a)} > 1. \quad (13)$$

Provided that this criterion holds, it is also true that there is an  $A$  that is higher than 1, and

$$\frac{1 - t_n^a}{1 - t_o^a} \frac{t_o^a p_n(G_n^a)}{t_n^a p_o(G_o^a)} < A \leq \frac{t_o^a r_o(t_o^a)}{t_n^a r_n(t_n^a)}, \quad (14)$$

because if (12) holds, the ratio on the right hand side of (14) is greater than the ratio on the left hand side.<sup>9</sup> That is, if the parameter of technological change ( $A$ ) has a value between the left and right hand side of (14) then (12) (and (13)) holds.

This possibility is interesting here because it can be shown that the left-hand side of (14) can be higher than 1 if (7) does not hold. This is possible if

$$\frac{p_n(G_n^a)}{p_o(G_o^a)} > \frac{1 - t_o^a}{1 - t_n^a} \frac{t_n^a}{t_o^a}, \quad (15)$$

The right-hand side is smaller than 1 because of (6). The higher the change in the function  $p_i(\cdot)$ , or the smaller is the change in parameter  $A$ , the more probable it is that (15) is true, in addition to the fact that the change in function  $r_i(\cdot)$  should be large enough indicated by the fact that (7) should be violated.

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<sup>9</sup> To see this rearrange (13) to get

$$\frac{1 - t_n^a}{1 - t_o^a} \frac{p_n(G_n^a)}{p_o(G_o^a)} < \frac{r_o(t_o^a)}{r_n(t_n^a)}, \text{ and multiply both sides by } (t_o^a/t_n^a).$$

In sum there are relevant ( $A > 1$ ) cases when  $\Omega_o > \Omega_n$ , or when

$$\frac{\pi\Omega_o + 1 - \pi}{\pi\Omega_A + 1 - \pi} > A > 1 \quad (16)$$

The entrepreneur does not innovate under such conditions. With  $\Omega_o > \Omega_n$ , however, the ratio in (16) is an increasing function of the probability  $\pi$ . The more probable it is the entrepreneur thinks the government will behave in an autocratic way, the less probable it is that the innovation occurs. Note that the alternative to constitutional government is the stationary bandit (and a not a roving one). As we saw, given the level of  $A$ , the crucial factors are the change in  $r_i(\cdot)$  and in  $p_i(\cdot)$ . The important factor is thus whether the increase in innovation brings a relatively great change in the sensitivity of production to the changes in transaction costs.

This means that the factors limiting the probability of autocratic behaviour in the eyes of innovators will be more important in the catch-up process of those countries that are relatively developed and are close enough to the world's "cutting edge" technology. This fact is revealed in two features of what this simple model implies. First,  $A$ , the expected rise in productivity can be thought of as a measure of the distance from the technological frontier of the world: less developed countries are able to apply a more developed technology and reach a high speed of technological change and economic growth. Second, as I tried to show in section 2, when a country is switching to a strategy of innovation instead of imitation the sensitivity to transaction costs will be higher. Thus a higher change in  $p_i(\cdot)$  and  $r_i(\cdot)$  will be a characteristic of those countries that are close enough to the technological frontier of the world and are about to embark on a development path based on innovation. Those means that make the government commit credibly to individual rights will be more crucial in these countries: the closer the technology of a country is to the technological possibility frontier of the world, the more probable it is that the inability of the government to make a general commitment to secure individual rights will constrain economic development. What is emphasized here is not the security of individual rights as an important factor, but the fact that the security of property rights will not necessarily be ensured by the revenue maximizing logic of even a stationary bandit. For innovation to be the driver of economic growth in a country with a cutting edge technology, the government needs to make a credible commitment to secure property rights which indicates that the government's commitment is not driven by revenue maximizing considerations.

This implies that a commitment to secure property rights which is made only because such a commitment increases the government's income together with that of the players is not a sufficient condition for innovation-driven economic development. The government must be constrained exogenously, or must have a preference in which the reduction in the security of property rights cannot be substituted by a higher income.

### *3.3. Ensuring civil rights as a signal of exogenous constraints*

So far I have tried to show that (1) innovation makes production more rights-intensive because of which (2) exogenous constraints on the government become more important. As a third step in my argument, I shall try to show in the following that ensuring civil rights is a way of revealing that the government for some reason faces such exogenous constraints.

The reason is that there is no difference between “property” and “human” or “civil” rights: human rights are property rights. This means that once human rights are protected, property rights must be protected as well. But since “property” rights may be protected with insecure “human” rights, secure “human” rights show a specific approach to securing property rights. This approach can be called an exogenous commitment which, as I argued, is necessary for innovation.

When it comes to the property rights perspective, the lack of any difference between the two kinds of rights derives from the fact that both the term “property” rights and “human” or “civil” rights refer to rights to use a resource to achieve an aim which the owner of the asset regards as worthwhile. This is why several authors have pointed out that property rights and civil or human rights cannot be meaningfully separated from each other (Rothbard 1998, Buchanan 1999, Alchian 2008). As the protection of individual rights is just another expression for the idea of individual freedom, the difference between property rights and individual rights are just another aspect of the difference between *economic* freedom and *individual* freedom.<sup>10</sup> But this difference is arbitrary because it depends on what we mean by “economic”. Although Hayek is often mentioned as a great champion of economic freedom he (1960:35) notes that “it is very questionable whether there are any actions which can be called merely ‘economic’ and whether any restrictions on liberty can be confined to what are called merely ‘economic’ aspects”.

