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Sincerely,
EJE, Team

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Endogenous Growth And Country Heterogeneity In Economic Growth: Evidence From Selected OECD Countries

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Abstract

Investment in human capital, innovation, and knowledge are significant contributors to economic growth. Theories of economic growth indicate that saving and investment are the main forces of economic growth. Nevertheless, empirical results are not unanimously consistent with theory. In addition, economic growth varies from country to country. Neglected country heterogeneity in cross-country empirical analysis can be spurious. Making empirical contribution, this paper attempts to address the abovementioned problems by empirically testing determinants of economic growth utilizing data from OECD countries. For comparison purposes, selected OECD countries are divided into two groups: richest economies and relatively less rich economies. Results of empirical estimation indicate that lagged investment and lagged saving play a negative role in economic growth. For both richest economies and relatively less rich economies, country heterogeneity influences economic growth.

Keywords: Economic Growth, Endogenous Growth, Country Heterogeneity

Introduction

A great deal of research pertains to the fundamental forces that drive economic growth over time. Despite the fact that economic growth is crucial to reduce world poverty, it is not a panacea for achieving sustainable and shared development process. This paper empirically tests determinants of economic growth utilizing data from OECD countries. For comparison purposes, selected OECD countries are divided into two groups: richest economies (Group 1) and relatively less rich economies (Group 2). Following Bhattarai (2004), this paper assesses the importance of investment and saving, trade openness, shares of government spending and tax revenue in GDP, and growth rate of population in economic growth.

Main growth theories emphasize the importance of factor accumulation and technological progress in the process underlying economic performance. Empirical estimation finds somewhat surprising results. For richest OECD countries, lagged investment, lagged saving, and government consumption are found to be significantly and negatively related to growth, while openness to trade is found to be significantly and positively related to growth. For relatively less rich countries, lagged investment, government consumption and population growth are all found to be significantly and negatively related to growth. For both groups, country heterogeneity influences economic growth.

The remaining part of this paper is organized as follows. Section 2 reviews related literature. Section 3 explains the economic rationale of potential explanatory variables. Section 4 describes the data. Section 5 introduces the econometric model and justifies econometric techniques. Section 6 interprets the results. Section 7 concludes.

Related Literature

This section focuses on empirical literature on growth related to advanced economies and, more specifically, on cross-country empirical

works rather than growth accounting approaches[1].

A large amount of previous research emphasizes the importance of factor accumulation and technological change in the process underlying economic growth. Only a partial selection of literature is mentioned here. Mankiw *et al.* (1992) uses cross-country regressions on a sample consisting of 98 countries and supports the view that investments in physical and human capital are the driving forces of economic growth. This finding has been confirmed by subsequent research, for example Arnold *et al.* (2007). The rate of gross secondary school enrollment is widely used in previous literature as a proxy of human capital. Temple (1999) argues that focus on schooling rather than training is mainly due to data limitations. Easterly and Levine (2001) points out that the relation between human capital and economic development is still subject to debate. Besides, the economically and statistically significant positive relation between investment and growth has been challenged, since there is a potential endogeneity of investment to growth.

Moreover, it is widely acknowledged that research efforts are of the greatest importance for advanced economies, since R&D plays a substantial role in the production of knowledge and the process of technological change. However, Jones (1995) challenges the validity of research-driven growth models on the basis that accelerating R&D has not induced any persistent upwards trend in the economic growth rates of OECD countries.

The new growth theory emphasizes that appropriate public policies (related to education policy, fiscal and regulatory regimes, and financial systems) can exert a considerable influence on long-run economic growth by creating an environment more favorable to physical and human capital

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[1] Growth accounting aims at investigating how much growth can be attributed to the accumulation of factors and the unexplained component (Solow residual). Growth accounting has a long tradition in the literature of economic growth. For instance, Solow (1957) finds that technological change accounts for seven eighths of the total increase in the output per capita over the period of 1909-1949 in United States.

accumulation and to R&D efforts. Also, stability-oriented macroeconomic policy (associated with a low inflation rate, improved public finances, and an undistorted exchange rate) fosters stronger growth by creating a more conducive environment for private investment (Fisher, 1993; Bleaney, 1996; Temple and Sirimaneetham, 2006). Nevertheless, the direction of causality between growth and sound macroeconomic outcomes can be dubious.

Empirical studies (Edwards, 1998; Dollar and Kray, 2002) find that outward-oriented economies exhibit faster growth rates over long periods of time. Nonetheless, some research, in line with Rodriguez and Rodrik (1999), challenges the findings of such a strong and positive link between openness and growth. Foreign Direct Investment (FDI) has also been advocated as a source of growth when the host country is endowed with a sufficient human capital stock to absorb technology transfers (Borensztein *et al.,* 1998). Again, the direction of causality between FDI and growth is uncertain (poorer economies tend to attract less FDI).

On the basis of multivariate regressions of 21 OECD countries over the period of 1971-1998, Bassanini *et al.* (2001) confirms that policy variables related to macroeconomic conditions, trade openness and financial markets structure, physical and human capital accumulation, and R&D, influence economic growth.

Economic Rationale

Levine and Renelt (1992) asserts that no consensus on the theoretical framework underlies empirical works on growth. Similarly, Sala-i-Martin (1997) argues that growth theories are "not explicit enough" about what variables should be included as explanatory variables in empirical estimation. According to previous literature, a country's economic growth rate tends to be linked to a variety of economic, political, and social variables. The decision over which specific variable to use is mainly driven by empirical results from previous literature. This paper follows the theoretical rationale of potential explanatory variables in Bhattarai (2004) and discusses related issues.

Physical investment rate. While the Solow Model indicates that physical capital accumulation affects growth only in the transitional period to the steady state, endogenous growth models argue for more persistent effects. Lucas (1988) claims that the main force behind long-run economic growth lies in the process of learning-by-doing, *i.e.*, workers improve their productivity as they spend longer hours doing their job. Hence, the accumulation of capital generates positive externality which offsets the diminishing returns underlined by the Solow Model. Alternatively, Barro (1990) proposes a model of public spending and growth, according to which returns to private investment may increase due to positive externality of public spending on infrastructure, which can be seen as free inputs for firms. Despite the theory that there exists a robust and positive link between physical capital accumulation and economic growth, empirical estimation requires further consideration, as the investment rate does not capture any information concerning the quality of investment. Furthermore, there is a potential endogenous growth of investment. Therefore, this paper utilizes lagged investment in the empirical estimation.

Saving rate. Higher saving rates translate into more capital accumulation, and therefore faster growth rates. The saving rate reflects, among other things, preferences and incentives to accumulate capital. It is substantially influenced by the age dependency ratio, the nature of the retirement system, and economic policy. Since there is also a potential endogenous growth of saving, lagged saving is used.

Openness to trade. There are strong theoretical reasons to expect a positive and robust correlation between the share of trade in GDP and growth. Trade openness allows the exploitation of comparative advantage and increasing returns to scale, technology transfers, diffusion of knowledge, as well as exposure to competition, which ultimately promotes economic growth.

Government consumption / GDP and Tax revenue / GDP. These variables are used as a proxy for the "government burden". Public spending can play a beneficial role for the economy (Barro, 1990; Bleaney *et al.*,

2001). However, an excessive public sector, financed by high tax rates, may constitute a "heavy burden" by promoting and maintaining ineffective public programs, distorting market incentives and hindering private activity (Loayza and De Soto, 2002). We must acknowledge that tax revenue provides information related to average taxes in the economy only, while Ahn and Hemmings (2001) argues that incentives created by fiscal systems are more likely to be reflected by marginal taxes than average taxes. However, we must rely on the latter due to data limitations. Also, including the tax revenue to GDP ratio in our growth regression may not be relevant and may introduce an unnecessary element of multicollinearity, since tax revenues are more likely to affect government consumption than growth.

Population growth rate. Since the Malthus Growth Model, most theoretical works assessing the demographic-economic growth relation have emphasized that excessive population would retard growth due to excessive resources consumption. However, the composition of the population matters for growth. The neoclassical growth theory predicts that labor force growth is conducive to economic growth. On the other hand, a population growth rate driven by aging populations is deemed to be a hindrance to economic growth.

Data

The data are gathered from World Bank and OECD, spanning from 1972 to 2004 across 19 countries. All countries in the data set (Luxembourg, United States, Norway, Ireland, Switzerland, Denmark, the Netherlands, Australia, Austria, Finland, Sweden, Canada, United Kingdom, Belgium, France, Japan, Germany, Italy, and Spain) are classified as the most advanced economies in the world.

Due to data limitations, Iceland is eliminated from the sample (data on tax revenue as a share of GDP are not available) and the analysis of the determinants of growth of the selected OECD countries is restrained to the 1972-2004 period.

The dependent variable is the growth rate of real GDP per capita

(GROWTH). It is calculated by dividing nominal GDP with total population. Then, real GDP per capita, y, is given by dividing GDP per capita with GDP deflator. Finally, we takes the first difference of log-level of real GDP per capita and obtain GROWTH, *i.e.*, $\ln y_t - \ln y_{t-1} = \text{GROWTH}$.

The set of explanatory variables is as follows.

Investment rate (I) is the share of gross fixed capital formation in GDP and excludes inventories.

Saving rate (S) is the share of gross domestic savings in GDP. Gross domestic savings are calculated as GDP less total consumption.

Openness to trade (OPEN) is measured by the sum of imports and exports as a share of GDP.

Ratio of government consumption to GDP (G) is given by general government final consumption expenditure as a share of GDP. It includes all government current expenditures for purchases of goods and services (including compensation of employees) and also includes most spending on national defence and security.

Ratio of tax revenue to GDP (TAX) is a measure of compulsory transfers to the central government for public purposes as a share of GDP.

