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Financial Development and Resource Curse: Panel Threshold Evidence

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ABSTRACT

This paper examines the relationship between natural resources and financial developmentusing non-dynamic panel threshold analysis. This paper contributes to the natural resource curse (NRC) literature in three main areas. First, we focus on the relationship between resource abundance and financial development which is rarely discussed in the NRC literature. Second, we suppose that the relationship between resource abundance and financial development may not necessarily monotonic. It is because many relationships between economic variables are not linear throughout time or space due to natural cycle of economics forces. Therefore it might be the case that at one level of natural resources, the effect to financial development is negative while at another level the effect might be positive. Third, development of social capital seems to be an important mechanism for nullifying the NRC paradox. Employing an endogenous non-dynamic panel threshold estimation technique, we find four important results; first, the relationship between natural resource and financial development is non-monotonic; second, human development contributes positively to the financial development; third, the existence of NRC hypothesis in the finance-resource nexus is depending on the level of human development. Low human development economies experience negative contribution of natural resources to financial development, while this relationship is not applicable for high human development economies.

INTRODUCTION

Natural resource-rich countries shall enjoy better economic growth and socio-economic welfare compared to those that are less fortunate. Natural resources that have been endowed to the countriesshould be a genuine source of fortune and happiness. Surprisingly, everyday experiences and empirical studies show the reverse (Frankel 2010). It seems that natural resource abundance is detrimental to economic growth. This puzzling phenomenon is known as the natural resource curse (NRC) hypothesis. In the past decades it has attracted voluminous research papers that try toempirically show the prevalence of the NRC and at the same time attempted to provide analytical explanations on why the NRCexisted in the resources abundance economies (Sachs and Warner 1995, Leite and Weidmann 1999, Gylfason 2001, Gylfason and Zoega2006).From literature, it is suggested that there are at least three theories explaining the NRC: Dutch disease models (Sachs and Warner, 1999), rent seeking phenomenon (Tornell and Lane, 2000), and institutional explanation (Sachs and Warner, 1995 and 2001).However, the empirical findings from these studies are still far from conclusive.

In this paper, we extend the debate on the NRC hypothesis by addressing threeimportant issues. First, we focus on the relationship between natural resource abundanceand financial development. Besides high number of literature discussing the issue of natural resource and economic growth, or financial development and growth, economists have not putmuch effort to study on the relationship between natural resources and financial development.Resource abundancecould directly jeopardise financial deepeningas well as economic growth through the crowding out effect i.e. the productive means of economic activities are mainly channelled in to the exploitation of resources and neglecting other sectors. Unfortunately, not many empirical literature analyses the intricacies of NRC paradox in the relationship between financial development and resource abundance (among the handful papers that discuss the issue are Yuxiang and Chen 2010, Nili and Rastad, 2007).

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Second, we extend further the investigation to the non-monotonicity relationship between resource dependence and financial development. Previous studies imposed an important priori restriction so that the relationship between financial development and resource abundance is set to be linear and monotonic (Brunnschweiler and Bulte 2008;and Bhattacharyya and Hodler 2010,among others). However we argue that the relationship between economic variables may not necessarily linear throughout time or space due to natural cycle of economics forces. We suppose that the development of financial sector varies depending on the natural resources. This phenomenon is commonly applicable to bending backward labour supply curve in transitory economy (Guha, 1989) and in economic growth-carbon emission analysis using the Environmental Kuznet Curve (Dinda 2004; and Narayan and Narayan 2010).At the same time, the intricacy relationship between financial development and natural resources raises another crucial question: how much resource to be exploited so that natural resources do have favourable effect on financial development and economic growth? At what level of resource exploitation to avoid the curse? This issue has never been addressed before and that is why this article tries to determine the level of resource that beneficial to financial development.