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<sup>10</sup> The equality between protecting property rights and ensuring individual freedom is also clear from the famous definition of Lord Acton (1907:3) who described freedom (liberty) as “the assurance that every man shall be protected in doing what he believes his duty against the influence of authority and majorities, custom and opinion.”

Consequently, insecure human rights are insecure property rights. Yet they are very often separated. It seems that the difference between “property” and “human” rights lies not in what they mean to the private players, but rather in the way they are defined. As restrictions on human rights are restrictions on the use of assets for various purposes they can be evaluated similarly to market regulation. Considering the two different aspects of regulation emphasized by Vanberg (2001:21-27), “property” rights refer to the security of assigning rights while “human” rights refer to the definition of rights. To use Vanberg’s (2001:23) terms, “property” rights give an answer to the question “who owns what?” while “human” rights give an answer to the question, “what does it mean to own something?” As a consequence it is possible to have secure property rights and insecure “human” rights at the same time, in theory at least. In this case individual rights are defined relatively narrowly but their assignment is clear, and arbitrary re-assignments are not probable.

Why does this difference between the two kinds of rights become important when it comes to innovative activity? My hypothetical answer to this question is that it arises from the difference in the definitions explained above: securing human rights are equal to protecting private players when they follow such activities whose consequences to the government are very difficult to predict. In this sense these activities are similar to innovation: the consequences are not clearly positive from the point of view of the government.<sup>11</sup> Because of its unpredictability, the expected results of innovation cannot be specified ex ante and, as a result, one cannot be sure that the government will prevent the realization of possible profit opportunities, the consequence of which may easily turn out to be against its will. Protecting human and thus civil rights is a signal that a government can commit to individual rights for other reasons than expected higher income. This is what I called above an exogenous commitment to protect property rights. Civil rights are not exogenous constraints but they are a signal that the government faces such exogenous constraints. Farber’s (2002) theory concerning the role of rights as signals is thus very much in line with my argument and it also helps make the argument face the data. Farber (2002) emphasizes the costs of protecting human rights when giving detailed reasons why respecting human rights is a signal that the government is able or is made to “take rights seriously” and secure them even if utilitarian calculations would suggest otherwise.

In sum, however artificial the difference between economic freedom and civil liberties or property and human rights is, it reflects a general view that civil liberties do not have much to

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<sup>11</sup> Acemoglu and Robinson (2006) shows, for instance, that the expected political turbulence of introducing a new technology can make the ruler prevent its introduction and make economic growth slower.

do with the “economy”; that is, they must be secured for their own sake, if at all. Thus ensuring them brings with it the sign that the government is committed to individual rights not because of the income they may provide but because it is effectively made to pursue an abstract ideal such as individual freedom.

**4. The effect of civil rights on economic catching up**

The prediction I formulated above can possibly be tested on panel data of a cross section of countries. In such a setting the hypothesis implies that as a country is getting closer to the world’s technological leader, the more important the security of individual rights will be as a factor in its catching up. The reason is that a country with a more advanced technology will have fewer opportunities to imitate others, and as a result innovation as a strategy of growth will be more important. Thus an exogenous commitment to property or individual rights will have more impact on the speed of the convergence among the nearly rich than among the poor. As a part of this complicated prediction I will confine myself here to showing that the convergence process is usually retarded by a failure to ensure civil rights protection. Inasmuch as convergence is fuelled by innovative activities, this supports my hypothesis.

Since my argument is based on the idea of a catch-up through imitation I will use a model of imitation to test the hypothesis. Barro and Sala-i-Martin (1997) develops a model in which the catch-up process of those lagging behind is driven by the imitation of innovation in the leader country. They show that even in this model conditional convergence holds but somewhat differently than is well-known from the Solow model (Solow 1956, Mankiw et al. 1992, Barro-Sala-i-Martin 2003:44-50) of economic growth. In their model the conditional convergence equation can be written as (Barro and Sala-i-Martin 1997:16)

$$\frac{\dot{y}_i}{y_i} - \gamma = G \left( \frac{y_i}{y}, \left( \frac{y_i}{y} \right)^* \right), G_1 < 0, G_2 > 0. \tag{17}$$

In this equation  $y_i$  is the income per worker in the follower,  $y$  is that of the leader, while  $\gamma$  is the rate of growth of the per worker income in the leader, asterisks denoting steady state values. Simply put, conditional convergence holds here in terms of per worker income relative to the leader ( $y_i/y$ ), and not in terms of income as is the case in the Solow-model.

Since the income data cover years after WWII, it is reasonable to pick the United States as the leader country. As a result the dependent variable in the estimations that follow will be the GDP per worker of a certain country as a share of that of the United States:

$$(\text{income gap})_{it} = \text{gdp}_{it} / \text{gdp}_{\text{USAt}} \cdot$$

That is, the gap variable is the ratio between the GDP per worker in country  $i$  and year  $t$  and GDP per worker in the United States in year  $t$ . The dependent variable in the following regressions will be, in line with equation (17), the growth rate of the average annual growth rate of the income gap variable.<sup>12</sup> These data come from Heston, Summers and Aten (2009)<sup>13</sup>, providing data on GDP per worker measured at PPP adjusted prices. According to equation (17) variables on the right hand side should include the income gap in the initial period, and the factors that determine the steady state. Accordingly, I specify the equation to be tested in the following form:

$$\begin{aligned} (\text{rate of change in income gap})_{it} = & \beta_0 + \beta_1 \ln(\text{income gap})_{it-1} + \beta_2 \ln(\text{latitude} + 90)_{it-1} + \\ & \beta_3 \ln(\text{individual rights})_{it-1} + \beta_4 [\ln(\text{income gap})_{it-1} \times \ln(\text{individual rights})_{it-1}] + \mathbf{X}'_{it} \boldsymbol{\beta}_5 + \varepsilon_{it} \end{aligned} \quad (18)$$