Population growth rate (POP) measures the annual change in total population.

The summary descriptive statistics of the variables are presented in Table 1.

Table 1 Summary Descriptive Statistics

Variables	Mean		Std. Dev.		Min (Country)		Max (Country)	
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
GROWTH	0.023	0.021	0.023	0.02	0.008 CHE	0.017 SWE	0.041 IRL	0.024 FIN
I	0.224	0.221	0.037	0.04	0.188 USA	0.181 GBR	0.256 CHE	0.294 JAP
S	0.262	0.234	0.066	0.042	0.176 USA	0.175 GBR	0.362 LUX	0.313 JAP
OPEN	0.859	0.568	0.529	0.293	0.201 USA	0.218 JAP	2.002 LUX	1.316 BEL
G	0.184	0.201	0.042	0.038	0.109	0.147	0.254	0.273

					CHE	JAP	DNK	SWE
TAX	0.363	0.372	0.075	0.078	0.267	0.259	0.465	0.488
					USA	JAP	DNK	SWE
POP	0.007	0.004	0.005	0.004	0.003	0.002	0.013	0.012
					DNK	DEU	AUS	CAN

On average, the real GDP per capita tends to have grown at a faster rate in the richest OECD countries: 2.3% versus 2.1% in the remaining countries. Investment rates are similar in both groups, while the most advanced economies exhibit slightly higher saving rates over the period 1973-2004. Descriptive statistics show a clear difference between the two sub-samples regarding their openness to international trade. The richest economies are also the most outward-oriented. Standard deviations, however, tend to indicate a certain level of heterogeneity of openness within groups. The size of the public sector appears, to some extent, larger in the relatively less rich OECD economies. Lastly, both groups record low population growth rates. On average, population growth rates do not exceed 1%.

Econometric Model

For comparison purposes, selected OECD countries are divided into two groups   (j = 1, 2): Group 1 includes the top 10 economies (excluding Iceland), and Group 2 consists of the remaining ten economies. Each sub-sample involves data on n_j countries observed over 32 periods[2], i.e., $n_j \times 32$ observations.

We begin the empirical analysis by performing a series of preliminary tests. A pooled OLS regression is first estimated to allow comparisons across both cross-section and time dimensions. The paper hypothesizes the following linear equation:

$$\text{GROWTH}_{it} = \alpha + \beta_1 X_{1it} + \cdots + \beta_6 X_{6it} + \varepsilon_{it}, \qquad (1)$$

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[2] The initial panel data spanned the period of 1972-2004. Since I and S are lagged once, one year is missing, making the time span 31 years.

where GROWTH is the dependent variable; the Xs are the explanatory variables; α is a single intercept for the entire model. The subscripts i and t represent country and year, respectively. Also, we assume that $\varepsilon_{it} \sim iid(0, \sigma_\varepsilon^2)$ for all i and t.

However, it is plausible that unobserved heterogeneity of countries affects the effect on growth of a change in our regressors. Since the pooled OLS estimators may be biased due to country fixed effects, we subsequently run a second regression:

$$\text{GROWTH}_{it} = \alpha + \beta_1 X_{1it} + \cdots + \beta_6 X_{6it} + \gamma_1 D_{1it} + \cdots + \gamma_{n_j-1} D_{n_j-1it} + + \varepsilon_{it}, \qquad (2)$$

where the Ds are country dummies. Since the regression includes a constant term, only (n_j-1) dummies are included[3]. The $\hat\gamma$s measure the individual change from the intercept. OLS is used to estimate the model. If the joint significance test of dummies coefficients reveals that at least some of them are statistically significant, pooled OLS estimators obtained from (1) are biased (due to omitting fixed effects dummies).

In that case, unobserved heterogeneity in the model specification must be controlled. Accordingly, the disturbance term must be decomposed as follows:

$$\varepsilon_{it} = \alpha_i + u_{it}. \qquad (3)$$

It is assumed that there is no time effect. α_i is an unobserved country-specific effect that may (fixed effects model[4]) or may not (random effects model) be correlated with explanatory variables. Also, we assume that u_{it} is uncorrelated with X_{it}. Accordingly, the following linear growth regression is estimated:

$$\text{GROWTH}_{it} = \alpha + \beta_1 X_{1it} + \cdots + \beta_6 X_{6it} + \alpha_i + u_{it}. \qquad (4)$$

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[3] Luxembourg is the reference country of Group 1, and Finland is the reference country of Group 2.

[4] Equation (2) performs "least squares dummy variables" estimation, which are similar to fixed effects estimation. Only the intercept changes.

Both fixed effects model (FE) and random effects (RE) model assume that country specific-effects are constant across time. However, α_i can be regarded either as a "fixed effect" when it is treated as a parameter to be estimated for each country i, or as a "random effect" when it is treated as a random variable (Wooldridge, 2002). The OLS framework can be applied to the FE approach, whereas the RE approach requires the GLS framework. Hausman specification test is carried out to check whether the RE or FE model should be used.

Since the time span of the data is quite long (32 years), serially correlated disturbances are realistically expected, in which case the usual FE standard errors are very misleading (Wooldridge, 2002). Estimation method that computes standard errors robust to serial correlation is required. Also, since the data span countries of different sizes, heteroskedastic disturbances are also expected. Coefficient estimates are still unbiased, but standard errors tend to be underestimated. As a result, the probability of type I error increases. We address this issue by estimating a feasible GLS specification assuming the presence of cross-section heteroskedasticity in the error term (*i.e.*, different disturbance variances for the different countries). Diagnostic tests for serial correlation and heteroskedasticity find that serial correlation and heteroskedasticity both exist. As a result, for comparison purposes, the paper conducts robustness check and provides estimation results of the following cases: heteroskedasticity; serial correlation; neither heteroskedasticity nor serial correlation.

Given the lack of clear theoretical framework underlying the choice of the growth model specification, interpreting the empirical results should also be cautious. Levine and Renelt (1992) notably argues that empirical findings on the determinants of growth are not robust to changes in specification. Also, it cannot be ruled out that a specification error has been made in the growth model we estimated. Such misspecification issues may occur when an incorrect functional form is chosen and/or when relevant explanatory variables are omitted. The fixed effect estimation only controls for omitted variables that are persistent over time. While including an

irrelevant variable does not lead to bias (but induces a loss in efficiency), omitting a relevant variable yields biased and inconsistent estimates.

Empirical Results

This paper provides, describes and attempts to explain our empirical findings for both sub-samples in turn. Similarities and differences between the latter are also discussed.

The Richest OECD Economies

The analysis of the pooled regression augmented with country dummies, Equation (2), shows that the initial pooled regression, Equation (1), produces biased coefficients. Indeed, a Wald test is performed to evaluate restrictions on the estimated dummies coefficient. Under the null hypothesis, all the $\hat{\gamma}$s are set equal to zero; *i.e.,* cross-section heterogeneity does not matter for growth since data are consistent with a single intercept for the entire model. Under the alternative, at least some of the dummy coefficients are different from zero and, therefore, our model specification should account for cross-section heterogeneity. The Wald test statistic for eight restrictions (92.57) is compared against the critical value of a Chi-square distribution with eight degrees of freedom (15.51 at the 5% significance level). The test statistic exceeds the critical value. Hence, the null hypothesis is rejected.

It follows that the growth model specification must be transformed to take account of country-specific effects. The next step is to check whether these latter should be treated as random or fixed. Hence, the Hausman specification test is performed. The Hausman test statistic (58.10) is compared against the critical value of a Chi-square distribution with six degrees of freedom (12.59). Since the test statistic exceeds the critical value, the null hypothesis is rejected. Hence, it is concluded that a FE model provides a better fit. The main empirical findings related to the determinants of growth are based on a FE model adequately estimated to take account of the presence of heteroskedastic and serially correlated errors.

The test of significance for the coefficient of TAX yields a p-value of 0.33, which largely exceeds the 5% significance level. Hence, we fail to reject the null hypothesis according to which the estimated coefficient is equal to zero. Given this result, and the fact that we are initially concerned with the explanatory power of the variable, TAX is excluded from the set of explanatory variables. POP is also found to be statistically insignificant[5], but we keep it in the regression. Estimation results are shown in Table 2.

Table 2 Estimation Results for Group 1

	Dependent Variable : GROWTH			
	Method: Fixed Effects Panel		Periods included: 32	
	Cross-sections included: 9	Total panel (balanced) observations: 288		
	Regression 1	Regression 2	Regression 3	Regression 4
	Coef. (P-values)	Coef. (P-values)	Coef. (P-values)	Coef. (P-values)
C	0.245	0.242	0.245	0.242
	(.000)	(.000)	(.000)	(.000)
I(-1)	-0.160***	-0.159***	-0.160***	-0.159***
	(.000)	(.001)	(.000)	(.000)
S(-1)	-0.210***	-0.207***	-0.210***	-0.207***
	(.000)	(.003)	(.000)	(.003)
OPEN	0.038**	0.04***	0.038***	0.040***
	(.017)	(.001)	(.000)	(.000)
G	-0.889***	-0.892***	-0.889***	-0.892***
	(.000)	(.000)	(.000)	(.000)
POP	-0.169	-0.005	-0.169	-0.005
	(.655)	(.992)	(.593)	(.988)
R^2	0.363	0.353	0.363	0.353

Note: (1) the estimation method of Regression 1 takes account of heteroskedasticity and serial correlation; the estimation method of Regression 2 takes account of serial correlation; the estimation method of Regression 3 takes account of heteroskedasticity; the estimation method of

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[5] We also perform a Wald test to test the joint significance of TAX and POP. We fail to reject the null hypothesis that both coefficients are equal to zero. We decide to keep POP, because we are less sceptical about the link between population growth and economic growth than we are about the link between TAX and GROWTH.