Third, this study attempts to provide an alternative solution to the NRC problem through social and human development channel.Empirical work by Gylfason and Zoega (2006) and Guisoet. al. (2004) reaffirmshighly importance of human capital in the process of empowering financial development. However the process of developing human capital could be deprived if a country has plenty of natural resources. It is because wealth and richness could divert away the attention towards excellence in education. In the long run this could end up with lack of institutional reform and weak human capital(Gylfason 2001). Therefore, we suppose that a country can have plenty of resources and at the same time experiencing good financial development if social capital is of the high quality. If this supposition is true, then policy makers should set certain threshold levelof human development that can sufficientlynullify the resource curse paradox.

The purpose of this paper is to examine the monotonicity relationship between natural resource and financial development with considering human development channel. This study is expected to expanding the natural resource curse literature by answering following specific questions. (1) Does NRC paradox existin the resource dependence and financial development nexus? (2) Does the relationship between natural resources and financial development is monotonic? (3) Does development of social capital really capable to nullify the bad spell of natural resources?

The remainder of the paper is organized as follows. In Section 2, we briefly discuss the theory and recent evidence of the NRC hypothesis and financial development. Section 3 describes the dataset used in the empirical analysis and the layout of the econometric procedures. Section 4 discusses the estimation results, and finally, Section 5 offers concluding remarks.

NATURAL RESOURCES, FINANCIAL DEVELOPMENT AND HUMAN CAPITAL

Economists generally agree that certain level of financial development is needed to spur economic growth(Rajan and Zingales,2003). Financial development functions as a mechanism that could accelerate efficient resource allocation and productivity. However countries which have abundance of natural resources always have a tendency to side-linedrelatively less important sectors including finance(Looney1991; Kutan&Wyzan2005).As productive economic activities are limited then it is presume that the development of financial sector which serve to facilitate an efficient allocation of resource between real and financial sectors will also be dampen. Things are getting worst if allocation of national budget expenses is distributed proportionately which further leads to inefficiency in financial sectors. In some resource dependence economies, although tax revenue or investment is relatively high, the effect of investment to growth is marginal (Atkinson and Hamilton 2003, Stevens and Dietsche2008). Nili and Rastad (2007) investigates this puzzling phenomenon and find that one of the root causes is due to less developed financial institution which leads to imbalance and unsustainable economic growth.

At the same time,natural resource-rich developing economy tend to exploit and export large volume of natural resources such oil, timber or valuable minerals (to name a few).This exposes the economy to instability as international resource pricesare subject to price volatility (Ploeg and Poelhekke, 2010) and could inflate value of local currency that eventually had serious repercussion to domestic economy in the form of spending effect irrespective of exchange rate regimes. For resource dependence economies with less developed financial system (which is very common) seldom able to counter-effect against exchange rate volatility or less competitiveness due to inability to relaxing financial constraints and reducing institutional risk (Larrain 2004).

Another important issue is that Leamer et al. (1999) argue that the complexities relationship between natural resources and financial development is subject to level of human capital inherent in the economy. Right skilled and highly competence labour forces are needed to accelerate evolutionary development paths of resource abundance economywhich usually start from labour-intensive extraction industries → capital-intensive extraction → resource-based manufacturing→ capital–intensive manufacturing. The view makes sense because at each stage, human capital is the one who fulfil all job requirements for the processes. Therefore, government's investment to educate labour force to acquire required skilled will pay off in the future. However not many studies delve in this very important issues with respect to natural resource curse hypothesis.

Glyfason (2001) among the handful economists who study on the above mentioned issue remarks that abundant of natural resources is not a root problem of resource curse. It is the institutional and socio-economic nature including human capital that nurturethe "Dutch disease", rent seeking and myopic problem about future development. Certain level of human capital development is required by which it could stave off the above mentioned diseases and at the same time could lower transaction costs, promote cooperation among different parties, developing good trust for nations and joint ventures in exploration of natural resources (Fukuyama, 2001;Gleason, Chun, &Mathur, 2002).