The vector  $\mathbf{X}$  includes four control variables. Three of them come from implications of the neoclassical model for relative income levels (Jones 2002: 56-63). These are the investment rates in physical and human capital and the sum of the growth rate of the labour force, the rate of amortization, and the assumed rate of long run technological change. These variables are all measured as relative to the values characterizing the United States. Data on physical capital investment and labour force growth come from Heston, Summers and Aten (2009), too. The rate of long-run technological change plus amortization rate is assumed to be 0.08 as in Caselli (2005: 685, 690-691). The source of the data on human capital investment is Barro and Lee (2001)<sup>14</sup>. Using average years of education in the population above the age of 15 I estimate the level of human capital by the Mincerian specification, following again the usual methods of growth econometrics (Caselli 2005: 685-686, Hall and Jones 1999: 89). The income gap variable and human capital data are measured in year  $t$ , while investment in physical capital and population growth reflects the average value of the period ending with year  $t$ . The fourth variable in vector  $\mathbf{X}$  is the economic freedom index of the Fraser Institute (Gwartney and Lawson 2008), a measure of economic policy and institutions (including the security of property rights).<sup>15</sup>

The independent variable that is aimed to be a proxy for the commitment to secure individual rights is the civil rights index from the Freedom in the World report of the Freedom

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<sup>12</sup> This is actually the reduction rate of the gap. An increase in the income gap variable is a decrease in the difference between the income per worker of the country in question and that of the United States.

<sup>13</sup> [http://pwt.econ.upenn.edu/php\\_site/pwt\\_index.php](http://pwt.econ.upenn.edu/php_site/pwt_index.php)

<sup>14</sup> <http://www.cid.harvard.edu/ciddata/ciddata.html>

<sup>15</sup> <http://www.freetheworld.com/release.html>

House (2010)<sup>16</sup>. This variable is the result of evaluating (1) freedom of expression and belief, (2) associational and organizational rights, (3) the rule of law, and (4) personal autonomy and individual rights on a scale between 1 and 7 with 1 being the highest level of civil rights.

The hypothesis concerning the role of individual rights enforcement in the catch-up process of countries is to be tested by including an interaction term as the product of civil rights and the value of the gap in the initial year. The interaction term has two possible interpretations, and the decision about which one is appropriate must be based on the theory (Brambor et al. 2006:71-73). According to the argument I have presented so far the interaction term should be interpreted as a measure of the extent to which economic convergence can be slowed down by a looser protection of individual rights. As a higher civil liberties score means lower protection, the coefficient of the interaction term ( $\beta_4$ ) is expected to be positive.<sup>17</sup> Because of the conditional convergence hypothesis, those countries with a lower gap will have a higher growth rate compared to the leader, *ceteris paribus*. In this model this breaks down to saying that when the gap is decreasing because, for example, the leader's growth is speeded up, the followers' growth rate will be speeded up as well. The extent to which it is speeded up, however, depends on its civil liberties score. A positive coefficient of the interaction term ( $\beta_4$ ) shows that with a lower level of civil rights protection (a higher level of civil liberties score) this catching-up process will be retarded.

Before running regressions, the question must be answered which method of panel regressions is the most useful here. Although using the fixed effects model is the most widespread in the empirical literature on economic growth, I chose to use a random effects model, too, for the following reasons. The first one is the nature of the data. Since the methods of enforcement of individual rights seem to be country specific, a very important part of the information is lost if only the within estimator is used. Second, there are good reasons to think that the diffusion of technology is affected by geographical factors (Spolaore and Wacziarg 2009: 495-502), which are also "dropped out" in the fixed effects model. Although a possible alternative is the between effects estimator, Wooldridge (2002: 269) suggests using random effects model if the fixed effects one is ruled out. As a kind of a compromise I shall use a random effects model which includes the latitude of a country's centroid (Gallup et al.

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<sup>16</sup> <http://www.freedomhouse.org/template.cfm?page=439> The initial year in this dataset is 1972. This data is used for the first period (1970-1975).

<sup>17</sup> More precisely,  $\frac{\partial(\text{rate of change in the gap})_it}{\partial \ln(\ln(\text{income gap})_{it-1})} = \beta_1 + \beta_4 \ln(\text{individual rights})_{it-1}$  implying that if  $\beta_4$  is positive, the effect of a reduction in the gap variable will increase the growth of the gap to a lesser extent, the larger this coefficient is.

1999)<sup>18</sup> as an independent variable, as a proxy for regional effects (Table 1 and Table 3). Although this is a fixed effect, it is not country specific.<sup>19</sup> In addition to that I shall also present the results for the fixed effects model (Table 2 and Table 4).

The size of my dataset is limited by the availability of data. Taking the narrowest sample, it includes data between 1970 and 2005 in an unbalanced panel structure, thus each period is a five year one. The smallest sample I use includes 89 countries and 482 observations, while the largest one includes 106 countries and 843 observations.