Regression 4 does not take account of serial correlation nor heteroskedasticity. (2) *, ** and *** indicate rejection of the null hypothesis at 1%, 5% and 10% level of significance, respectively.

I(-1) and S(-1) are economically and statistically significant. Both coefficients (-0.160 and -0.210 respectively) take a negative sign, while a positive sign is expected. These findings are not consistent with economic theory. Higher investment and saving rates should translate into higher capital accumulation and therefore in economic growth. I reflects fixed physical capital accumulation. We argue that growth in advanced economies can be driven by R&D efforts, which are not taken into account in our measure of investment. Also, higher S allows for greater capital accumulation, which includes human capital investment. When OECD countries face a mismatch between demand and supply of workers' skills, human capital accumulation, resulting from higher saving rates, may not translate into higher growth rates. Also, higher saving means lower consumption, which may translate into slower economic growth rates when household consumption expenditures account for a substantial part of GDP. OPEN is statistically significant. Its coefficient (0.038) takes the expected positive sign but is quite low regarding the expected direct and indirect gains from international trade. Trade openness, measured as the sum of exports and imports divided by GDP, may be more closely linked to country size. Due to internal constraints, small economies like Luxembourg are likely to exhibit greater openness than bigger ones like United States. However, this phenomenon should be captured by our model which allows for omitted variables constant over time. Recent developments in international trade theory may bring an explanation for such a low coefficient. While the standard theory based on competitive trade models argues that free trade (reflected by the volume of trade) is the best policy, scholars have recently claimed that the policy prescription is not as clear when imperfect competition models are considered. International trade is still considered as a source of economic growth, the mechanism through which openness to trade is conducive to economic growth may not be captured by our model. G is

economically and statistically significant. Its coefficient (-0.889) takes the expected negative sign. This is consistent with theory that regards an excessive government size as a hindrance for private activity. Taxes required to finance the public sector distort incentives and government intervention is likely to cause a less efficient allocation of resources.

R^2 takes the value of 0.36. Such a level for the goodness of the fit of our model is expected given the issue related to the uncertainty of the growth model specification. The Jarque-Bera statistic, distributed as a Chi-square with two degrees of freedom, is used to test the null hypothesis of residual normality (Figure 2). The p-value associated with is 0.20 Hence, the null is rejected at the 5% (and even 10%) significance level. Residuals are normally distributed. However, the violation of the normality assumption is not a problem, because our sample size is quite large. The Jarque-Bera test can also be regarded a test of mis-specification. Indeed, the non-normality of the residuals may be explained by the presence of many large residuals. The existence of a number of outliers would suggest that our growth model does not capture the data generating process.

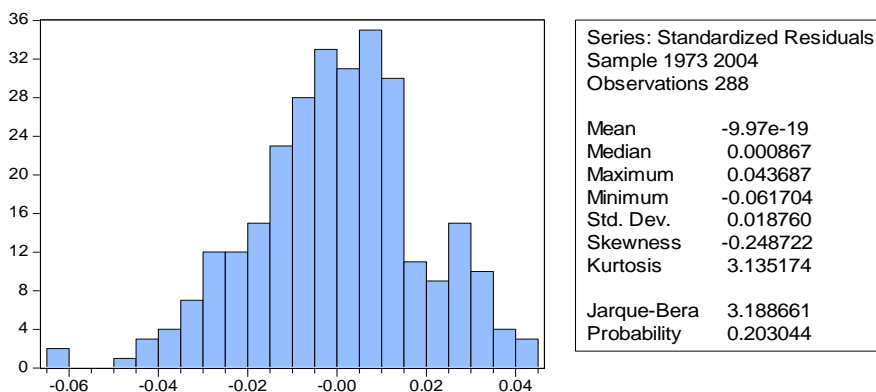| Series: Standardized Residuals	
Sample 1973 2004	
Observations 288	
Mean	-9.97e-19
Median	0.000867
Maximum	0.043687
Minimum	-0.061704
Std. Dev.	0.018760
Skewness	-0.248722
Kurtosis	3.135174
Jarque-Bera	3.188661
Probability	0.203044

Figure 1 The Jarque-Bera Test for Normality of the Residuals

Correlations of explanatory variables with each other are presented below (Table 3). Data indicate a quite strong correlation between openness to trade and lagged saving rate, *i.e.*, OPEN and S(-1) are closely correlated.

Multicollinearity can lead to larger standard errors and smaller t-ratios. As a result, the probability of type II error increases.

Table 3 Correlation Matrix between the Explanatory Variables

	I(-1)	OPEN	G	S(-1)	POP
I(-1)	1				
OPEN	-0.13	1			
G	-0.27	-0.06	1		
S(-1)	0.26	0.65	-0.3	1	
POP	0.08	-0.02	-0.21	0.06	1

Finally, it is noticed that, whatever the estimation method used, the empirical findings do not change. Estimated coefficients keep the same sign and the amplitude of the response to a one unit change in the (statistically significant) explanatory variables is barely altered by a change in the estimator used (OLS or GLS) and by a change in the correction for serial correlation. The explanatory power of our growth model is slightly greater when heteroskedasticity is assumed.

The Relatively Less Rich OECD Economies

Analysis of the pooled regression augmented with country dummies, Equation (2), shows that the initial pooled regression, Equation (1), produces biased coefficients. This time, the Wald test statistic for nine restrictions (45.13) is compared against the critical value of a Chi-square distribution with nine degrees of freedom (16.92 at the 5% significance level). Following the testing methodology detailed previously, a growth model specification that takes account for country-specific effects is favored . Again, Hausman test finds that a FE model provides a better fit. Again, the main empirical findings are based on a FE model adequately estimated to take account of the presence of heteroskedastic and serially correlated errors.

Both TAX and OPEN are not statistically related to growth. The p-value associated with the Wald test statistic is 0.94. It greatly exceeds the 5% significance level. Hence, we failed to reject the null hypothesis that both estimated coefficients are equal to zero. However, TAX is only deleted,

because it is believed that the link between TAX and GROWTH is dubious. Estimation results are reported in Table 4.

Table 4 Estimation Results for Group 2

	Regression 1	Regression 2	Regression 3	Regression 4
Dependent Variable : GROWTH				
Method: Fixed Effects Panel Periods included: 32				
Cross-sections included: 10 Total panel (balanced) observations: 320				
	Coef. (P-values)	Coef. (P-values)	Coef. (P-values)	Coef. (P-values)
C	0.229 (.000)	0.198 (.009)	0.229 (.000)	0.198 (.000)
I(-1)	-0.191** (.013)	-0.179* (.095)	-0.191*** (.000)	-0.179*** (.001)
S(-1)	-0.089 (.166)	-0.036 (.583)	-0.089* (.096)	-0.036 (.532)
OPEN	0.002 (.914)	0.006 (.836)	0.002 (.843)	0.006 (.635)
G	-0.704*** (.000)	-0.637*** (.000)	-0.704*** (.000)	-0.637*** (.000)
POP	-0.990*** (.001)	-1.032*** (.002)	-0.990*** (.008)	-1.032*** (.005)
R^2	0.269	0.241	0.269	0.241

Note: (1) the estimation method of Regression 1 takes account of heteroskedasticity and serial correlation; the estimation method of Regression 2 takes account of serial correlation; the estimation method of Regression 3 takes account of heteroskedasticity; the estimation method of Regression 4 does not take account of serial correlation nor heteroskedasticity. (2) *, ** and *** indicate rejection of the null hypothesis at 1%, 5% and 10% level of significance, respectively.

The results argue that trade openness is not related to growth, because relatively less advanced OECD economies may have insufficiently specialized in high-technology products to stay competitive in world markets against emerging countries. This time, POP is found to be economically and statistically significantly related to growth. Its coefficient (-0.990) takes the expected negative sign predicted by the theory when the population growth

rate is substantially driven by aging population. I(-1) remains economically and statistically significant. Its coefficient (-0.191) is still negative and is inconsistent with economic theory and previous empirical studies. S(-1) is no longer significantly related to growth. G is still economically and statistically significant. The coefficient for the variable (-0.704) takes an expected negative sign. The negative effect on economic growth of a one unit change in government spending tends to be smaller in relatively less rich OECD economies as compared with the top 10. It is argued that the relatively less "advanced" countries may suffer from a lack of infrastructure. In that case, public spending may be beneficial to some extent. None of the estimated coefficients (excluding the intercept) appear to be positively related to economic growth.

Only 27% of the total variation in real GDP per capita growth rates are explained by the linear combination of our regressors (I(-1), S(-1), OPEN, G and POP). Again, the residuals do not appear normally distributed (Figure 3). The p-value associated with the Jarque-Bera test statistic is 0.20. Hence, the null is rejected at the 5% (and even 10%) significance level. The rejection of the normality assumption may be due to the existence of a number of outliers that would suggest that our growth model does not capture the data generating process.