IMPERICAL MODEL

We are going to estimate the relationship between natural resources and financial development under the threshold effect using endogenous panel threshold developed by Hansen 1999 and 2000. Hansen (2000) is commonly used in cross-sectional estimation. However it can be extended to panel analysis provided that there is no problem of endogeneity.Unlike to the traditional approach, in which the threshold level is determined exogenously, the result from endogenous threshold estimation is more robust and free from inferential problem (Hansen 1999). Using balanced standard panel financial development model (Bhattacharyya and Hodler, 2010), the empirical linkages between financial development and natural resources use the followingequation:

$$FD_{it} = \begin{cases} \beta_0^1 + \beta_1^1 NR_{it} + \beta_2^1 HD_{it} + \beta_3^1 X_{it} + e_{it}, & NR_{it} \le \lambda \\ \beta_0^2 + \beta_1^2 NR_{it} + \beta_2^2 HD_{it} + \beta_3^2 X_{it} + e_{it}, & NR_{it} > \lambda \end{cases} \qquad (1)$$

where *FD*is the financial development, *NR* is the country's natural resource dependence, HD is human development, *X* is a vector of controls (political stability and economic growth), subscript *i* and *t* indexes the individual and time respectively and ε_{it} is the error with independent and identically distributed (iid) with mean zero and finite variance. Since we use logs, the effect of natural resources on financial development is expressed as elasticity.

To test the threshold hypothesis outlined in the previous section, we use NR (i.e., level of natural resource dependency) as the threshold variable to split the sample into regimes or groups, and $\lambda$is the unknown threshold parameter. In this equation, level of natural resource exploitation acts as sample-splitting (or threshold) variables. This type of modelling strategy allows the role of human development to differ depending on whether natural resources are below or above some unknown level of λ. The impact of natural resources on financial development will be β_1^1 and β_1^2 for countries with a low or high dependency regime, respectively. It is obvious that, under the hypothesis $\beta^1 = \beta^2$, the model becomes linear and no differences between the two.

The first step of our estimation is to test the null hypothesis of linearity $H_0 : \beta^1 = \beta^2$ against the threshold model in Equation (1). We follow Hansen (1996, 2000), who suggests a heteroskedasticity-consistent Lagrange Multiplier (LM) bootstrap procedure to test the null hypothesis of a linear formulation against a threshold regression alternative. Since the threshold parameter λ is not identified under the null hypothesis of the no-threshold effect, the *p* values are computed by a fixed bootstrap method. Hansen (2000) shows that this procedure yields asymptotically correct *p* values. It is important to note that, if the hypothesis of $\beta^1 = \beta^2$ is rejected and a threshold level is identified, we should test again the threshold regression model against a linear specification after dividing the original sample according to the threshold thus identified. This procedure is carried out until the null of $\beta^1 = \beta^2$ can no longer be rejected.

Even though natural resources may have a positive effect on financial development, the results may have been driven by resource-rich countries with high quality of human capital. In order to examine this possibility, Equation (1) is extended as follows to include an interaction term between human capital and natural resources (*HDxNR*).

If the coefficient of the interaction term between human development and natural resources is positive and statistically significant, this implies that the contingency positive financial development effect increases as human development improves. On the other hand, if the coefficient is negative and significant, this indicates that the contingency negative financial development effect increases as resource dependency economy improves.

THE DATA

This study employs balanced panel estimations fornon-overlapping of 3 years average from 1999 to 2009 36 middle income countries. We did not include high or low income countries to reduce heterogeneity and outliers problems. Following Cavalcanti, Mohaddesand Raissi(2011a, b) we use total natural resource rent and oil rent variables to measure resource abundance. Two financial development indicators are used to measure the overall financial development which widely used by previous researchers; (i) ratio of bank credit over bank deposit. It measures banking sector development. The higher the ratio indicates higher development of banking sector and expected that the economic development is less dependent on resources;(ii) ratio of stock market capitalization over GDP,which reveals the degree development in equity market. Countries with high market capitalization are expected to have more comprehensive economic based activities and less dependent on the natural resources.Government expenditure on education proxiesintensity of human capital which is commonly used in literature.Two control variables are realGDP per capita constant 2000 USD prices and political stability index ranges from -2.5 the most unstable to 2.5 the most stable. All dataset as in Table 1 are obtained from World Development Indicators published by World Bank except political stability which is from International Country Risk Guide (ICRG).

