Global dynamic timelines for IPRs harmonization against software piracy

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Abstract

This paper employs a recent methodological innovation on intellectual property rights (IPRs) harmonization to project global timelines for common policies against business software piracy. The findings on 99 countries are premised on 15 fundamental characteristics of software piracy based on income-levels (high-income, lower-middle-income, upper-middle-income and low-income), legal-origins (English common-law, French civil-law, German civil-law and, Scandinavian civil-law) and, regional proximity (South Asia, Europe & Central Asia, East Asia & the Pacific, Middle East & North Africa, Latin America & the Caribbean and, Sub-Saharan Africa). The results broadly show that a feasible horizon for the harmonization of blanket policies ranges from 4 to 10 years.

1. Introduction

According to the Business Software Alliance (BSA), the tide of decline in software piracy on personal computers (PCs) in many countries a few years ago has been stemmed and reversed by fast growing PC makers in some of the world's highest piracy nations which have caused the overall numbers to worsen (BSA, 2007). Accordingly, dollar losses from software piracy have risen by $8 billion to nearly $48 billion, and with the trend expected to soar exponentially, there has been renewed interest in measures of fighting software piracy (Andrés, 2006; Andrés & Goel, 2011; Andrés & Goel, 2012; Andrés & Asongu, 2013a; Asongu, 2012a). However, a recent trend has emerged on the feasibility of and timelines for common policies against the scourge (Andrés & Asongu, 2013b; Asongu, 2012b).

In light of the above, this paper provides a global picture on feasible timelines for intellectual property rights (henceforth, IPRs) harmonization against software piracy based on recent methodological innovations on the adoption of common policies. The empirical evidence is based on 99 countries, and the richness of the dataset provides us with the degrees of freedom necessary to disaggregate countries into fundamental characteristics of piracy based on income-levels, legal origins and regional proximity. The intuition motivating the study is that, upholding blanket IPRs policies in the battle against software piracy may not be effective unless they are contingent on the fundamental characteristics and prevailing trajectories, dynamics and tendencies of software piracy within identified fundamental characteristics. The theoretical and empirical underpinnings from the convergence literature are twofold: convergence in piracy rates within a fundamental characteristic will mean the adoption of common policies is feasible, and full convergence implies the enforcement of the common policies without distinction of nationality or locality within each fundamental characteristic (Asongu, 2012b).

The rest of the paper is organized as follows. Section 2 presents the data and outlines the empirical method. Section 3 discusses the estimation results, and Section 4 concludes.

2. Data and Methodology
2.1 Data

The data includes annual observations for ninety nine countries for the years 1994-2010. The limitations to 99 countries and the 17 year annual periodicity are due to constraints in software piracy data availability. In our paper, the measure of piracy employed is the percentage of software (primarily business software) in a country that is illegally installed (without a license) annually and is taken to capture the extent of software piracy. Piracy rates are obtained from the Business Software Alliance (BSA, 2011)[1]. Since it is unlikely to find convergence within a highly heterogeneous set of countries, fundamental characteristics are determined in terms of legal origins (Asongu, 2012ab; La Porta et al., 1998, 1999), income-levels (Husted, 2000; Marron & Steel, 2000; Kranenburg & Hogenbirk, 2005; Kim, 2004; Depken & Simmons, 2004; Moores & Esichaikul, 2011) and regional proximity (Narayan et al., 2011; BSA, 2011)[2]. The choice of the control variables is contingent on theoretical underpinnings of conditional convergence, which state that, if countries differ in macroeconomic and institutional characteristics on which software piracy is endogenous then, it is possible for conditional convergence to take place. Nine control variables are employed in two different specifications to control for macroeconomic and institutional determinants of

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[1] Among the many researchers that have used this data are Andrés (2006), Andrés and Goel (2011), Asongu (2013a,b), Andrés and Asongu (2013ab) and Marron and Steel (2000).
[2] Note should be taken of the fact that, government quality (transparency, corruption, regulation quality, etc …) and macroeconomic fundamental characteristics have the draw-back of being time-dynamic. Hence, cannot be used.

software piracy. These include: economic prosperity, research and development (R&D), internet penetration, population growth and IPRs laws (Constitution, Main intellectual property (IP) law, World Intellectual Property Organization (WIPO) treaties, Multilateral treaties and Bilateral treaties)[3]. Data for the explanatory variables were taken from the World Bank Development Indicators (WDI), and the Financial Development and Structure Database (FDSD). The summary statistics show that, there is quite a degree of variation in the data utilized so that one should be comfortable and confident that reasonable estimated relationships would emerge. Pearson's correlation coefficients were computed. These coefficients indicate that multicollinearity does not appear to be at hand here. [4]

2.2 Methodology

The estimation procedure typically follows evidence from recent convergence literature (Asongu, 2012b). The choice of the β-convergence strategy is due to constraints in the data set, which is a panel. The dynamic panel system GMM employed is as follows:

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (1)$$

$$\ln(Y_{i,t}) = \sigma \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (2)$$

