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ARTICLE INFO	Nasser R. Al-Mawali (2011). Does the level of intellectual property rights have different effects on inter- and intra-industry trade?. *Investment Management and Financial Innovations*, *8*(4)
RELEASED ON	Friday, 20 January 2012
JOURNAL	"Investment Management and Financial Innovations"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES **0**

NUMBER OF FIGURES **0**

NUMBER OF TABLES **0**

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Does the level of intellectual property rights have different effects on inter- and intra-industry trade?

Abstract

This study provides an answer to an intuitive question concerning whether there are any differences in the effect of level of intellectual property rights (IPRs) protection on inter- versus intra-industry trade. Gravity equations of inter- and intra-industry trade are estimated in the context of a constant coefficient approach by means of Ordinary Least Squares (OLS) and a random effects approach by means of Generalized Least Squares (GLS). The principal finding suggests that the presence of IPRs protection is important for both inter- and intra-industry trade; however, it is more important for intra-industry than for inter-industry trade (total trade).

Keywords: total trade, intra-industry trade, intellectual property rights.
JEL Classification: C33, F10, O50.

Introduction

The issue of IPRs protection is of growing worldwide importance as economies move increasingly towards knowledge-based activities (Fink & Braga, 1999). Indeed, the attention paid by trade economists to IPRs issues has recently increased, especially after the inclusion of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) in the current system of the World Trade Organization (WTO). In particular, there is a number of studies that have analyzed the links between IPRs and economic welfare, economic growth, innovations, foreign direct investment, and technology transfer[1].

The existing IPRs literature has identified two key channels through which the status of the IPRs protection in a destination country affects the behavior of foreign firms when exporting to that country. The first of these is the "market expansion effect", and the second is the "market power effect". These effects explain how foreign exporting firms might react to a change of IPRs in an importing destination country. The market expansion effect is defined as a case in which strong foreign IPRs protection expands export markets by ensuring exclusive rights to sell the protected exports (Maskus & Penubarti, 1995). Alternatively, a foreign exporting firm may choose to react negatively to strong IPRs protection in a destination country by restricting the quantity of its exports and increasing the unit price. This is known as the "market power effect" (Maskus & Penubarti, 1995).

Since the market power and market expansion effects offset each other, no clear theoretical prediction can be made about the impacts on the direction of trade in a world of varying IPRs protection regimes. All that can be concluded from the existing theory is that the pattern of a country's exports across importing countries depends on the relative importance of these two effects (Smith, 1999, 2002; Rafiquzzaman, 2002). This indeterminacy in the effects of IPRs protection on trade flows exists across a wide range of studies such as the one by Plasmans and Tan (2004) on China, Yang and Huang (2009) on Taiwan, and Yong et al. (2009) on trade between China and ASEAN. Neither these nor other studies made differences between inter- and intra-industry trades.

To the best of my knowledge, no study to date has specifically attempted to investigate the affect of IPRs protection on intra-industry trade (IIT) compared with its effect on inter-industry or total trade (TT). It is to be expected that the relationship between IPRs protection and IIT flows will be quite different from that which exists when TT is conducted. The reason for such a difference is that IIT involves exchanging products within the same industry, whereas TT does not. Therefore, the existence of bilateral IIT between two trading partners implies that the trading partners have the same or similar industrial pattern and base. In this regard, intellectual piracy, unauthorized use of technology, and other IPRs-related issues become more important when the two trading partners merely conduct IIT.

In view of the fact that the existing trade literature on IPRs and trade has neglected the possible differences between the effect of IPRs protection on IIT and its effect on TT, this study aims to bridge this gap by providing an answer to the empirical question of whether the level of IPRs affects IIT differently. The empirical investigation is based on pooled South African data and takes advantage of the recent theoretical underpinning of the relationship between bilateral trade flows and IPRs. The study proceeds as

[1] For theoretical studies of IPRs and trade refer to Schwartz (1991), and Taylor (1993). For studies of IPRs and innovation, refer to Helpman (1993), and Taylor (1994). Literature on IPRs, innovation, and economic growth include studies by Romer (1990), and Mankiw et al. (1992).

follows. Section 1 presents data and methodology; section 2 reports the results and discussion; and the conclusion is presented in the final section.