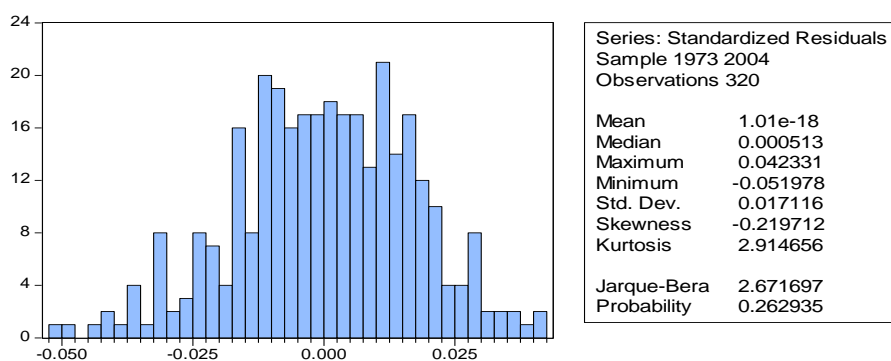| Series: Standardized Residuals	
Sample 1973 2004	
Observations 320	
Mean	1.01e-18
Median	0.000513
Maximum	0.042331
Minimum	-0.051978
Std. Dev.	0.017116
Skewness	-0.219712
Kurtosis	2.914656
Jarque-Bera	2.671697
Probability	0.262935

Figure 2 The Jarque-Bera Test for Normality of the Residuals

Correlations of explanatory variables with each other are reported

below (Table 5). This time, data indicate that a strong correlation exists between the lagged investment rate and the lagged saving rate. Again, it follows that it must be careful when interpreting inferential statistics, because they may be uninformative.

Table 5 Correlation Matrix between Explanatory Variables

	S(-1)	POP	OPEN	I(-1)	G
S(-1)	1				
POP	0.26	1			
OPEN	-0.19	-0.15	1		
I(-1)	0.79	0.29	-0.45	1	
G	-0.49	-0.18	0.42	-0.61	1

Lastly, it is obvious that the second set of empirical findings tend to be slightly more sensitive to the estimation method used. Estimated coefficients keep the same sign. However, when the GLS estimator is used, the estimated responses of a change in I(-1) and G tends to be greater, while the estimated responses of a change in OPEN and POP are smaller. Again, the explanatory power of the model tends to be greater when the estimation approach takes account of heteroskedastic disturbances. Also, POP is found to be statistically significant only when the model for heteroskedasticity and serial correlation is corrected.

Conclusion

This paper investigates determinants of economic growth and empirically test the determinants based on OECD countries. For comparison purposes, the sample is split into two groups so as to investigate the sources of growth in the most advanced countries (Group 1), and in the relatively less wealthy countries (Group 2).

Growth theory has identified physical and human capital as well as technological development as major factors underlying the process of economic growth. By allocating or by creating the conditions to allocate more resources to the capital accumulation and R&D efforts, public policies can exert a considerable influence on long-run growth. Previous literature on

growth empirics, like Levine and Renelt (1992) and Sala-i-Martin (1997), tends to argue that growth theories are "not explicit enough" about what variables should be included in the right-hand-side of the growth regression. In our empirical work, we follow Bhattarai (2004) and assess the importance of investment and saving rates, trade openness, shares of government spending and tax revenue in GDP, as well as population growth rate in accounting for economic growth.

In line with Bhattarai (2004), country-specific factors are important determinants of economic growth among the two groups of OECD countries. However, some of our estimates are not consistent with the economic theory or with the findings of Bhattarai (2004). Tax revenue/GDP is removed from the set of explanatory variables, because it is found to be statistically insignificant and its explanatory power of growth is dubious. The most surprising result is that lagged investment and saving rates in the case of Group 1 and lagged investment rate solely in the case of Group 2 are negatively related to growth. Openness to trade contributes to explaining growth in the top 10 countries. Our estimate (0.04) is quite similar to Bhattarai's estimate (0.06). The data suggest a more sizeable effect on growth of a one unit change in government spending/GDP (-0.89 and -0.70, versus -0.21 in Bhattarai (2004)), while they suggest a smaller response to a one unit change in population growth rate (-0.99, vs. -1.89 in Bhattarai's paper). For both groups, the empirical results are robust to changes in the estimation method used (OLS/GLS, with/without correction for serial correlation).

It is well known that high saving rate will result in low growth due to the reduction of people's investment and consumption. Also, there is a reasonable explanation for the negative relation between the investment rate and growth. To some extent, fixed assets investment is mainly dominated by the government and the government's aggressive investment is mostly to keep economic growth during the recession. So it exists a negative correlation between them.

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Financial Performance Of Selected Conventional And Islamic Banks In Kingdom Of Bahrain – A CAMEL Ranking Based Approach

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Abstract

This paper evaluates and compares the performance of Retail conventional and Islamic banks in kingdom of Bahrain using CAMEL ranking approach for the period 2007-14. Empirical studies show that Islamic banks are less profitable and efficient compared to retail conventional banks due to their inherent institutional factors. Current study has tested this postulate by analyzing the performance of retail conventional and Islamic banks in Bahrain under the CAMEL ranking framework. Bahrain has been chosen as the focal point of study as both Islamic and conventional banks play a significant role in Bahrain. Apart from that the extant literature review conducted by authors identified a dearth of similar studies in Bahrain. Islamic banks have demonstrated a superior performance compared to conventional banks under all CAMEL sub-parameters. Among other findings, the empirical results show not only a better performance by Islamic banks in the inter-performance analysis; it has also identified huge variations in the performance of the banks within the sub-parameters under study. The statistical analysis conducted by the authors affirmed that there are

significant differences in the intra as well as inter performance of the conventional and Islamic banks under study. Thus contrary to the conclusions drawn by other notable studies, in this research, the Islamic banks secured top positions compared to conventional banks despite their business being constrained by the sharia rules which prohibits them to undertake all profit making activities.

Keywords: Capital adequacy, Asset quality, Earning quality, Managerial efficiency, Liquidity

Introduction

This paper conducts a comparative analysis of the financial performance of selected Conventional and Islamic Retail Commercial banks in Bahrain during 2007-2014. Bahrain, as the Gulf's financial capital for more than 40 years, has led the Middle East in a range of sectors – from Banking, to asset management, to Islamic finance. The banking industry in Bahrain has come a long way over the last few decades. Segments such as commercial, retail, investments and Islamic banking have made great inroads in the industry. According to a recent survey of 152 economies worldwide, Bahrain's regulatory environment ranks second in the GCC[6] . This is supported by the fact that the Central Bank of Bahrain (CBB), the sector's sole regulator, has provided guidance in setting up Islamic financial structures for over 30 countries. Banking form the biggest part of Bahrain's financial services sector and the commercial banks are playing major role in the mobilization of savings, augmenting capital formation, facilitating investments in all sectors of Bahrain's economy and promoting economic development of the country.

The banking industry in Bahrain has been carved into two main

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[6] Fraser Institute – a Wall street Journal Company, Economic Freedom of the World 2014 Report

segments: the conventional banking segment and the Islamic banking segment. In an attempt to profit from the growing hype of Islamic banking, most banks have created a separate entity or Subsidiary under their wing to focus primarily on this growing market. Currently there are 403 licensed financial institutions in Bahrain out of which there are 79 conventional bank licensees and 24 Islamic bank licensees. Among them 22 under conventional banking and 6 in Islamic banking are focusing mainly on Retail market. Conventional commercial banks have been in operation in Kingdom of Bahrain for more than 80 years. They have dominant share in almost all facets of banking. Since their incorporation in Bahrain, Islamic banks are not only a major source of Islamic banking products, but also offer a variety of banking services such as foreign exchange business, money transfers, documentary trade finance, portfolio management and underwriting of capital market issues. The below table provides a snapshot of the retail commercial banks in Bahrain.

Table 1.1 Structure of Retail commercial banking in Bahrain as at end of March 2015

	Conventional banks	Islamic Banks
No. of Banks	22	6
No. of Branches	126	59
Share of deposits*[7]	32.62%	28%

Source: http://www.cbb.gov.bh/assets/CBBr and BANKSCOPE

The share of Islamic banks in financial intermediary services has phenomenally increased over the years. The Central bank of Bahrain is giving ample focus to the Islamic banking industry in an attempt to maintain their prominent position in the GCC Islamic Centre. This is praiseworthy as they are functioning under dual constraints. While operating as commercial banks they adhere to socio-economic-political-regulatory framework like their conventional counter parts at the same time they are mandated to obey Islamic laws – the sharia principles which are their guiding force. They

[7] * Share of deposits of banks selected under study

cannot indulge in certain profit bearing activities as those activities are not in conformity with the divine laws of Islam which is a constraining factor for their profitability.

Thus it is natural that the Islamic banks face steep challenges in sharing deposits and credit markets. As such it is hypothesized that Islamic banks may not be at par with the conventional banks in terms of their financial performance due to these stringent institutional factors. The main focus of this paper is to look into whether the performance of the Islamic banks is different from the conventional banks with respect to Capital Adequacy, Asset Quality, Management Efficiency, Earning Quality and Liquidity using the CAMEL paradigm for the period 2007-2014. This study of comparison is useful in providing valuable information and suggestions to relevant parties: bank customers, bank management, regulators and rating agencies.

This paper is organized as follows: Section 2 draws the need for the study along with its scope. Section 3 provides review of literature along with methodology, data source and analysis used in the study. Section 4 briefs out the performance measures detailed out as conceptual framework of CAMEL and its sub-parameters. Section 5 contains empirical results and analysis and section 6 provides conclusion along with suggestions and topics for further research.

Need for the study

Since growth, efficiency and competitive environment are quintessential for the economic stability and development, it is important to analyze the performance of commercial banks. This exercise is all more relevant in Bahrain because of the existence of conventional and Islamic retail banks competing with each other in spite of the inherent differences in their institutional frameworks. The extant review of literature undertaken by the researchers has proved a dearth of studies in Bahrain's context. Hence the current study is identified to fill the gap.

Identified research gaps

A detailed literature review conducted by the researchers, indicate that there is a dearth of studies conducted in Bahrain comparing performance of Islamic vis-a-vis conventional banks. The studies conducted in GCC and other East Asian countries have brought out inconsistence results. To resolve the above issues and to smooth the inconsistencies, this study has been undertaken.