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \sigma(\ln(Y_{i,t-\tau}) - \ln(Y_{i,t-2\tau})) + \delta(W_{i,t-\tau} - W_{i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \qquad (3)$$

where $Y_{i,t}$ is the proxy for the rate of piracy in a country i at period t. σ = 1+ β. $W_{i,t}$ is a vector of determinants of piracy (or control variables), η_i is a country-specific effect, ξ_t is a time-specific constant, and, $\varepsilon_{i,t}$ an error term. The first two equations above are the standard approaches in the literature for investigating conditional convergence if $W_{i,t}$ is taken as strictly exogenous (Fung, 2009, p. 3). The dynamic system GMM approach is based on the last two equations. Absolute convergence is estimated without $W_{i,t}$. In line with Islam (1995, p. 14), yearly time spans are too short to be appropriate for studying convergence as short-run disturbances may loom substantially in such brief time spans. Therefore, considering the data span of 17 years, we are consistent with Asongu (2012b) in using two-year non-overlapping intervals (NOI)[5]. This means in our analysis, τ is set to 2. We also compute the implied rate of convergence by calculating σ/2. Hence, the estimated coefficient of the lagged differenced endogenous variable is divided by 2 because we have used a two year interval to absorb the short-term disturbances. With $0 < |\sigma| < 1$, we conclude on the evidence of convergence. The broader interpretation suggests, past variations have less proportionate impact on future differences, implying the variation on the left hand side of Eq. (2) is decreasing overtime (Asongu, 2012b).

3. Empirical results

Table 1 presents the main findings that answer the three questions motivating paper. In other words, policy makers are most likely to ask the following three questions before

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[3] Please see Appendix 1 for definitions and sources of the variables.
[4] Owing space constraints, the summary statistics and correlation analysis have not been presented but can be provided upon request.
[5] We have 9 two-year non-overlapping intervals: 1994; 1995-1996; 1997-1998; 1999-2000; 2001-2002; 2003-2004; 2005-2006; 2007-2008; 2009-2010. Owing to data and periodical constraints, the first interval is short of one year.

considering the harmonization of IPRs policies on software piracy. (1) Is software piracy converging globally or not? (2) If this were so, what are the rate and timing of the convergence process? (3) For which relevant fundamental characteristics (of software piracy) do answers to the first and second questions apply? Whereas an answer to the first question will guide on the feasibility of harmonizing blanket policies, the answer to the second will guide on an optimal timeframe for such blanket policies. Ultimately, the answer to the third (given that the first-two are already answered), will determine the feasibility-of, timeframe-for and exclusiveness (or non-arbitrariness) of the common IPRs policies. This third question is most relevant because, it underlines the need for common policies to be contingent on the prevailing speeds of and time for full (100%) convergence within each identified fundamental characteristic of software piracy.

Concerning the first question raised, software piracy is not converging from a global perspective. This implies the answer to the second question is not applicable. The absence of convergence at the world level justifies the harmonization of policies based on fundamental characteristics of income-levels, legal origins and regional proximities. The findings based on these fundamental characteristics broadly show that a feasible horizon for the harmonization of blanket policies ranges from 4 to 10 years.

Table 1: Timelines for policy harmonization against software piracy

		Absolute Convergence (AC)			Conditional Convergence (CC)		
		AC	% of AC	Yrs to AC	CC	% of CC	Yrs to CC
Income Levels	High Income	Yes	35.00%	5.71 Yrs	Yes	28.00%	7.14 Yrs
	Upper Middle Income	Yes	38.50%	5.19 Yrs	Yes	38.50%	5.19 Yrs
	Lower Middle Income	Yes	40.00%	5.00 Yrs	Yes	19.25%	10.38 Yrs
	Low Income	No	---	---	No	---	---
Legal Origins	English Common Law	Yes	34.50%	5.79 Yrs	Yes	45.00%	4.44 Yrs
	French Civil Law	Yes	38.00%	5.26 Yrs	Yes	31.00%	6.45 Yrs
	German Civil Law	No	---	---	Yes	24.50%	8.16 Yrs
	Scandinavian Civil Law	No	---	---	No	---	---
Regions	South Asia	Yes	46.00%	4.34 Yrs	No	---	---
	Europe & Central Asia	No	---	---	Yes	34.50%	5.79Yrs
	East Asia & Pacific	Yes	39.00%	5.12 Yrs	Yes	24.00%	8.33Yrs
	Middle East & North Africa	Yes	38.00%	5.26 Yrs	Yes	38.50%	5.19Yrs
	Sub-Saharan Africa	Yes	42.50%	4.70 Yrs	Yes	37.00%	5.40Yrs
	Latin America & the Caribbean	Yes	37.50%	5.33 Yrs	Yes	43.50%	4.59Yrs
	World	No	---	---	No	---	---

Source: Own construction
Yrs: Years.

4. Conclusion

This paper has been a response to growing policy efforts toward IPRs harmonization against business software piracy. We have provided the basis for blanket policies against the scourge using 15 fundamental characteristics. The global dynamic timelines provided are based income-levels (high-income, lower-middle-income, upper-middle-income and low-income), legal-origins (English common-law, French civil-law, German civil-law and, Scandinavian civil-law) and regional proximity (South Asia, Europe & Central Asia, East Asia & the Pacific, Middle East & North Africa, Latin America & the Caribbean and, Sub-Saharan Africa). In the timeline to full convergence, countries within a given fundamental

characteristic can work toward feasible common policies and upon full convergence (100%), the adopted policies can be implemented without distinction of nationality or locality.