1. Data and methodology

The analyses in this study utilize cross-sectional data from 50 countries for two years, 1995 and 2000[1], using gravity models of trade as in Choudhry et al. (2000), Subhash and Chua (2000), and Thornton and Goglio (2002). The dependent variable(s) is bilateral IIT flow (and TT flows) between country *i* (South Africa) and country *j* (South Africa's trading partner) at time *t* (i.e., year 1995 and 2000). The study measures IIT using the methodology of Kandogan (2003), which is based on Grubel and Lloyd (1975). Data for the dependent variables (IIT and TT) cover the South African trade data and are measured in US dollars at constant 1995 prices. The data were obtained from the UN International Trade Data.

The basic gravitational variables[2] that appear as independent variables in this study are economic size ($GDP_i \times GDP_j$), market size ($POP_i \times POP_j$) and geographical distance (Dis_{ij}). The first two variables are measured in US dollars at constant 1995 prices and are obtained from the World Bank, World Development Indicators (2003). Geographical distance data (Dis_{ij}) were obtained from Rose (2000). Other independent (control) variables are trade intensity (TI) and trade barriers (TB). The IIT and TT data were obtained from the UN International Trade Data. The TB variable is measured by the average tariff rate and was obtained from the Trade Analysis and Information System (TRAINS) database. The strength of IPRs protection in different countries was measured by the updated version of the Ginarte and Park (1997) index.

The econometric analysis of the pooled data by default commences with an estimation of the constant coefficient approach by means of pooled OLS. However, to control for the possibility of omitted variables without observing them, this study also employs estimation techniques of fixed effects and random effects. Because the test results of Breusch and Pagan (1980) and Hausman (1978) favor random effects, the latter is of use. The above discussion leads us to estimate the following two augmented gravity models of trade[3]:

$$\ln(IIT_{ijt}) = \beta_0 + \beta_1 \ln(GDP_{it} \times GDP_{jt}) + \beta_2 \ln(POP_{it} \times POP_{jt}) + \beta_3 \ln(Dis_{ij}) + \beta_4 \ln(TI_{ijt}) + \\ + \beta_5 \ln(TB_{jt}) + \beta_6 (IPRs_{jt}) + e_{ijt}, \quad (1)$$

$$\ln(TT_{ijt}) = \beta_0 + \beta_1 \ln(GDP_{it} \times GDP_{jt}) + \beta_2 \ln(POP_{it} \times POP_{jt}) + \beta_3 \ln(Dis_{ij}) + \beta_4 \ln(TI_{ijt}) + \\ + \beta_5 \ln(TB_{jt}) + \beta_6 (IPRs_{jt}) + e_{ijt}, \quad (2)$$

The first equation regresses IIT on three basic gravity variables, two control variables and an IPRs variable, whereas the second equation is a re-estimation of the first one taking TT as a dependent variable.

To ensure the robustness of the estimates, several diagnostic tests on the above models were performed, including tests for heteroskedasticity using the Breusch-Pagan and Cook-Weisberg tests; multicollinearity using the correlation matrix and variance inflation factor (VIF); normality using the skewness/kurtosis test and normality graphs; model specification using the link specification test; and omitted variables using the Ramsey RESET test. All results show that the chosen models of IIT and TT are well specified except for heteroskedasticity, which has been rectified by using robust standard errors[4].

2. Results and discussion

The overall performances of the basic gravity variables for dependent variables (IIT and TT) are quite satisfactory in terms of statistical significance and econometric interpretation. While geographical distance reduces both IIT and TT, a greater market size and higher standard of living expand them.

The main concern of this paper was to determine whether the level of IPRs affects IIT differently than it affects TT. This has been achieved by analyzing the IPRs variable in both equations. Table 1 presents the empirical results for equation (1) and equation (2).

[1] The choice of the years was based on the data viability of IPRs as measured by an updated version of the Ginarte and Park (1997) index.