Table 1 and 2 show the results of the estimation of equation (18) when the commitment to individual rights is proxied by the Freedom House's civil liberties index. Column 1 and 2 in Table 1 includes only "traditional" independent variables as suggested by the neoclassical model of growth adjusted with the geographical factors. It seems that the effects of the variables, whether time dummies are included or not, are in line with the predictions of the neoclassical model<sup>20</sup> and statistically significant except for the growth of the labour force which is not significant when time dummies are included. At the same time the conditional convergence understood in the special sense explained above holds, as shown by the statistically significant and negative coefficient of the value of the gap variable.

In column 3 and 4 the economic freedom and the civil liberties variable are added. Since civil liberties include the rule of law, here the economic freedom index is an average of its components without the component called legal system and the security of property rights. The result seems to be supporting the pessimistic view that the commitment to individual rights does not have much to do with economic, let alone technological, development. When the cross variable is also added, however, both variables seem to have a positive effect on the change in the gap (column 5). This points out that there may be different channels through which civil rights can interact with the economic catch-up process. The positive sign of the coefficient on the log of the civil liberties show that all the other variables in the regression being constant countries with a lower level of civil rights protection are catching up faster. The other channel which is emphasized in this paper counteracts this as is shown by the positive coefficient of the interaction term. This latter shows that a reduction in civil rights decreases the growth of the gap; and this decreasing effect is larger the lower the protection of

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<sup>18</sup> <http://www.cid.harvard.edu/ciddata/ciddata.html>

<sup>19</sup> Problems that arise when the fixed effects model is applied in growth regressions are discussed by Durlauf et al. (2005: 627-636). Instead of using a fixed effects model, they suggest that between-country heterogeneity should be modelled explicitly.

<sup>20</sup> Note that it is not a typical conditional convergence model, since the independent variable is the gap defined in the text.

civil rights is. This effect is illustrated in Figure 1<sup>21</sup> which shows the 95 percent confidence intervals of the marginal effect of  $\ln(\text{gap})$  on the rate of change of the gap variable. It is clear that the effect of a one percent reduction in the gap is decreasing as the civil liberties score is increasing: at lower levels of civil rights protection catching-up is slower. At the maximum value of the civil liberties score (7), the marginal effect is not significantly different from zero at the 5 percent significance level. That is, countries with the lowest level of civil rights protection will probably not catch up with the leader when left behind.

When only the interaction term is added of the two (Table 1, column 6), the coefficient is only significant at the 10 percent level and its magnitude is smaller as well. This is in line with the two counteracting effects I have just mentioned. To further investigate these effects, in column 7 a cross variable is included as a dependent variable which is the product of the civil liberties score and a dummy variable that equals one when the log of the gap variable is lower than  $-1$ , and zero otherwise. This variable is shown to significantly affect (at the 5 percent level) the growth of the gap variable.

It is notable that economic freedom (even without the component measuring property rights) is significant at the five percent level in each specification. In the literature on economic growth it is usually found that the index of economic freedom is in a significantly positive relationship with economic growth<sup>22</sup> The results in Table 1 show that this is true for the catch-up process as well. Countries with a higher level of economic freedom will catch-up faster to the technological leader, than those with a lower one. This may be a support to those theories that emphasize that institutional constraints can block the introduction of new technologies and, as a result, growth.

Using a fixed effects model instead of a random effects one leads to very similar conclusions as is shown in Table 2 but with some fundamental differences, too. As it could be expected, excluding between-country information lets only fewer variables be significant. When economic freedom and civil liberties are included, none of the traditional variables are significant statistically at the usual significance level. A notable exception is the gap variable showing the strength of the conditional convergence understood as above. Again, economic freedom seems to be the most important factor for catching up.

In addition, the civil liberties index is not significant in any of the specifications, but the interaction term behaves similarly. It has a significantly positive sign and is about as large as the coefficient of the interaction term. That is, the main proposition of this paper, that an

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<sup>21</sup> Brambor et al. (2006:73-77) suggest this kind of reporting results on interaction terms.

<sup>22</sup> These results are summarized in Czeglédi and Kapás (2009: 33-59).

exogenous commitment to property rights is beneficial to economic catching-up, is given further support. But the conjecture about a threshold value of the gap is not, as is also shown by the results in column 7 and 8, where the cross-variables with the same gap-dummies as above are not significant at the 10 percent level. A possible reason for the lack of significance is that using time and country fixed effects at the same time may be “too much” and does not leave much variance in the dependent variable to be explained (Gundlach and Paldam 2008) considering the fact that the civil liberties variable is very much time-invariant.

Briefly, these results give support to my claim that providing a higher security of individual rights is a way of reducing transaction costs resulted from public rent seeking. The effect of such a reduction is dependent on the level of technological advancement of the country.<sup>23</sup>

When the same regressions are run with the individual rights proxied by the polity2 variable from the Polity IV database (Marshall and Jaggers 2009)<sup>24</sup>, the results are much weaker. This variable is intended to measure the level of autocracy or democracy on a scale between -10 and 10 evaluating the constraints on those in power and the rules of the political process<sup>25</sup>. Thus this variable can be seen as a proxy for the extent to which the formal political institutions are democratic or not. As can be seen from Table 3 and 4 the only case when one of the variables in question is significant is in column 3, Table 3: the interaction term is significant but only at the 10 percent level with the expected sign. This result does not necessarily weaken the claims in this paper for two reasons. An exogenous commitment to property rights is not the same as formal constraints on the executive power. This kind of commitment can come from other sources. Second, it was emphasized that the formal constraints on the executive power can be ignored, and what is important is the possible chance the players conceive that those in power will break this rule. In this light the civil liberties score gives stronger results because ensuring civil liberties is a *de facto* signal of an

