



# Endogenous growth and intellectual property rights: A north–south modeling proposal



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## ABSTRACT

In this paper, we develop a general equilibrium endogenous growth model that emphasizes the IPR enforcement effects on growth, in a scenario of north–south technological knowledge diffusion. The economy consists of three sectors, and firms are engaged in step-by-step innovation. In line with the literature, we introduce an IPR parameter that makes imitation more difficult. We find that, in steady state, the increases in IPR protection result in decreases in the growth rate. This result is in line with the literature, which argues that the enforcement of IPR does not always have a positive effect on economic growth. To sum up, we present some suggestions for future research which can help to clarify the relationship between IPR and endogenous growth.

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## 1. Introduction

There is a broad consensus in the literature regarding the understanding of innovation as vital for economic growth (e.g., Aghion and Howitt, 1992; Barro and Sala-i-Martin, 2004; Acemoglu and Akgicig, 2012). Moreover, Intellectual Property Rights (hereafter referred to as IPR) are recognized as relevant for understanding innovation and thus emerge as a crucial determinant for economic growth analysis (e.g., Gould and Gruben, 1996; Glass and Saggi, 2002; Sener, 2006; Dinopoulos and Segerstrom, 2010).

According to Falvey et al. (2009) and Chu et al. (2012), we would expect a positive impact of stronger IPR on economic growth. Indeed, increasing patent protection raises the R&D incentives and improves technological progress, which in turn decreases economic growth volatility, proving that a superior patent breadth leads to a higher expected growth rate. Additionally, it is common among empirical studies to find a net positive effect between IPR protection (measured by a system of patents, for instance) and innovation. In fact, the empirical evidence suggests a positive relationship between this kind of protection and innovation, despite certain characteristics of the sample, such as the type of countries in the study (for instance, the above result is significant mostly for low and high income countries but not for middle income countries), may bring some bias into the analyses (for a detailed analysis of such differences see Azevedo et al., 2012).

Within the literature on economic growth, important contributions to the field of IPR have been made in juxtaposition with international trade. Several questions have emerged, such as: what is the optimal enforcement of IPR in a North (South) open economy? What are the effects of introducing IPR into a north–south endogenous growth model? These questions are in line with our research aims for this paper, as will be made clear below.

Several papers have used a north–south endogenous growth set up to deal with the above mentioned questions, specifically in terms of what is the optimal enforcement of IPR protection. Sá et al. (2009), for example, discuss this topic in relation to a small and developing open economy, analyzing whether there should be no enforcement on the one hand or complete enforcement on the other. Their results point to the dominance of a positive relationship between IPR enforcement and welfare, albeit showing that, when departing from weak protection choices, some exceptions may be found. Wu (2010) observes that there is no consensus in the literature on the relationship between IPR protection and economic growth, since this relationship relies on the development level of the country, which imposes different necessities of innovation and imitation that affect the impact of IPR protection. Mondal and Gupta (2009) also propose an endogenous growth model that analyses the effects of IPR protection on economic growth, concluding that a strategy of strengthening IPR in the South may lead to welfare gains in both the North and the South (although the marginal welfare gain is higher in the former than in the latter), which leads to a rise in the Northern innovation rate and a decrease in both the Southern rate of imitation and the south–north wage in the new steady state equilibrium. Thus, this strategy has a positive effect on the steady state equilibrium growth rate in both countries.

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In this paper, we aim to understand the effect of introducing IPR protection into a north–south endogenous growth model and it is important to stress that our goal is to study this effect only within endogenous growth models. Therefore, we don't take in consideration the other kind of models. Despite the important contributions that have been emerging to this research framework, the analysis is still in its infancy. In order to assess this latest evidence, we conducted a simple bibliometric exercise to gain a more quantitative picture of the research patterns concerned with IPR in the specific framework of Endogenous Growth Models (EGM). This exercise is based on two datasets gathered from the bibliographical database SciVerse Scopus.<sup>2</sup> Our first dataset was obtained using the terms “Endogenous Growth Model” (EGM) as search words (in all fields and choosing article and review as document type), whereas the second dataset was gathered from a similar search using the terms “Intellectual Property Rights” and “Endogenous Growth Model” simultaneously (EGM + IPR). The first set encompasses 2004 articles, while the second only comprises 71 articles.<sup>3</sup>

Fig. 1 represents the temporal evolution of the number of published articles broadly about EGM and specifically about EGM + IPR. Articles on EGM (alone) have been appearing since 1991, whereas the first year in which we find published articles concerning both IPR and EGM is 1998. This comprehensive search, whose first recorded entry is in 1998, sustains the argument that the analysis of IPR in the context of endogenous growth models is a rather new research field. Furthermore, despite the visible and sustained increase in EGM related research from 1995, the number of publications relating to EGM + IPR has remained almost stable over the years in focus.

As Fig. 1 shows, the relative weight of EGM + IPR in total EGM is small, with a peak occurring in 2012. However, there is no clear evidence of growth in relation to this weight in the analyzed time period. Faced with the fact that this line of research has only recently been undertaken, we argue that there are still important caveats that have to be dealt with, and in our paper we intend to contribute to limiting their scope, our original aim and main motivation being to explain the IPR enforcement effects on growth, in the presence of north–south technological knowledge diffusion.

As starting points for our modeling proposal, we consider Connolly and Valderrama's (2005) and Afonso's (2012) studies, both using a similar endogenous growth framework, which propose analogous building blocks in their models and achieve interesting results.