Statement of the research problem

Studies conducted by Samad (2002), Atif Mian (2003), Samad (2004), Hasan, Maher Mohammed and Dridi (2010), Rosnia (2010) have found that conventional banks perform better than the Islamic banks. Current study is under taken to test whether same pattern could be identified in the Bahrain market where evidences based on research is inadequate to reach to a similar conclusion. Hence the current study is undertaken to find out whether there are any differences in the intra and inter group performance of conventional and Islamic banks in Bahrain.

Research Questions

The study seeks to answer the following research questions.

What are the indicators of financial performance and what are the models used to measure it?

Were there any significant differences in the inter-group and intra-group financial performance of Conventional vis-à-vis Islamic banks with reference to CAMEL ratios? (within the groups and across the groups)

What are the suggestions and recommendations for policy formulations?

Objectives

This study has the following objectives:

To identify the indicators of financial performance and to choose the

models for its measurement.

To study the inter group and intra-group financial performance of in terms of CAMEL ratios of reference bank groups (Conventional and Islamic banks).

Hypotheses formulated

Based on the objectives outlined above, the following hypotheses have been formulated:

H_O: There are no significant differences in the financial performance across reference bank groups in terms of CAMEL ratios.

Ho: There are no significant differences in the financial performance within the conventional banks in terms of CAMEL ratios

Ho: there are no significant differences in the financial performance within the Islamic banks in terms of CAMEL ratios.

Methodology
Scope

The study covers the period from 2007-2014. The Bahrain Retail commercial banks have been grouped under two categories: Islamic and Conventional, selected banks from conventional and all the Islamic banks have been taken under the study.

Sample selection:

As the objective of the study was performance evaluation of retail commercial banks in Bahrain, only commercial banks which provide the core retail banking services[8] have been selected for this study. Thus the study has followed a stratified convenient sampling technique. Samples were chosen based on the following criteria.

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[8]   Core banking services are deposit collection, payment services and loan underwriting along with other banking services like cash management, trust services, risk management services, loan commitments etc.

Banks providing core retail banking services.

Comparable Asset size (within 25th rank in asset size)

Data availability (required data for CAMEL).

Out of 28 conventional retail banks, 4 banks fit into the above criteria.

All banks (6) in the Islamic Retail commercial bank group were taken in the study as they fit into the criteria.

Thus out of 34 major banks, 10 banks have been chosen as they fit into the above criteria. The study period covers eight years beginning from the financial year 2007 to 2014. The data processed in the research represent the average of the variables values for the 8 years.

Table 1.2 shows the selected banks for the study and their asset size.

Table 1.2 Banks selected under Conventional Retail Banking Group

Bank	Asset Size ($ in Millions)	Rank Based on Assets Size in Bahrain
Ahli United Bank BSC (AUB)	33,445	1
Bank of Bahrain and Kuwait (BBK)	9,311	6
Bank Muscat International (BMI)	1,744	19
National Bank of Bahrain (NBB)	7,283	9

Table 1.3 Banks selected under Islamic Banking Group

Bank	Asset Size ($ in Millions)	Rank Based on Assets Size in Bahrain
Al Baraka Banking Group BSC (Albaraka)	23,464	3
Al-Salam Bank Bahrain BSC (Al-Salam)	5,200	11
Bahrain Islamic Bank BSC (BISB)	2,328	16
Ithmar Bank BSC (Ithmar)	7,423	8
Khaleeji Commercial Bank (KHCB)	1,588	22
Kuwait Financing House (KFH)	3,941	12

Source: BankScope

Data Source

To realize the objectives of the study, two distinct data sources are used: (i) Fact sheets published by Central bank of Bahrain (ii) financial statements published by BANKSCOPE. BANKSCOPE is a complete financial analysis tool, combining information on 11,000 world banks with a financial analysis software program. The information includes detailed spreadsheet data (balance sheet and income statements), ownership information (shareholders and subsidiaries), Reuter's news articles, ratings and rating reports. The data is updated 18 times a year.

Data Analysis

Different ratios of CAMEL were extracted from the financial statements of the banks from BANKSCOPE.

Limitations of the current study

The sample size of the study is not uniform because of data constraints. For example we have included all banks in Retail Islamic group, however only 4 banks out of 28 in the retail conventional banks category are selected.

This study used CAMEL framework to measure financial performance. An interesting direction for further research would be to employ parametric Stochastic Frontier Analysis (SFA) and or the non-parametric Data Envelopment Analysis (DEA) and rating method of CAMEL to estimate the technical, allocative and scale efficiency of the selected banks. This would enable to assess the methodological differences in the two popular approaches as well as to assess the sturdiness of efficiency scores calculated under both methods.

Review of Literature

In academic research, review of related literature plays a significant role as it provides a link between the proposed research and the earlier studies. Performance evaluation started when the first commercial bank was established at Mesopotamia in 3000 BC. In recent times, especially after the advent of

financial sector reforms, there are large number of studies undertaken globally to analyze and evaluate various aspects of performance and its measurement in the banking sector. This section provides a brief review of earlier studies on the financial performance analysis of banks undertaken using CAMEL rating and ranking methods all over the world. Notable studies conducted are: Samad (2002) examines the comparative performance of Bahrain's interest-free Islamic banks and the interest-based conventional commercial banks during the post-Gulf War period with respect to (a) profitability, (b) liquidity risk, and (c) credit risk. Nine financial ratios are used in measuring these performances. Applying Student's t-test to financial ratios for Islamic and conventional commercial banks in Bahrain for the period 1991-2001, the paper concludes that there is no major difference in performance between Islamic and conventional banks with respect to profitability and liquidity. However, the study finds that there exists a significant difference in credit performance. Atif Mian (2003) used 1,600 banks in 100 emerging economies, and identified the strengths and weaknesses of the three dominant organizational designs (state owned, private sector and foreign) in emerging markets. His paper found that foreign banks and private banks provide a sound financial performance compared to their counterparts in the market. Samad (2004) investigated the performance of seven locally incorporated commercial banks in the GCC for the period 1994-2001. Financial ratios were used to evaluate the credit quality, profitability, and liquidity performances. The performance of the commercial banks was compared with the banking industry in Bahrain which was considered a benchmark. The results revealed that commercial banks in Bahrain were relatively less profitable, less liquid and were exposed to higher credit risk. Nimaladasan.B (2008) attempted a comparative study of financial performance of banking sector in Bangladesh. He analyzed 6562 branches of 48 banks under the category of Foreign Commercial Banks (FCBs), National commercial Banks (NCBs), Private commercial Banks (PCBs) and Government Owned Development Financial Institutions (DFIs) for the period 1999-2006. He has used 7 sub – parameters of CAMEL to assess the

performance of banks and concluded that foreign commercial banks and private commercial banks performed better than the National commercial banks (NCBs) and Government owned Development Financial Institutions (DFIS). Mihir Das and Annyesha Das (2010) compared the performance of public sector banks with private/foreign banks under CAMELS framework using rating method. 15 sub-parameters of CAMELS were analyzed and concluded that private/foreign banks fared better than public sector banks in most of the CAMELS sub-parameters. Hasan, Maher Mohammed and Dridi (2010) examined the performance of Islamic banks (IBs) and conventional banks (CBs) during the global crisis by looking at the impact of the crisis on profitability, credit and asset growth, and external ratings in a group of countries where the two types of banks have significant market share. Their analysis suggested that IBs have been affected differently than CBs. Factors related to IBs'business model helped limit the adverse impact on profitability in 2008, while weaknesses in risk management practices in some IBs led to a larger decline in profitability in 2009 compared to CBs. IBs'credit and asset growth performed better than did that of CBs in 2008-09, contributing to financial and economic stability. Rosnia (2010) compared the financial performance of Malaysian conventional banks versus Islamic banks against profitability and liquidity. It found that for the period 2004-08, Islamic banks were less profitable but have greater liquidity compared to conventional banks.

The extant literature review suggests a dearth of research in the performance areas in the GCC especially in Bahrain in spite of its status as the financial hub of the GCC. Thus the current study has been undertaken to fill in the gap by analyzing the financial performance of the selected retail conventional banks versus Islamic banks for the period 2007-2014.

Performance measures – Theoretical framework of CAMEL

To gauge the financial soundness and thereby evaluate the efficiency of the banks, regulators all over the world have resorted to CAMELS. CAMELS' ratings are the result of the Uniform Financial Institutions Rating

System, the internal rating system used by regulators for assessing financial institutions on a uniform basis and identifying those institutions requiring special supervisory attention. Regulators assign CAMELS ratings both on a component and composite basis, resulting in a single CAMELS overall rating. When introduced in 1979, the system had five components. A sixth component—sensitivity to market risk—was added in 1996. The CAMEL supervisory criterion in banking sector is a significant and considerable improvement over the earlier criteria such as frequency, check, spread over and concentration. The six components of the new CAMEL model are: • C—Capital adequacy • A—Asset quality • M—Management • E—Earnings • L—Liquidity • S—Sensitivity to market risk.   CAMELS' framework can be used to rate the banks as well as rank them based on their performance in the ratios. Regulators normally assign rating and those banks which fall below with composite CAMELS ratings of 4 or 5, are deemed to be "problem" banks and may be subject to regulatory enforcement actions. The alternative method which is used by many researchers is ranking of CAMEL ratios. As discussed earlier in the current study, financial performance is tested using CAMEL framework. After analyzing financial statements of the various banks under study, 5 sub-parameters were adopted in measuring the bank performance in terms of Capital adequacy, Asset quality, Management efficiency, Earning quality and Liquidity.   The sub-parameters chosen under each of the CAMEL acronym are:

Capital adequacy

Capital adequacy reflects whether the bank has enough capital to absorb unanticipated losses and reduction in asset values that could otherwise cause a bank to fail, and provide protection to depositors and creditors in the event of liquidation. The balance sheet of the bank cannot be expanded beyond the level determined by the capital adequacy ratio.