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<sup>23</sup> It may be more convincing to take a look at some specific country examples. Japan and Korea reached about 30 percent of US per worker GDP in 1965 and have been able to close the gap since then. During this period their civil liberties scores have been relatively high (1 and 2 in Japan, 2 or 3 in Hong Kong). South Korea, a country that may be interesting when talking about autocracy, reached that level in 1985, which is the time from which its civil liberties score improved (from 5 to 2). As a counterexample, Iran can also be mentioned. In 1980 its gap was 0.35, and since then it has only reduced, taking into consideration the well-known fact that civil liberties have not been at their peak in Iran (it is given a score of 5, 6 or 7). Another counter-example is Venezuela where civil rights have worsened since 1985 at the same time as the country has been lagging further and further behind US per worker GDP. At the same time of course, civil liberties are not the only factor involved in catching up as implied by the regressions as well. These examples are only illustrations and do not give additional support to the argument beside the regressions.

<sup>24</sup> <http://www.systemicpeace.org/polity/polity4.htm>

<sup>25</sup> The variable was rescaled to the interval between 1 and 7, - 1 being the highest level of democracy - in order to be comparable with the civil liberties score.

exogenous commitment for the reasons given in section 3.3, while the polity score gives weaker results because formal institutions are only *de iure* signals.

## 5. Concluding remarks

Although there is a consensus in the literature on economic growth on the positive role of institutions in economic development, the mechanisms and exact forms of these effects are not clear. In this paper I focused on one question of the many that can be raised concerning the mechanism through which different institutions can promote economic development. The paper was concerned with the role ensuring civil rights as a part of individual rights play in economic development. I argued that the security of individual rights and especially civil rights is a sign that for an exogenous commitment to property rights which is a commitment to secure these rights for their own sake and not for utilitarian reasons. The main proposition was that (1) exogenous commitment to property rights protection has a positive effect on catch-up growth, and (2) this factor is especially important for those countries that are relatively developed and are close to the richest concerning their technology.

This hypothesis was based on two arguments that complemented each other. The first was about the nature of innovation: as innovation is inherently novel, it is more an individual rights-intensive activity than imitation. Second, a stationary bandit may not be able to credibly commit to secure property rights to an extent sufficient for innovators in the presence of a change in the individual rights intensitivity of production. This leads to the conclusion that a commitment to secure property rights regardless of their consequences on the income of government is what is needed for a catch-up. This hypothesis was tested by regressions analysis run on a panel of countries. The fact that the model is not specified for growth but for the gap variable defined as above, based on a theoretical model that puts technological imitation at the core of the convergence process, gives some further corroboration to the hypothesis and to the mechanism that is hypothesized to be behind the convergence effect of individual rights.<sup>26</sup>

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<sup>26</sup> Aghion et al. (2008) draw a similar conclusion concerning the effect of democracy on economic growth applying a different argument. Their two crucial hypotheses are that (1) in a democracy market entry is freer, and (2) that more developed industries are enhanced to a larger extent than less developed ones, which can also be hindered by a freer entry. The role of political institutions in their model comes from the assumption that they make politicians give a greater weight to general welfare in their utility functions, and it is consequently less probable that they will be captured by interest groups trying to block entry. They show in such a setting that democratic institutions have a larger effect within developed countries than in less developed ones. The critical point in this argument is the Schumpeterian view of innovation that models it as the result of firms with

How can these conclusions help us improve on the answers given so far to explain the correlation between democracy and income, and the much less clear relationship between growth and income? This paper suggests that a stationary bandit can enhance development until a certain level is reached and the strategy of imitation stops working. Innovation needs an exogenously constrained government. In this perspective a higher level of democracy is not “caused” by development, rather, the highest level of economic development cannot be reached without the institutions put in place by democracy.

One unclear aspect of the argument that raises further questions comes from the fact that formal rules will not be necessarily enforced and followed. Even constitutions can be seen as only “parchment barriers” (Melton 2010). Thus an important question concerning the effect of constitutional rights is why people follow these rules or why they think they should follow them. The argument of this paper may be developed further in this direction giving an alternative interpretation to those results of growth economics that show that values and norms “matter” (Spolaore and Wacziarg 2009, Voigt and Park 2008). What the argument laid down above suggests is that the fact that people think of individual rights as ends, and not as means to achieve something else, enriches society more, the greater the extent to which economic growth is based on innovation.

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monopolistic power that can be preserved by for example blocking entry to the market. This view of innovation is, however, seriously doubted by some researchers (Boldrin and Levine 2008).

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## Appendix

Solving the problem given in (4) and supposing that  $G_i^j, t_i^j > 0$  leads to the solutions:

$$t_i^j = -\frac{r_i(t_i^j)}{r_i'(t_i^j)} - \frac{F_i^j}{1-F_i^j} \quad (\text{A1})$$

$$p_i'(G_i^j) = \frac{1}{S_i^j(t_i^j)r_i(t_i^j)Y_i}, \quad (\text{A2})$$

where  $i \in \{o, n\}$ ,  $j \in \{a, c\}$ ,  $Y_o = I$ ,  $Y_n = A$ , and  $S_i^j = F_i^j + (1-F_i^j)t_i^j$ ,  $F_o^a = F_c^a = 0$ .