Nevertheless, these two articles report distinct results. Connolly and Valderrama (2005) focus on welfare and growth within a dynamic argument, arguing in favor of free trade, particularly from the point of view of developing countries. Afonso (2012) also focuses on technological knowledge diffusion issues, but in relation to the dynamics of wage inequality.

Thus our framework is based on Connolly and Valderrama (2005) and Afonso (2012), but we also draw on some studies specifically oriented towards IPR within EGM, such as those of Mondal and Gupta (2009), Sá et al. (2009) and Wu (2010). As in the first two studies, we also consider a model consisting of two economies (North and South) and three productive sectors in each economy: final goods, intermediate goods and designs (R&D sector). However, in comparison with Afonso (2012), we drop the hypothesis of distinct types of labor, and we do not consider transportation costs separately as in Connolly and

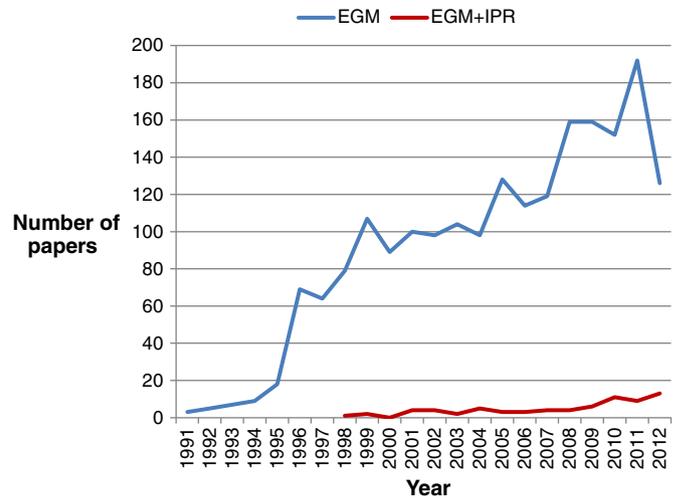


Fig. 1. Number of published papers by year.

Valderrama (2005). Moreover, we introduce a new parameter into the probability of imitation, in order to capture the effect of IPR protection, since it is an adequate procedure for showing that IPR enforcement aims at constraining imitation. Our main motivation is to contribute to overcoming the present gap in the literature on endogenous growth, given that most of the related literature, as it has been shown above with the bibliometric account, has treated IPR protection as a secondary issue or it has dealt with the relationship between IPR protection and other things, essentially between IPR protection and innovation (e.g., Helpman, 1993; Lai, 1998; Yang and Maskus, 2001; Akiyama and Furukawa, 2009).

Connolly and Valderrama (2005) make reference to IPR, but commence their analysis by assuming the absence of both domestic and international IPR enforcement. Afterwards, they introduce IPR, which force Southern imitators to pay a license fee to Northern innovators, and model them simultaneously as an increase in the imitative research fixed cost and a reduction in the fixed cost of innovative research. The authors show that the presence of IPR can positively affect both Northern and Southern welfare and argue that, in a world where growth is driven by technology and Southern research affects that developed in the North, Southern nations can benefit from some degree of IPR to foreign firms. Additionally, they state that the imposition of a low level of IPR leads to superior steady state growth rates compared with Southern trade liberalization alone. Moreover, they show that the gain associated with the increase in IPR is greater for both countries, as long as the South remains open to imports of Northern intermediate goods.

Afonso (2012) does not ignore IPR, but does not explicitly model them either. For instance, the author argues that the investment in a blueprint can only be claimed if profits are positive within a given period in the future and if this is guaranteed by both costly R&D and internal patents enforcement, that is, a national IPR system which protects the leader firm's monopoly of that quality good internally though not worldwide, while simultaneously spreading learned knowledge to other national firms in line with Connolly and Valderrama, (2005).

Connolly and Valderrama (2005) and Afonso (2012) introduce IPR enforcement, but deal with this issue in a simplified manner because their main purpose was not to discuss IPR. Hence, departing from modeling frames similar to these studies, we intend to focus our research on IPR. As mentioned above, we introduce a new parameter into the probability of imitation, which is treated by following the consensual position in the literature, that IPR protection makes imitation more difficult (e.g., Park and Lippoldt, 2005; Nair-Reichert and Duncan, 2008; Trommetter, 2010; Ivus, 2011). Nevertheless, it is important to stress that there is no agreement regarding the best way to introduce IPR into this type of model (see, for example, Mondal and Gupta, 2009; Sá et al., 2009; Wu, 2010).

<sup>2</sup> Scopus is the largest abstract and citation database of peer-reviewed literature and quality web sources, having been designed and developed for over 500 users and librarians internationally. This dataset includes the abstracts and references of 15,000 peer-reviewed journals from more than 4000 international publishers ([http://www.elsevier.com/wps/find/bibliographicdatabasedescription.cws\\_home/705152/description#description](http://www.elsevier.com/wps/find/bibliographicdatabasedescription.cws_home/705152/description#description), accessed on 22th October 2012).

<sup>3</sup> This search procedure is unrestricted and comprehensive in the sense that the engine searches in the whole text. Even so, it is important, bearing in mind that any bibliometric exercise bares a limitation concerning the impossibility of the chosen keyword being able to embrace the whole research in analysis (in our case, IPR and endogenous growth models related research).

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