The Sub-parameters of Capital Adequacy parameters are:

Tier1 ratio,

Total capital ratio,

Equity to net loans,

Equity to liabilities

Equity to assets

Asset Quality

Asset quality is an important parameter to test the financial credibility of the banks and their risk exposure.

The Sub-parameters of Asset Quality parameters are:

loan loss reserve to gross loans,

loan loss provisions to net interest revenue,

loan loss reserve to impaired loans,

Impaired loans to gross loans,

Impaired loans to equity

Management efficiency

Management efficiency is another quintessential component of the CAMEL model which ensure the growth and stability of a bank.

The sub – parameters chosen to measure management efficiency parameters are:

Recurring earning power,

Non-operational items to net income,

Equity to total asset

Cost to Income ratio

Operating profit to Risk weighted assets (%)

Earning quality

Earning quality ratios are used to measure the ability of the bank to earn profit compared to expenses. It shows the bank's overall efficiency and performance as it examines the bank's investment decisions as compared to their debt situations.

The Sub-parameters chosen to measure earning quality parameters are:

Net interest margin,

Net interest revenue to average assets,

Other operational incomes to average assets,

Return on average assets

Non-interest expenses to average assets

Liquidity

Liquidity is the ability of the bank to meet financial obligations as they become due, without incurring unacceptable losses.

The sub-parameters used in this study to analyze liquidity of the banks are:

Interbank ratio (IBR),

Net Loans / Total Assets,

Liquid Assets / Dep plus ST Funding and

Liquid Assets / Total Deposits plus Borrowing.

Net loans to total deposits and borrowing

Performance of selected banks in the above sub-parameters will be calculated, the average of these determines the rank for each of the parameters which finally contribute to the composite rankings.

Analysis and results discussion

This section presents a discussion on the inter-bank group financial performance of selected retail commercial banks under conventional and Islamic banking framework during 2007-2014. Notable earlier studies under this focal theme in Bahrain in particular is by Samad (2002) who concludes based on his analysis that there is no major difference in the performance between Islamic and Conventional banks with respect to profitability and liquidity with marked differences in the credit performance. Rosnia, Ebrahim, Osman, Wahad., (2010) compared the financial performance of Malaysian conventional banks versus Islamic banks against profitability and liquidity. The study found that for the period 2004-08, Islamic banks were less profitable but have greater liquidity compared to conventional banks.

There is a general perception that conventional banks due to their vast years of experience as well as interest based services perform better than Islamic banks, which focus mainly on interest free and sharia compliant activities. Following analysis and empirical results shed light on whether the above perception can be upheld and find out if there can be a contrary explanation.

For appraising the financial performance, CAMEL ranking model was used. The performance of the different bank groups have been studied with reference to Capital adequacy, Asset quality, Management efficiency, Earning quality and Liquidity for the period 2007-2014. This section attempts an inter-bank group analysis and contains intra-bank group comparative study as well.

Composite Capital adequacy of selected banks under study

Capital adequacy is a reflection of the inner strength of a bank, which would enable a bank to sustain its stability during the times of crisis. Hence capital adequacy has a bearing on the overall performance of a bank. Capital adequacy is judged by checking those ratios which directly indicate financial soundness such as TIER 1 ratio, Total capital ratio (Capital adequacy ratio), Equity to net loans, Equity to liabilities and Equity to customer and short term funding.

Tier 1 ratio (T 1 R) of capital adequacy measures Tier 1 capital; which is shareholder funds plus perpetual non-cumulative preference shares as a percentage of risk weighted assets and off balance sheet risks measured under the Basel rules. This figure should be at least 4%. A higher ratio reflects a stronger bank. The mean ratio for the group was 18.5%. The individual bank ratios do not cluster around the mean which has resulted in high CV (47.07%). The highest T1R was maintained by KHCB and BBK maintained the lowest T1R. NBB has secured 2nd position followed by Alsalam and KFH. A very high TIR ratio shows that the banks are taking proactive measures though it is considered to be sound, the high CV values among the banks is of great concern. Another interesting observation is that the banks were only required to keep 4%, yet 5 of the banks under study

have kept more than the average, which is quite baffling.

Total capital ratio (TCR) is the total capital adequacy ratio under the Basel rules.

It measures Tier 1 + Tier 2 capital which includes subordinated debt, hybrid capital, loan loss reserves and the valuation reserves as a percentage of risk weighted assets and off balance sheet risks. This ratio should be at least 8%. This ratio cannot be calculated simply by looking at the balance sheet of a bank but has to be calculated internally by the bank. At their option, they may publish this information in their annual report. The highest was maintained by KHCB, followed by NBB and Alsalam, while Ithmar had the lowest ratio. The mean ratio for the group is 20.2 with a CV of 33.38, though it is high compared to other sub-parameter, the CV is comparatively low. Still we can infer that the individual ratios don't cluster around the mean. In Bahrain, the regulator has made it mandatory for the banks to keep 12% TCR. Except for Ithmar, all other banks have kept very high TCR, which has led to the high CV.

Equity to total assets (E/TA) is indicative of the relative proportion of equity applied to finance the assets of a company. This ratio is sometimes referred as net worth to total assets ratio hence provides realistic picture of the long-term or prospective solvency position of the business. In this sub-parameter, KHCB has secured first position followed by KFH and Alsalam. The lowest position was taken by BBK. The mean ratio for the group is 15.7% with a very high CV of 43.22%. A very spectacular finding here is that the Islamic banks have taken the first 4 positions.

Equity to net loans (E/NL) ratio measures the equity cushion available for the banks to absorb losses on the loan book. A higher ratio reflects a stronger bank. The mean ratio for the group was 44.3 with a very high CV of 62.34%. The first position under this parameter was taken by Alsalam bank, followed by Albaraka, KHCB and KFH respectively. In this parameter also Islamic banks had a stellar performance compared to their counter parts in the market.

Equity to total liabilities (E/TL) is a leverage ratio. This leverage

ratio is another way of looking at the equity funding of the balance sheet and is an alternative measure of capital adequacy. Higher the ratio reflects lower risk for the banks. KHCB has secured to the first position followed by KFH and Alsalam and the last two positions were taken by Albaraka and BBK respectively. The mean score for the group is 20% with a high CV of 55.72%, which can be attributable due to the difference in the ratios maintained by the first and last ranked bank among the group.

When all ranks achieved by banks under the four sub-parameters are averaged, due to its stellar performance in all the sub-parameters, KHCB sustained its first position followed by Alsalam and KFH respectively. The lowest 3 ranks are obtained by Ithmar, AUB and BBK respectively. From the regulator's perspective, all the banks are adequately capitalalised, which is a good sign. However, high variances in these ratios especially E/NL, E/TL should be of concern for the regulator.

Composite Asset quality of selected banks under study

The quality of assets is an important parameter to study the degree of financial strength. The purpose to measure the asset quality is to ascertain the composition   of non-performing assets (NPAs) as a percentage of total assets. The quality of assets of the selected banks is as given below, measured through their performance in the sub-parameters contributing to the overall asset quality.

Loan loss reserve to gross loans ratio (LLR /GL) is a reserve for losses expressed as a percentage of total loans. Given a similar charge-off policy, a higher ratio reflects a poor loan portfolio. The mean ratio for the banks under study was 4.39 percent. It implies that the loans loss perception of the banks was 4.39 percent. In other words the loan recovery perception is 95.61 percent. Across the banks, Alsalam indicates the maximum loan recovery perception of 99.1 percent and a minimum of 90.8 percent by BMI. The ratios categorically indicate that the loan portfolio of the banks under study was good and confidently recoverable. Alsalam has attained first position as the ratio of Loan loss reserve to gross loan was lowest among the

group. BMI and Ithmar had the highest ratios. Except for Alsalam, none of the banks had LLR/GL ratio less than the mandatory rate of 1.5%. As indicated by the C.V. this ratio varies widely across the banks.

Loan loss provision to net interest revenue (LLP/NIR) is the relationship between loan loss provisions in the profit and loss account and the interest income over the same period. Ideally this ratio should be as low as possible and in a well-run bank, if the lending book indicates higher risk, this should be reflected by a higher ratio. The mean ratio for the group was 53.46 implying that 46.54 percent of net interest revenue has been earmarked against probable loan loss. There is no mandatory norm for this ratio but it is good if the ratio is low. Across the banks, Ithmar indicates the highest ratio followed by BISB. These two banks, especially Ithmar, should critically review its loan portfolio, assess the credit worthiness of its borrowers, and try to reduce the ratio. KHCB has maintained the first position, followed by KFH and NBB. Due to the significant variations across the banks in this ratio, it has resulted in a very high CV(155.34 percent).

Loan Loss Reserve to Impaired loans (LLR/IL) Loan loss reserve is calculated as the sum of any specific, generic and other types of allowances for loan losses, which might also include those that have been temporarily created in addition to generic and specific. "Impaired loans" are considered to be the measure of problem loans. A loan is deemed to be impaired if there is an objective evidence of impairment (i.e. a "loss event"), and that loss has an impact on the estimated future cash flows. Thus this ratio illustrates the asset quality of the bank. There is mixed views regarding the ranking and performance for this ratio. We have presumed a higher ratio indicates a better performance as it reflects the bank's readiness to meet the problem loans. Accordingly, KFH has been ranked first followed by AUB and NBB, and the last positions were taken by BisB and Ithmar.