[2] For the theoretical basis for the gravity model refer to: Anderson (1979); Bergstrand (1985, 1990); Deadorff (1984, 1998); Helpman and Krugman (1985); Evenett and Keller (1998, 2002); Anderson and Wincoop (2001); Harrigan (2001); Hansson and Xiang (2002); and Cheng and Wall (2004).

[3] The potential of an endogeneity between dependent variable(s) IIT (and TT) and the measure of IPRs protection may exist because IPRs laws and their enforcement are probably influenced by other factors such as economic development. However, to eliminate the possible endogeneity, this study has lagged the IPRs variable such that if the dependent variable is *y* (*t*), the IPRs variable is IPRs (*t*-5), where *t* refers to time.

[4] All test results are available from the author upon request.

Table 1. Estimation results

	Equation (1) Intra-industry trade (IIT)		Equation (2) Total trade (TT)	
	Default OLS estimation	GLS random effects estimation	Default OLS estimation	GLS random effects estimation
Constant	6.32 (3.98)*	0.753 (4.29)*	1.34 (2.11)*	3.23 (2.97)*
$GDP_{it} \times GDP_{it}$	3.24 (1.05)	4.13 (1.13)*	3.00 (1.00)	6.21 (2.45)*
$POP_{it} \times POP_{i}$	4.24 (0.43)	3.24 (1.96)*	5.24 (3.15)*	8.21 (2.52)*
Dis_{ij}	-5.78 (-3.86)*	-7.92 (-4.45)*	-3.76 (-0.01)	-5.76 (-2.99)*
TI_{ji}	7.24 (2.45)*	6.85 (4..86)*	2.94 (1.35)*	-5.86 (2.11)*
TB_{jt}	-.012 (-2.34)*	-.143 (-3.76)*	-.323 (-.1.99)*	-.456 (-2.26)*
$IPRs_{jt}$	9.34 (3.56)*	6.34 (2.45)*	.413 (2.87)*	2.12 (1.97)*
R-square	.87	.83	.90	.86

Notes: t-statistics for the OLS and the corresponding z-statistics for the random effects model are given in the parentheses. The asterisk (*) indicates that the given variable is statistically significant up to the 10% level of significance; otherwise, the variable is statistically insignificant. Estimation uses White's heteroskedasticity-consistent covariance matrix estimator.

The empirical results of the first equation reveal that in the case of IIT, the level of IPRs affects IIT positively and is statistically significant. This implies that a higher level of IPRs leads to a higher level of IIT. On the other hand, the result of the second equation reveals that the level of IPRs also affects TT positively and is also statistically significant. Similarly, this also indicates that a higher level of IPRs leads to a higher level of bilateral TT; however, the magnitude (coefficient) of the IPRs variable in the case of TT is relatively smaller than in the case of the former (IIT). This result supports the pre-expected notion that the level of IPRs affects IIT differently than it affects TT, and that the level of IPRs has a relatively stronger effect in the case of IIT. This might be explained by the fact that conducting IIT implies that the trading partners share a similar industrial base, and thus the presence of IPRs in a destination country is relatively more important. This result provides guideposts for policy makers in exporting countries, as an exporting country might need to demand a higher level of IPRs protection in a destination country when conducting IIT.

Conclusion

It was generally believed that the strengthening of IPRs carried positive effects on total trade (TT) flows. However, the results of this study challenge this notion based on the fact that the importance of IPRs does depend on the type of trade – inter- or intra-industry. The study presents an explicit econometric testing of the possibility of any differences between the effect of IPRs on IIT and on TT.

The principal finding is that the presence of IPRs protection is important for both TT and IIT. However, it is more important in the case of IIT. Furthermore, the results of the random effects estimation imply that the results obtained could be generalized beyond the employed dataset to a certain extent. Several econometric testings have been used to check the robustness of the results, and it was determined that the results are satisfactory in terms of theoretical setting and econometric specifications.

A key policy implication of the results of this study is that an exporting country should demand a tighter level of IPRs protection from the destination country when it conducts IIT than when it conducts TT.

Future research is needed to replicate this analysis on data for other countries, and on industry-specific data. This would help to verify whether the results of the present study are representative, and whether the results differ across different industries.

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