To have a more meaningful and robust analysis, we exclude potential outlier observations by computing *DFITS* statistics proposed by Belsley et al. (1980). Figure 1 depicts simple regression between financial development, economic growth and natural resource dependence. The result shows that natural resources have negative relationship with financial development and economic growth respectively while financial development shows a positive relationship with economic growth. These initial findings are consistent with literature for resource curse hypothesis (Sachs and Warner 1995) and growth-financial development nexus (Demetriades and Law 2006)

RESULTS

Table 2 depicts result from different estimation of Equation 1 depending on the dependent, independent and with or without interaction term. Model A refers to ratio of bank credit while Model B refers to market capitalization used as dependent variable. Number 1 or 2 in the middle refers to oil rent or total resource rent variables to proxy natural resourceindicator. Then, small capital in parentheses (a) or (b) representsan estimation of Equation 1 with interaction or without interaction between natural resources and human development (NAT x HD). The result reveals several interesting findings. First, all the *p*-values of the hypothesis of no threshold effect as computed by a bootstrap method with 1,000 replications and 15% trimming percentage are rejected at least at 5% significant level (Model A1(a): 0.017; Model A1(b): 0.000; Model A2(a):0.007; Model A2(b):0.001; Model B1(a):0.000; Model B1(b):0.001; Model B2(a):0.000 and B2(b):0.001). The finding strongly suggests that the relationship between financial development and natural resources is non-linear, and therefore the imposition of*a priori* monotonic restriction on the relationship also can be very misleading. The finding provides a better explanation for a relationship between natural resources and financial development whichare not uniform depending on the degree of natural resource dependency.

Second, the presence of threshold level also indicates that the analysis of financial development and natural resources can be split into two different groups depending on the*de-facto*level of natural resources abundance i.e. lownatural resource and highnatural resource economy. Any country that own natural resources less than the threshold value can be considered as low resource abundance, while the one with greater than the threshold value can be classified as a high resource abundance economy. Estimation of Equation 1 is contingent to low and high resource abundance. Third, the negative contribution of natural resource (either coefficient of the oil rent or total natural resource rent) to

financial development is consistent for low or highresource abundance economies. Although the magnitude slightly decreasing but both are persistently negative. The result is in line with the finding NRC literature such as Sachs and Warner (1995). The finding of this research is robust even if we replace credit ratio variable with market capitalization as a proxy for financial development. The result from Model B shows a similar relationship.

Next, the analysis shows that the human capital contributes to development of financial sector. The coefficients are consistently positive ranges from 0.005 to 0.126 for all models. Another interesting result is that the regression's result from the interaction term has provided new insight into the understanding of financial development-natural resources nexus. The negative effect of natural resource on financial development can be nullified as human development improving. For instance for model A1(b) >1.98, the negative effect of (-0.067) natural resource curse towards financial development is neutralised when human development reach 0.8815. The result is consistent for model B. This result is to show that human development is an important ingredient for financial development and could nullify the resource curse. These cross-section regression estimations are econometrically valid since no heteroskedasticity problem detectedin the models.

CONCLUSION

In this paper, we re-examine the well-known empirical puzzle of the resource curse hypothesis using a non-dynamic panel threshold regression with reference to financial development nexus. In particular, we endogenously determine the threshold level for low-resource abundance and high-resource abundance economy. Using the estimated threshold point, we empirically analysed the different effects of natural resources on financial development.

There are several major findings in this paper. First, *a priori* monotonic restriction on the study of NRC-financial development could lead to a premature conclusion. In this study, we consistently fail to reject the presence of the threshold effect in the estimation regardlessof models. Second, the study highlights the different effect of natural resources on financial development depending on the resource abundance. Third, resource curse hypothesis seems to be prevalence although at different degree of intensity for both low and high resource abundance economies. Finally, no doubt that human development plays an important role in promoting financial development and nation that endowed with natural resources and at the same time desires to have full benefit from financial development should not neglect the importance of human development. Expenditure on human development is definitely will fruitful in the near future.