Appendix

Appendix 1: Variable Definitions, and sources

Variables		Variable Definitions (Measurement)	Sources
Piracy	Piracy	Logarithm of Piracy rate (annual %)	BSA
Growth per capita	GDP	Logarithm of real GDP per Capita, PPP (international constant dollars, 2005)	World Bank (WDI)
Research and Development	R & D	Research and Development Expenditure (% of GDP)	World Bank (WDI)
Internet Penetration	Internet	Logarithm of Internet Users per 1000	GMID
PC Users	PC	Logarithm of PC Users per capita	GMID
Population	Pop.	Logarithm of the total Population	World Bank (WDI)
Constitution	Const.	Dummy variable: Copyright is mentioned in the constitution	WIPO
Main_IP_law	MIPlaw	Main Intellectual Property Law	WIPO
IP_rlaw	IPrlaw	Intellectual Property Rights Law	WIPO
Wipo_treaties	WIIPO	World Intellectual Property Organization	WIPO
Mutilateral	Multi.	Multilateral Treaties	WIPO
Bilateral	Bilat.	Bilateral Treaties	WIPO

WDI: World Bank Development Indicators. FDSD: Financial Development and Structure Database. BSA: Business Software Alliance. GMID: Global Market Information Database. GDP: Gross Domestic Product. Log: Logarithm. WIPO: World Intellectual Property Organization.

References

Andrés, A. R., (2006). "The relationship between copyright software protection and piracy: Evidence from Europe", *European Journal of Law and Economics* **21**, 29–51.

Andrés, A. R., & Goel, R. K., (2011). "Corruption and software piracy: A comparative perspective", *Policy & Internet* **3(3)**, 1-24.

Andrés, A. R., & Goel, R. K., (2012). "Does software piracy affect economic growth? Evidence across countries", *Journal of Policy Modeling* **34**, 284-295.

Andrés, A. R., & Asongu, S. A., (2013a). "Fighting software piracy: which governance tools matter for Africa?", *Journal of Business Ethics*. http://link.springer.com/article/10.1007%2Fs10551-013-1620-7 (accessed: 15/01/2013).

Andrés, A. R., & Asongu, S. A., (2013b). "Global trajectories, dynamics and tendencies of software piracy: benchmarking IPRs harmonization" *Journal of Business Ethics*: *Forthcoming*.

Asongu, S. A., (2012a). "Fighting software piracy in Africa: How do legal origins and IPRs protection channels matter?" *Journal of the Knowledge Economy*: Forthcoming. http://link.springer.com/article/10.1007/s13132-012-0137-0 (accessed: 29/12/2012).

Asongu, S. A., (2012b). "Harmonizing IPRs on software piracy: Empirics of trajectories in Africa", *Journal of Business Ethics*: Forthcoming. http://link.springer.com/article/10.1007%2Fs10551-012-1552-7?LI=true#page-1 (accessed: 29/12/2012).

Business Software Alliance, (2007). 2006 Piracy study. BSA, New York.

Business Software Alliance, (2011). "Ninth Annual BSA Global Software 2011 Piracy Study" http://portal.bsa.org/globalpiracy2011 (accessed: 21/12/2012).

Depken, C. A., & Simmons, L., (2004). "Social construct and the propensity for software piracy", *Applied Economics Letters* **11**, 97-100.

Fung, M. K., (2009). "Financial development and economic growth: Convergence or divergence?", *Journal of International Money and Finance* **28**, 56-67.

Husted, B. W., (2000). "The impact of national culture on software piracy", *Journal of Business Ethics* **26**, 197-211.

Islam, N., (1995). "Growth empirics: A panel data approach", *The Quarterly Journal of Economics* **110**, 1127-1170.

Kim, L., (2004). "The multifaceted evolution of Korean technological capabilities and its implications for contemporary policy", *Oxford Development Studies* **32**(3), 341-63.

Kranenburg, H. L., & Hogenbirk, A.E., (2005). "Determinants of multimedia, entertainment, and business software copyright piracy: A cross-national study," *Journal of Media Economics* **18**, 109-129.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W., (1998). "Law and finance", *Journal of Political Economy* **106**, 1113-1155.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W., (1999), "The quality of government", *Journal of Law, Economics and Organization* **15**, 222-279.

Moores, T. T., & Esichaikul, V., (2011). "Socialization and software piracy: A study", *Journal of Computer Information Systems*, 1-9. (http://iacis.org/jcis/articles/Moores_Esichaikul_51_3.pdf) (accessed: 25/10/2012).

Marron, D. B., & Steel, D. G., (2000). "Which countries protect intellectual property? The case of software piracy", *Economic Inquiry* **38(2)**, 147-74.

Narayan, P. K., Mishra, S., & Narayan, S., (2011). "Do market capitalization and stocks traded converge? New global evidence", *Journal of Banking and Finance* **35**, 2771-2781.