**Proposition 1:**  $t_o^j > t_n^j$ ,  $j \in \{a, c\}$

Proof:

With  $G_i^j, t_i^j > 0$  and supposing that  $r_i(\cdot)$  is twice differentiable, the following conditions will

hold at the optimum value of  $t$

$$MB_i^j(t_i^j) = S_i^j(t_i^j)r_i'(t_i^j) + (1-F_i^j)r_i(t_i^j) = 0, \quad (\text{A3})$$

$$MB_i^{j'}(t_i^j) = S_i^j(t_i^j)r_i''(t_i^j) + 2(1-F_i^j)r_i'(t_i^j) < 0, \quad (\text{A4})$$

where  $i \in \{o, n\}$ , and  $MB_i$  is the marginal tax revenue of the government per one unit of potential income. (A3) can be rewritten as

$$S_i^j(t_i^j) = -(1-F_i^j) \frac{r_i(t_i^j)}{r_i'(t_i^j)}. \quad (\text{A5})$$

Based on the assumptions made in (3a,b) concerning the functions  $r_i(\cdot)$  and  $r_i'(\cdot)$  it can be shown that  $MB_o^j(t_n^j) > 0$ ,  $j \in \{a, c\}$  which implies that  $t_o^j > t_n^j$ , since MB is decreasing in  $t$ .

Because of (A5)

$$MB_o^j(t_n^j) = (1-F_i^j)r_o'(t_n^j) \left[ \frac{r_o(t_n^j)}{r_o'(t_n^j)} - \frac{r_n(t_n^j)}{r_n'(t_n^j)} \right] > 0 \quad (\text{A6})$$

since assumptions in (3a,b) imply that

$$\frac{r_o^j(t)}{r_o^{j'}(t)} > \frac{r_n^j(t)}{r_n^{j'}(t)}. \quad (\text{A7})$$

**Proposition 2:**  $t_o^j r_o(t_o^j) > t_n^j r_n(t_n^j)$ ,  $j \in \{a, c\}$ .

Proof:

Using proposition 1 and the assumption (3a) it is straightforward that

$$t_o^j > t_n^j, \quad (\text{A8})$$

$$r_o(t_o^j) > r_o(t_n^j), \quad (\text{A9})$$

$$r_o(t_n^j) > r_n(t_n^j), \quad j \in \{a, c\}. \quad (\text{A10})$$

Because of (A8) and (A9)  $t_o^j r_o(t_o^j) > t_n^j r_o(t_n^j)$ , while because of (A10)  $t_n^j r_o(t_n^j) > t_n^j r_n(t_n^j)$  holds, which together imply the proposition to be proven.

**Proposition 3:** if  $A > \frac{t_o^a r_o(t_o^a)}{t_n^a r_n(t_n^a)}$ , then  $G_n^a > G_o^a$ .

Proof:

Since

$$p'_n(G_n^a) = \frac{1}{t_n^a r_n(t_n^a) A}, \text{ and}$$

$$p'_o(G_o^a) = \frac{1}{t_o^a r_o(t_o^a)},$$

the assumption of this proposition implies that

$$p'_n(G_n^a) < p'_o(G_o^a). \quad (\text{A11})$$

From the assumptions in (3c) it follows that

$$p'_n(G_o^a) > p'_o(G_o^a). \quad (\text{A12})$$

(A11) and (A12) together imply that

$$p'_n(G_o^a) > p'_n(G_n^a).$$

This latter inequality together with the assumption that  $p''_i(G) < 0$ ,  $i \in \{o, n\}$  implies what is to be proven.

**Table 1**  
Estimation of equation (18) with the random effects model

	Dependent variable: rate of change in income gap between t and t+5						
	1.	2.	3	4.	5.	6	7.
Constant	-0.054 (-1.87)*	-0.041 (-1.63)	-0.172 (-4.70)***	-0.200 (-4.13)***	-0.236 (-4.65)***	-0.205 (-4.24)***	-0.227 (-4.51)***
ln(gap) <sub>it</sub>	-0.016 (-8.34)***	-0.013 (-6.27)***	-0.017 (-6.01)***	-0.013 (-4.01)***	-0.031 (-4.49)***	-0.022 (-3.78)***	-0.015 (-4.10)***
ln(investment rate) <sub>it</sub>	0.012 (3.34)***	0.014 (4.48)***	0.007 (1.89)*	0.005 (1.09)	0.003 (0.54)	0.003 (0.67)	0.004 (0.89)
ln(n <sub>t</sub> +g+δ) <sub>it</sub>	-0.017 (-1.72)*	-0.013 (-1.44)	-0.007 (-0.80)	0.000 (0.00)	-0.002 (-0.11)	0.004 (0.21)	0.000 (0.01)
ln(human capital) <sub>it</sub>	0.082 (6.83)***	0.051 (4.85)***	0.042 (2.66)***	0.047 (2.58)**	0.063 (3.22)***	0.042 (2.51)**	0.054 (2.86)***
ln(latitude+90) <sub>i</sub>	0.014 (2.24)***	0.014 (2.60)***	0.020 (3.09)***	0.025 (3.05)***	0.031 (3.66)***	0.027 (3.24)***	0.030 (3.48)***
ln(economic freedom) <sub>it</sub>			0.052 (4.72)***				
ln(economic freedom without the component of legal structure and security of property rights) <sub>it</sub>				0.055 (5.02)***	0.055 (5.33)***	0.054 (4.96)***	0.056 (5.29)***
ln(civil liberties) <sub>it</sub>				0.004 (1.01)	0.014 (3.11)***		0.011 (2.61)***
(ln(gap) <sub>it</sub> )× ×ln(civil liberties) <sub>it</sub>					0.013 (3.30)***	0.005 (1.76)*	
(gapdummy) ×ln(civil liberties) <sub>it</sub>							-0.018 (-2.46)***
gapdummy							0.018 (1.97)**
within R <sup>2</sup>	0.136	0.212	0.264	0.239	0.263	0.261	0.250
between R <sup>2</sup>	0.185	0.244	0.352	0.208	0.228	0.170	0.225
time dummies	No	Yes	Yes	Yes	Yes	Yes	Yes
number of observations	812	812	551	462	462	462	462
number of countries	102	102	92	91	91	91	92