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TABLE 1: Descriptive statistics of the dataset

	Market capitalization to GDP (Fdm)	Bank Credit to Bank Deposit (Fdb)	Total Resource Rent to GDP (Ntr)	Oil Rent to GDP (Nor)	Government Spending on Education to GDP (Edu)	Political Stability (pol)	GDP per Capita Constant 2000 (gdp)
Mean	2.91	4.41	5.31	3.74	15.90	-0.12	7.90
Standard Deviation	1.36	0.34	8.26	6.31	4.979	0.82	0.99
Minimum	-1.20	3.093	0.005	0.003	7.57	-2.208	5.363
Maximum	5.68	5.165	45.13	34.22	29.51	1.362	10.382
Obs	N=36 T =4	N = 36 T = 4	N = 36 T = 4	N = 36 T = 4	N = 36 T = 4	N = 36 T = 4	N = 36 T = 4

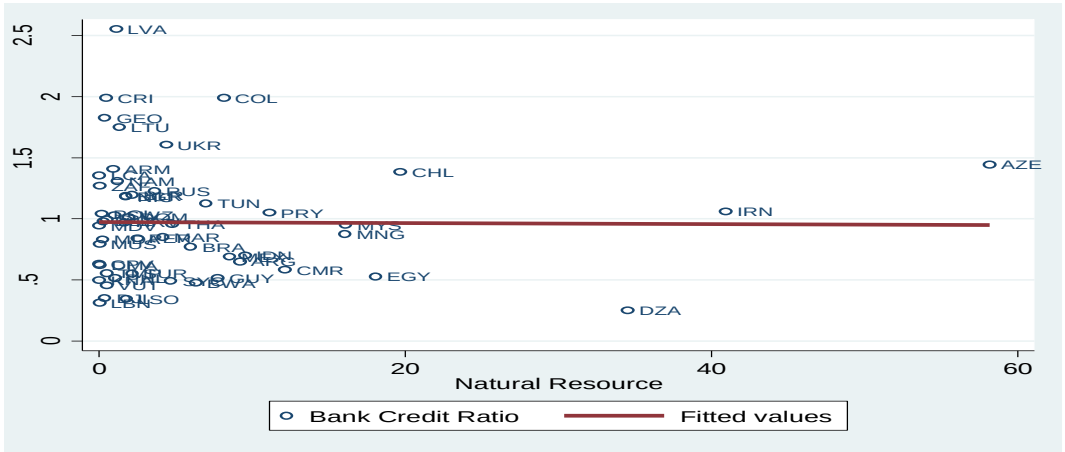
TABLE 2: Panel threshold estimates for Equation 1