Impaired loans to Gross loans (IL/GL) indicate the asset quality of the banks and their ability to mitigate credit risk. Hence a lower ratio reflects a higher quality of assets. The mean ratio for the group was 8.68%, which is considered to be good. However, due to the wide variations across the group

the CV was very high. The lowest was maintained by Alsalam and the highest was maintained by BisB. The management of BisB, BMI and Ithmar need to strictly monitor their loan portfolio as their pattern for this ratio is significantly different from their competitors, which can be a cause of concern during turbulent times.

Impaired loans to equity (IL/E) reflects impaired or problematic loans as a percentage of the bank's equity. This indicates the weakness of the loan portfolio relative to the bank's capital. A high ratio is a cause of concern. The mean ratio for the group was 42.45 percent which is high as per the bank management standard. It also indicates that the loan portfolio of the selected banks for the reference period was very weak. Bank wise, maximum percent was found for BisB followed by BMI. Alsalam has maintained the minimum which is 2.6 percent. The reason for such high ratio for other banks especially BisB, Ithmar, BMI should be an area for further study. Further, there is an urgent need for these banks' management to critically review their loan portfolio.

When the sub-parameters were averaged to gauge the composite asset quality performance, KFH has secured the first place due to its stellar performance, followed by Alsalam. NBB and AUB have secured 3rd and 4th position. It's worth mentioning that BisB, BMI, Ithmar and Albarak should critically review their loan portfolio. The huge variance in the performance of the banks under this study might also be a cause of concern to the regulator and can be a topic for further research. BisB, Ithmar, BMI and Albaraka need to scrutinize their non-performing assets cautiously. Barring a few conventional and Islamic banks, other banks haven't given a satisfactory performance in the asset quality.

Composite performance in Management efficiency of selected banks under study

Management efficiency is another significant component of the CAMEL model that indicates the growth and survival of a bank. Management efficiency means adherence to set of norms, ability to plan and

respond to changing environment, leadership and administrative capability of the bank. To judge these quintessential features of management, the below five sub-parameters were chosen, which measure the management efficiency not only in terms of increasing revenue but also decreasing cost.

Recurring earning power (REP) ratio is a measure of after tax profits adding back provisions for bad debts as a percentage of total assets. Effectively this is a return on assets performance measurement without deducting provisions. It indicates the ability of the management to ensure persistence growth trend. This also provides the long term vision of the bank and its ability to mitigate the risk and achieve higher returns for the shareholders. KHCB has secured first position followed by KFH and BBK, It is worthwhile to mention that conventional banks have performed well compared to their Islamic peers in this ratio. The mean ratio for the group is 1.66%. 7 banks have scored more than the average. Albarka's management needs to review their ALM to ensure long-term growth.

Equity to total assets (E/TA) equity is the owner's capital and is a cushion against asset malfunction. This ratio measures the amount of protection afforded to the bank by equity. Higher ratio indicates greater protection. KHCB, KFH, Alsalam and BisB have performed satisfactorily ahead of other banks. Albaraka, AUB and BBK have not performed well and have lagged behind the mean ratio for the group.

Non Op income to net income (NOI/NI) this ratio indicates the proportion of non-operating income to the total income. The income generated from non-banking operations was classified as non-operating income (NOI). After the advent of merchant banking and e-banking the proportion of NOI is expected to be high in net income. High proportion is an indicator of diversification. This ratio also shows the same trend as the other ratios as KFH and KHCB have taken the first two positions by securing higher score than the mean ratio of the group. Albaraka and BMI were the last two positions in this ratio, which is a cause of concern.

Cost to income (CTI) ratio is one of the most focused ratios and a measure of management efficiency. The major cost element is salaries of the

employees and interest payments for the depositors. CTI is a measure of operational efficiency. Banks use this ratio extensively for inter-bank and intra-bank (inter branch) comparative analysis and managements generally emphasize to their staff the need to reduce this ratio. A lower ratio reflects a better performance. Conventional banks have outperformed the Islamic banks in this ratio. AUB followed by NBB and BBK had taken the first 3 positions and BMI, Albaraka and Ithmar occupied the last 3 positions. These banks may need to adopt cost saving policies from the conventional banks.

Operating profits to risk weighted assets (OP/RA %) this ratio reflects the management efficiency. A higher ratio is better for the bank as it implies that the management was able to attain profit after setting aside the mandatory risk weighted capital. This ratio also reflects the management's adherence to the rules and regulations. The ratio implies the management's ability to generate profit after maintaining the adequate capital, thereby providing assurance and security to the customers. The mean ratio for the group is 0.85% and the CV is very high due the glaring differences in the ratio across the banks.

Ranks achieved under each sub-parameters of management efficiency were averaged in order to get their overall performance. KFH, KHCB and NBB have secured top position, which indicates that their management practices can be a lesson for the other banks. In general, conventional banks performed better than Islamic banks, with the exception of KHCB and KFH, whose performance in this category was comparable to the performance of conventional banks.

Composite performance in Earning Quality of selected banks under study

It primarily determines the profitability of a bank and explains its sustainability and growth of future earnings and hence this parameter is of particular interest to the management. It also attracts the attention of the equity holders who are interested in the ultimate returns, which depend on the earning quality.

Net interest margin (NIM): This ratio is the net interest income

expressed as a percentage of assets. A positive value is desirable as it implies the bank made optimal lending decisions and is successful in getting the timely interest on loans back from the customers. KHCB and Albaraka secured 1st and 2nd positions respectively. A noteworthy change here is that Albaraka whose presence mostly on the lowest quartile has come up for this ratio. The mean ratio for the group is 2.6 percent with wide variation across the banks as denoted by a high C.V.

Net interest revenue to average assets (NIR/AA): This ratio indicates whether a bank has positioned its assets and liabilities efficiently to take advantage of the interest rate changes. This ratio has an impact on the profitability and earning capacity of the bank as it must be large enough to cover the provisions for loan losses and security losses. Highest score was achieved by KHCB followed by NBB and BBK. Due to low performance by Albaraka, Alsalam and Ithmar the C.V is very high.

Other operational income to average assets (OOI/AA) This ratio indicates to what extent fees and other income represents earnings of the bank. In other words, OOI represents the income earned by the banks from its diversified and non-traditional banking functions such as merchant banking and e-banking services. It also indicates the extent of diversification of business services apart from its traditional functions such as mobilization of deposits and advancing loans. A high ratio indicates a high level of diversification and vice versa. Especially after the advent merchant banking and e-banking this ratio is expected to be high. Ithmar managed to register its presence in this ratio, which shows that they have a diversified business model. KFH has come out first and Alsalam has taken third position. However, KHCB, which has exhibited a stunning performance in other parameters, scored the 7th position in this sub-parameter, indicating that this is one area where KHCB management can focus on.

Return on average assets (ROAA) is perhaps the most important ratio to compare the earning efficiency and performance of banks as it evaluates the returns generated from the assets owned by the bank. Higher ratio indicates better efficiency. KFH has secured the first position followed by NBB and

KHCB. The lowest ranks were achieved by BisB, Ithmar and BMI. The wide differences in performance of these low performers from the high performers have resulted in very high C.V.

Non-interest expenses to average assets (NIE/AA) non-interest expense accrue from salaries of the staff, fees and other non-interest expenses of the bank. This ratio conveys a bank's efficiency as a lower ratio reflects a higher earning capacity. The mean ratio for the group is 2.7% and the individual scores of the banks cluster around the mean. The most efficient bank under this ratio was NBB followed by AUB and Alsalam. KHCB and KFH came after with 6th and 7th position, which is quite understandable as they have performed quite well with respect to their non-interest income compared to their peers if they can manage the spread efficiently then they do not have to worry about their low ranks. It is commendable here that NBB had performed well with respect to both non-interest revenue and have succeeded in minimizing the expenses, which can be a lesson to be followed by its peers.

For the composite performance of banks under earning capacity, NBB and KHCB have shared the first position, followed by BBK and KFH. Alsalam and Albaraka came after. Ithmaar and BMI scored the lowest in this category. Under earning capacity there are wide variances across banks.

Composite performance in liquidity of selected banks

Liquidity for a bank is the quantum of assets which are easily convertible into cash in order to meet their obligations. Liquidity is a crucial parameter in CAMEL as it reflects bank's ability to meet its financial obligations including customer's demand for cash across the counter. Lack of liquidity can have an undesirable impact on the credibility of the bank. The liquidity ratios indicate the bank's short-term solvency and its ability to pay-off the liabilities.

Interbank ratio (IBR) is money lent to other banks divided by money borrowed from other banks expressed in percentage. If this ratio is greater than 100 it indicates that the bank is a net placer of funds, and therefore more

liquid. The mean score for the group is 145.5 percent indicating that the group is a net placer of funds in the market. Albaraka is the net placer of funds to the market and Ithmar the net borrower. Second position is enjoyed by Alsalam and KFH was also a highest borrower in the market. The interbank variations are also very high for this ratio.

Net loans to total assets (NL/TA) is a liquidity ratio that indicates the proportion of assets that are tied up in loans. A higher ratio indicates a lower liquidity of the bank and vice versa. But there are two different opinions regarding maintaining higher liquidity. The traditional view is that, to meet the customers' demand for cash, the banks were expected to maintain liquidity. Otherwise it would lead to undesirable consequences. But another view is that after the advent of e-banking and internet banking, any amount can be transferred from one bank to another within a fraction of seconds. Therefore there is no need to keep excess liquidity, (instead the amount can be invested profitability) and whenever the need arises JIT (Just-in-Time) model be used to meet the customers demand for cash. The mean ratio for the group is 48.2 percent which means the quantum of liquidity was 52.8 percent. Utmost uniformity was witnessed in this ratio across the member banks as almost all member banks maintained around the same ratio.