Notes: Variables of investment rate, human capital, and that of the sum of the growth rate of labour force (n), the assumed rate of long-run technological change, and the amortization rate are measured as relative values to those of the US. For example, in the case of the investment rate the variable is  $\ln(\text{investment rate})_{it} = \ln(i_{it}/i_{USAt})$ , where  $i_{it}$  is the share of investment in physical capital in country  $i$  in period  $t$ , while  $i_{USAt}$  is the same for the US.  $g + \delta$  is assumed to be 0.08. Standard errors are clustered. Gapdummy=1 if  $\ln(\text{gap})_{it} \leq -1$  and 0 otherwise. Heteroskedasticity robust t-statistics are in parentheses. Letters in the upper index refer to significance: \*\*\*: significance at 1 percent, \*\*: 5 percent, \*: 10 percent. T-values without an index mean that the coefficient is not significant even at the 10 percent level.

**Table 2**  
Estimation of equation (18) with the fixed effects model

	Dependent variable: rate of change in income gap between t and t+5						
	1.	2.	3	4.	5.	6.	7.
Constant	-0.021 (-1.85)*	-0.047 (-3.10)***	-0.140 (-4.67)***	-0.181 (-5.76)***	-0.184 (-5.87)***	-0.180 (-5.77)***	-0.182 (-5.82)***
$\ln(\text{gap})_{it}$	-0.047 (-7.15)***	-0.043 (-5.80)***	-0.049 (-5.39)***	-0.051 (-5.44)***	-0.065 (-7.06)***	-0.059 (-6.11)***	-0.053 (-4.94)***
$\ln(\text{investment rate})_{it}$	0.013 (3.14)***	0.013 (3.40)***	-0.000 (-0.02)	-0.010 (-1.22)	-0.010 (-1.14)	-0.010 (-1.14)	-0.010 (-1.24)
$\ln(n_t + g + \delta)_{it}$	-0.039 (-2.59)***	-0.022 (-1.62)	-0.020 (-1.69)*	-0.006 (-0.25)	-0.005 (-0.21)	-0.005 (-0.25)	-0.005 (-0.22)
$\ln(\text{human capital})_{it}$	0.116 (6.41)***	-0.012 (-0.35)	-0.011 (-0.24)	-0.034 (-0.66)	-0.012 (-0.23)	-0.026 (-0.50)	-0.024 (-0.49)
$\ln(\text{latitude}+90)_i$			0.050 (3.66)***				
$\ln(\text{economic freedom without the component of legal structure and security of property rights})_{it}$				0.052 (4.05)***	0.053 (4.15)***	0.052 (4.10)***	0.053 (4.03)***
$\ln(\text{civil liberties})_{it}$				-0.002 (-0.60)*	0.010 (1.63)		0.003 (0.66)
$(\ln(\text{gap})_{it}) \times \ln(\text{civil liberties})_{it}$					0.011 (2.79)***	0.006 (2.22)**	
gapdummy							0.010 (1.01)
$(\text{gapdummy}) \times \ln(\text{civil liberties})_{it}$							-0.013 (-1.63)
within R <sup>2</sup>	0.170	0.280	0.340	0.358	0.366	0.363	0.364
between R <sup>2</sup>	0.002	0.023	0.047	0.086	0.080	0.083	0.084
time dummies	No	Yes	Yes	Yes	Yes	Yes	Yes
number of observations	843	843	574	485	485	485	485
number of countries	106	106	96	95	95	95	95

Notes: Variables of investment rate, human capital, and that of the sum of the growth rate of the labour force (n), the assumed rate of long-run technological change, and the amortization rate are measured as relative values to those of the US. For example, in the case of the investment rate the variable is  $\ln(\text{investment rate})_{it} = \ln(i_{it}/i_{USAt})$ , where  $i_{it}$  is the share of investment in physical capital in country  $i$  in period  $t$ , while  $i_{USAt}$  is the same for the US.  $g + \delta$  is assumed to be 0.08. Standard errors are clustered. Gapdummy=1 if  $\ln(\text{gap})_{it} \leq -1$  and 0 otherwise. Heteroskedasticity robust t-statistics are in parentheses. Letters in the upper index refer to significance: \*\*\*: significance at 1 percent, \*\*: 5 percent, \*: 10 percent. T-values without an index mean that the coefficient is not significant even at the 10 percent level.