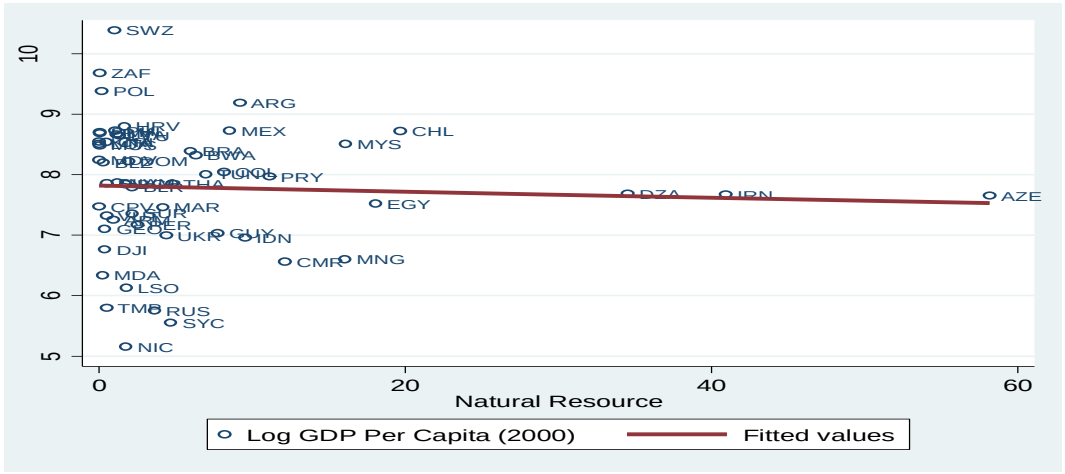
	Dependent: Ratio of Bank Credit to Bank Deposit					
	Model A1(a)			Model A1(b)		
	Linear	≤9.82	> 9.82	Linear	≤1.98	> 1.98
Constant	3.739 (0.36)	**3.850** (0.308)	**-3.172** (1.317)	4.008 (0.190)	**3.984** (0.225)	**4.199** (0.199)
NAT (***oil rent***)	-0.008 (0.004)	**-0.044** (0.010)	**0.014** (0.005)	-0.073 (0.009)	**-0.886** (0.079)	**-0.067** (0.009)
EDU	0.008 (0.007)	**0.005** (0.007)	**0.0072** (0.018)	0.010 (0.004)	-0.002 (0.005)	**0.065** (0.005)
POL	-0.051 (0.060)	**-0.112** (0.057)	**0.170** (0.169)	-0.054 (0.031)	**-0.172** (0.038)	**-0.051** (0.004)
GDP	0.082 (0.039)	**0.084** (0.034)	**0.821** (0.150)	0.038 (0.021)	**0.076** (0.024)	**0.010** (0.022)
INS ***(NATxEDU)***	-	-	-	0.078 (0.010)	**0.908** (0.079)	**0.076** (0.009)
Boot (p-value)	**0.017**			**0.000**		
R-sq	0.133	0.146	0.649	0.515	0.773	0.710
Het(p-value)	0.007	0.088	0.088	0.384	0.013	0.013
No. Obs	104	88	16	144	71	73
	Model A2(a)			Model A2(b)		
	Linear	≤16.06	> 16.06	Linear	≤1.975	> 1.975
Constant	3.503 (0.295)	**3.919** (0.256)	**-2.434** (0.347)	4.00 (0.190)	**3.984** (0.225)	**4.199** (0.199)
NAT (***Total Resource Rent)***	-0.009 (0.004)	**-0.030** (0.008)	**0.009** (0.006)	-0.072 (0.009)	**-0.886** (0.079)	**-0.066** (0.008)
EDU	0.023 (0.006)	**0.019** (0.006)	**0.027** (0.013)	0.010 (0.004)	-0.0019 (0.0047)	**0.006** (0.004)
POL	-0.042 (0.049)	**0.035** (0.044)	**-0.135** (0.084)	-0.054 (0.031)	**-0.172** (0.035)	**-0.05** (0.037)
GDP	0.078 (0.032)	**0.039** (0.027)	**0.767** (0.050)	0.038 (0.021)	**0.076** (0.024)	**0.010** (0.022)
INS ***(NATxEDU)***	-	-	-	0.077 (0.010)	**0.908** (0.078)	**0.075** (0.009)
Boot (p-value)	**0.007**			**0.001**		
R-sq	0.152	0.191	0.900	0.515	0.773	0.71
Het(p-value)	0.791	0.584	0.584	0.384	0.12	0.12
No. Obs	144	129	15	144	71	73