**Table 3**

Estimation of equation (18) with the random effects model and with the polity variable as an independent variable

	Dependent variable: rate of change in income gap between t and t+5			
	1.	2.	3	4.
Constant	-0.185 (-3.93)***	-0.204 (-4.25)***	-0.193 (-4.05)***	-0.200 (-4.02)***
ln(gap) <sub>it</sub>	-0.015 (-4.64)***	-0.022 (-4.55)***	-0.019 (-4.38)***	-0.015 (-3.99)***
ln(investment rate) <sub>it</sub>	0.005 (1.02)	0.003 (0.66)	0.003 (0.70)	0.004 (0.84)
ln(n <sub>t</sub> +g+δ) <sub>it</sub>	-0.008 (-0.52)	-0.009 (-0.60)	-0.006 (-0.42)	-0.008 (-0.54)
ln(human capital) <sub>it</sub>	0.039 (2.32)**	0.051 (2.84)***	0.041 (2.48)**	0.045 (2.52)**
ln(latitude+90) <sub>i</sub>	0.022 (2.83)***	0.026 (3.23)***	0.024 (2.99)***	0.025 (3.00)***
ln(economic freedom) <sub>it</sub>				
ln(economic freedom without the component of legal structure and security of property rights) <sub>it</sub>	0.054 (4.70)***	0.054 (4.90)***	0.053 (4.78)***	0.054 (4.81)***
ln(polity) <sub>it</sub>	-0.001 (-0.29)	0.007 (1.78)*		0.004 (1.05)
(ln(gap) <sub>it</sub> )× ×ln(polity2) <sub>it</sub>		0.006 (2.63)	0.003 (1.65)*	
(gapdummy) ×ln(polity2) <sub>it</sub>				-0.008 (-1.65)*
Gapdummy				0.008 (1.31)
within R <sup>2</sup>	0.298	0.305	0.308	0.302
between R <sup>2</sup>	0.208	0.229	0.204	0.203
time dummies	Yes	Yes	Yes	Yes
number of observations	482	482	482	482
number of countries	89	89	89	89

Notes: Variables of investment rate, human capital, and that of the sum of the growth rate of the labour force (n), the assumed rate of long-run technological change, and the amortization rate are measured as relative values to those of the US. For example, in the case of the investment rate the variable is  $\ln(\text{investment rate})_{it} = \ln(i_{it}/i_{USAt})$ , where  $i_{it}$  is the share of investment in physical capital in country  $i$  in period  $t$ , while  $i_{USAt}$  is the same for the US.  $g + \delta$  is assumed to be 0.08.  $\text{Gapdummy} = 1$  if  $\ln(\text{gap})_{it} \leq -1$  and 0 otherwise. Heteroskedasticity robust t-statistics are in parentheses. Letters in the upper index refer to significance: \*\*\*: significance at 1 percent, \*\*: 5 percent, \*: 10 percent. T-values without an index mean that the coefficient is not significant even at the 10 percent level.

**Table 4**

Estimation of equation (18) with the fixed effects model and with the polity variable as an independent variable

	Dependent variable:				
	rate of change in income gap between t and t+5				
	1.	2.	3	4.	5.
Constant	-0.159 (-6.08)***	-0.160 (-6.09)***	-0.160 (-6.09)***	-0.163 (-5.97)***	-0.160 (-6.09)***
ln(gap) <sub>it</sub>	-0.042 (-4.89)***	-0.044 (-5.20)***	-0.044 (-5.01)***	-0.042 (-4.77)***	-0.043 (-4.39)***
ln(investment rate) <sub>it</sub>	-0.014 (-1.75)*	-0.015 (-1.74)*	-0.015 (-1.75)*	-0.015 (-1.75)*	-0.015 (-1.76)*
ln(n <sub>i</sub> +g+δ) <sub>it</sub>	-0.015 (-0.84)	-0.015 (-0.80)	-0.015 (-0.80)	-0.015 (-0.86)	-0.014 (-0.81)
ln(human capital) <sub>it</sub>	-0.063 (-1.50)	-0.059 (-1.38)	-0.059 (-1.42)	-0.061 (-1.47)	-0.061 (-1.48)
ln(economic freedom) <sub>it</sub>					
ln(economic freedom without the component of legal structure and security of property rights) <sub>it</sub>	0.059 (4.71)***	0.059 (4.72)***	0.059 (4.75)***	0.060 (4.70)***	0.060 (4.69)***
ln(polity) <sub>it</sub>	-0.027 (-0.88)	-0.000 (-0.00)			-0.01 (-0.29)
(ln(gap) <sub>it</sub> )× ×ln(polity2) <sub>it</sub>		0.002 (0.71)	0.002 (1.08)		
(gapdummy) ×ln(polity2) <sub>it</sub>				0.001 (0.28)	-0.003 (-0.53)
Gapdummy					-0.001 (-0.12)
within R <sup>2</sup>	0.392	0.392	0.392	0.390	0.392
between R <sup>2</sup>	0.076	0.077	0.077	0.078	0.077
time dummies	Yes	Yes	Yes	Yes	Yes
number of observations	499	499	499	499	499
number of countries	92	92	92	92	92

Notes: Variables of investment rate, human capital, and that of the sum of the growth rate of the labour force (n), the assumed rate of long-run technological change, and the amortization rate are measured as relative values to those of the US. For example, in the case of the investment rate the variable is  $\ln(\text{investment rate})_{it} = \ln(i_{it}/i_{USAt})$ , where  $i_{it}$  is the share of investment in physical capital in country  $i$  in period  $t$ , while  $i_{USAt}$  is the same for the US.  $g + \delta$  is assumed to be 0.08. Standard errors are clustered. Gapdummy=1 if  $\ln(\text{gap})_{it} \leq -1$  and 0 otherwise. Heteroskedasticity robust t-statistics are in parentheses. Letters in the upper index refer to significance: \*\*\*: significance at 1 percent, \*\*: 5 percent, \*: 10 percent. T-values without an index mean that the coefficient is not significant even at the 10 percent level.

**Figure 1**

Marginal effect of a change of the log of the gap variable on the growth of the gap

$\left( \frac{\partial(\text{rate of change in the gap})_{it}}{\partial \ln(\ln(\text{income gap})_{it-1})} \right)$  and its confidence intervals at possible levels of the civil liberties score