Continue TABLE 2: Panel threshold estimates for Equation 1

Dependent: Market Capitalization						
	Model B1(a)			**Model B1(b)**		
	Linear	≤1.599	> 1.599	Linear	≤1.020	> 1.020
Constant	-5.159 (1.026)	**-6.538** (0.899)	**0.727** (1.772)	-5.187 (0.941)	**-7.672** (0.759)	-3.822 (2.19)
NAT ***(Oil Rent)***	-0.017 (0.013)	**-1.109** (0.258)	**-0.0274** (0.012)	0.016 (0.015)	0.481 (0.852)	-0.125 (0.038)
EDU	0.048 (0.018)	**0.084** (0.015)	**0.024** (0.035)	0.060 (0.017)	**0.094** (0.014)	-0.029 (0.041)
POL	-0.183 (0.146)	**-0.303** (0.158)	**0.112** (0.202)	-0.249 (0.133)	-0.438 (0.183)	0.104 (2.508)
GDP	0967 (0.111)	**1.120** (0.096)	**0.322** (0.189)	0.967 (0.098)	**1.203** (0.094)	**-0.408** (0.220)
INS ***(NATxEDU)***	-	-	-	-0.136 (0.038)	**0.216** (0.121)	**1.193** (0.368)
Boot (p-value)	**0.000**			**0.001**		
R-sq	0.408	0.695	0.196	0.454	0.816	0.306
Het(p-value)	0.455	0.043	0.043	0.047	0.142	0.142
No. Obs	92	53	39	92	45	47
	Model B2(a)			**Model B2(b)**		
	Linear	≤0.997	> 0.997	Linear	≤0.997	> 0.997
Constant	-2.541 (1.286)	**-4.785** (2.194)	-1.075 (1.499)	-2.642 (1.312)	**-4.771** (2.157)	**-1.876** (1.630)
NAT ***(Total Resource Rent)***	0.0019 (0.011)	**-2.237** (0.494)	**-0.013** (0.009)	0.0002 (0.014)	**-1.967** (0.996)	**-0.039** (0.019)
EDU	0.058 (0.020)	0.121 (0.378)	-0.028 (0.022)	0.058 (0.021)	**0.126** (0.044)	0.058 (0.029)
POL	-0.452 (0.133)	**-0.696** (0.276)	**-0.267** (0.159)	0.058 (0.021)	**-0.670** (0.265)	**-0.248** (0.182)
GDP	0.564 (0.139)	**0.795** (0.213)	**0.494** (0.169)	0.575 (0.142)	**0.777** (0.203)	**0.519** (0.178)
INS ***(NATxEDU)***	-	-	-	0.005 (0.062)	-0.065 (0.199)	**0.269** (0.235)
Boot (p-value)	**0.001**			**0.000**		
R-sq	0.139	0.394	0.129	0.141	0.396	0.147
Het(p-value)	0.173	0.159	0.159	0.231	0.159	0.159
No. Obs	144	55	89	144	55	89

Model A uses bank credit ratio as dependent variable while **Model B** refers to market capitalization ratio as dependent variable. The standard errors are reported in parentheses (White corrected for heteroskedasticity). Results correspond to trimming percentage of 15% and value in bold indicates significance at 5%.





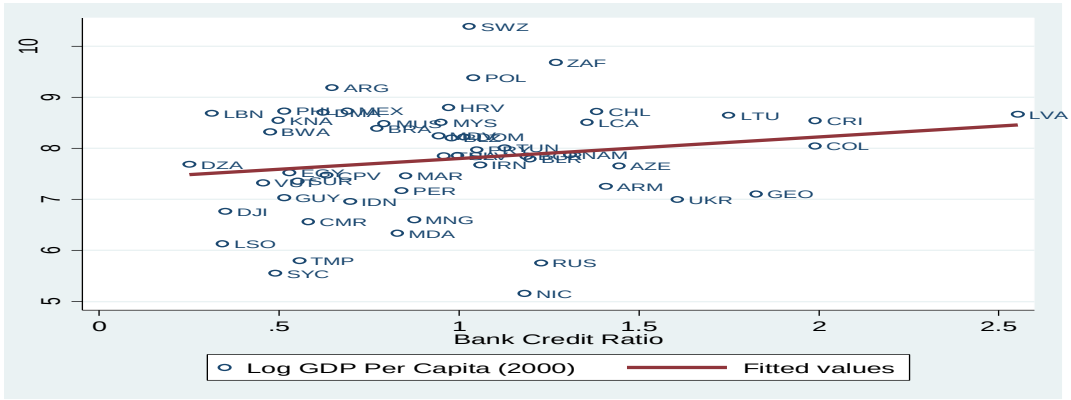


FIGURE 1: Relationship between natural resources dependence, financial development and economic Growth.