Net loans to total deposits & borrowing (NL/TD & B) this ratio measures the degree of illiquidity of the bank as it indicates the percentage of the total deposits which are locked into non-liquid assets. A high figure denotes lower liquidity. Alsalam has secured first position and BisB the last. Barring Albaraka and BMI, other banks individual scores cluster around the mean score (48.2%) due to which variations across are insignificant when compared to other ratios.

Liquid assets to deposits plus short term funding (LA/STF) liquid assets form all reserve assets hence are considered to be liquid. This ratio can be considered as a deposit run as it indicates the percentage of short term obligations that could be met with the bank's liquid assets in the case of sudden withdrawals. The higher this ratio, the more liquid the bank is, which reduces its vulnerability to bank run. Alsalam has come out as the less

vulnerable bank compared to its peers in the group followed by KFH and KHCB. Albaraka has taken 10th position. Due to the spectacular performance of those banks who have taken the first 5 positions compared to the remaining, there is high variation across the banks.

Liquid assets to total deposits plus borrowings (LA/TD & B) this ratio has its denominator as deposits plus borrowings with the exception of capital instruments. A higher ratio reflects a higher liquidity for the bank. Albarka has taken the first position in this ratio. The variations across banks are very wide in this ratio.

Ranks achieved by the banks under the five sub-parameters for the time period (2008-14) were averaged and composite ranking has been assigned to all the six banks. Based on that, Alsalam and NBB have achieved first and second position respectively and 3rd and 4th positions went to KHCB and KFH respectively.

Composite performance of Selected Banks in CAMEL

Ranks attained by each banks under the CAMEL parameters have been averaged and ranked. Below tables shows the final ranking result.

Composite performance of Selected Banks in CAMEL							
	C	A	M	E	L	Average Ranking	Overall Ranking
KFH	3	1	1	2	4	2.2	1
KHCB	1	5	2	1.5	3	2.5	2
NBB	4	3	3	1.5	2	2.7	3
Al Salam	2	2	6	3.5	1	2.9	4
BBK	10	6	5	2	5	5.6	5
AUB	9	4	4	8	8	6.6	6
Albaraka	7	10	10	3.5	7	7.5	7
BISB	6	9	7	7	10	7.8	8
BMI	5	7.5	8	10	9	7.9	9.5
Ithmaar	8	7.5	9	9	6	7.9	9.5

Due to its stunning performance throughout in all sub parameters KFH and KHCB secured first and second position respectively. NBB and Alsalam came 3rd and 4th respectively. BBK and AUB have taken 5th and 6th position .9th position is shared between BMI and Ithmaar.

This result has disproved the popular conception that conventional banks perform better than the Islamic banks. 2 of the Islamic banks have done better than the oldest bank in Bahrain, NBB. Alsalam bank has taken over the other two conventional banks BBK and AUB.

In order to check whether there are significant differences in the Interbank performance of the selected bans under CAMEL, Single Factor ANOVA test was used to the check and validate the below hypothesis;

H_0:   There are no significant differences in the inter-bank performance of selected banks under CAMEL parameters as against,

H_a: There are significant differences in the inter-bank performance of selected banks under CAMEL parameters.

Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Column 1	10	242.4103	24.24103	120.8741		
Column 2	10	401.5788	40.15788	550.4549		
Column 3	10	119.6358	11.96358	160.9949		
Column 4	10	17.95527	1.795527	0.402845		
Column 5	10	640.515	64.0515	517.541		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	24045.2	4	6011.3	22.25966	0.000034456	2.578739
Within Groups	12152.41	45	270.0535			
Total	36197.61	49				

Since the calculated value of F (22.25) is greater than the table value (critical value) (2.57), we reject the null hypothesis and accept the alternative hypothesis i.e., there are significant differences in the inter-bank performance of the selected banks under CAMEL parameters. The calculated P-value also reinforces the above statement.

Intra performance analysis of Conventional banks under CAMEL

The performance within the conventional and Islamic banks were

carried out in order to see whether there are significant differences in their performance to validates the high C.Vs of the sub-parameters under each of the parameters under CAMEL.

Among the conventional banks, due to its stellar performance NBB has stood first followed by BBK and AUB. BMI had to satisfy with 4th position. In order to check whether there are significant differences in the Intra-bank performance of the selected conventional banks under CAMEL, Single Factor ANOVA test was used to the check and validate the below hypothesis;

H_0: There are no significant differences in the intra-bank performance of conventional banks under CAMEL parameters as against,

H_a: There   are   significant   differences   in   the   intra-bank performance of conventional banks under CAMEL parameters.

Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Column 1	4	66.39259	16.59815	13.60686		
Column 2	4	137.6349	34.40873	89.8791		
Column 3	4	44.90338	11.22585	54.63493		
Column 4	4	7.265775	1.816444	0.037442		
Column 5	4	224.8232	56.20581	83.75533		
ANOVA						
Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	7422.477	4	1855.619	38.35292	0.00000107	3.055568
Within Groups	725.741	15	48.38273			
Total	8148.217	19				

Since the calculated value of F (38.35) is greater than the table value (critical value) (3.05), we reject the null hypothesis and accept the alternative hypothesis i.e., there are significant differences in the intra-bank performance of the conventional banks under CAMEL parameters. The calculated P-value also reinforces the above statement.

Intra performance analysis of Islamic banks under CAMEL

Among the Islamic banks, due to its persistent superior performance, KFH has achieved first position followed by KHCB, which competed for the coveted place and lagged behind by marginal points. Alsalam and Albaraka have taken 3rd and 4th position respectively pushing BisB and Ithmar to 5th and 6th.

In order to check whether there are significant differences in the Intra-bank performance of the Islamic banks under CAMEL, Single Factor ANOVA test was used to the check and validate the below hypothesis;

H_0: There are no significant differences in the intra-bank performance of Islamic banks under CAMEL parameters as against,

H_a: There are significant differences in the intra-bank performance of Islamic banks under CAMEL parameters.

Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Column 1	6	176.0177	29.33628	131.5244		
Column 2	6	263.9439	43.99066	892.8209		
Column 3	6	74.73237	12.45539	256.2842		
Column 4	6	12.66978	2.11163	0.55439		
Column 5	6	415.6918	69.28197	799.2473		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	16887.17	4	4221.791	10.14643	0.00000505	2.75871
Within Groups	10402.16	25	416.0863			
Total	27289.32	29				

Since the calculated value of F (10.14643) is greater than the table value, critical value (2.758), we reject the null hypothesis and accept the alternative hypothesis i.e., there are significant differences in the intra-bank performance of the Islamic banks under CAMEL parameters. The calculated P-value also reinforces the above statement.

Summary of findings

Based on the analysis it can be safely concluded that the selected Islamic and Conventional banks of Bahrain under study are adequately capitalized for their operations. KFH and KHCB have justified their top rank positions among their peers in the group by maintaining top positions in all the sub-parameters of composite capital adequacy.

The LLR/GL ratios of BMI, Ithmar, BisB and BBK categorically indicate that the loan portfolio of these banks require an immediate review and strict surveillance and monitoring.

All banks except for BMI, Ithmar, BisB have successfully reduced their impaired loans to gross ratio. There is a need for these three banks to scrutinize their loan portfolios more cautiously.

Alsalam bank performed very well in all sub-parameters. However, it has lagged in recurring earning power, which is a quintessential variable determining the growth levels of banks.

The mean CTI ratio for the group was 63.49 percent. It implies that 36.51 percent was the contribution towards fixed charges and other margins. It can be considered as highly satisfactory. A noteworthy observation is that conventional banks have been able to perform better than Islamic banks in this particular sub-parameter, hence their management techniques can be a lessons for the Islamic banks.

There were wide variations across the banks as well as in intra performance in most sub-parameters. Though it is reassuring for the regulator to know that the chances of bank run and panic are minimum, the wide variations could be a cause of concern for the regulator. The variations could be a topic of further studies.

Islamic banks like KFH, KHCB and Alsalam have recorded stunning performances in most of the parameters in the analysis and the last three positions went to BMI, BisB and Ithmar, which did not register their presence throughout in any of the parameters. The banking practices for the leading banks should be a lesson for the other banks. Moreover it is

imperative to check the reasons behind their unsatisfactory performance in spite of working under the same socio-economic-political-regulatory framework.

Islamic banks like KFH, Alsalam and KHCB need to be appreciated for maintaining high asset quality in spite of working in the same business environment as their peers. The banking practices of KFH should be a lesson for other members in the group.

Since Ithmar's CTI ratio is the maximum, it has to critically review its cost structure and take measures to control it. In this connection the cost control measures of the AUB should be a lesson for other members in the group.

After the advent of e-banking and internet banking any amount can be transferred from one bank to another within a fraction of seconds. Therefore there is no need to keep excess liquidity, (instead the amount can be invested profitably) and whenever need arises JIT (Just-in-Time) model be used to meet the customers demand for cash.

The mean IL/E ratio for the banks under study was 42.45 percent which is high as per the bank Management standard. The reason for such high ratio should be an area for further study. One of the major reasons for this high ratio is due to BisB, BMI and Ithmar banks, all of which have a very high IL/E as per the required standards. If we exclude, the low performers, then the mean score for the rest of the banks would be just 9.1% which denotes the enormity of the situation.

KFH, KHCB and NBB have demonstrated a spectacular performance throughout the analysis. Except for liquidity, KFH has commanded a stunning performance in all other sub-paramers. Asset quality of KHCB can be a cause of concern for its management during the long-term; hence a strict monitoring is necessary. Though it has topped among other conventional banks, NBB has been pushed to 4th position in capital adequacy when compared with other top performers. Alsalam bank had a performed well in all parameters, however, there is room for improvement under the management efficiency parameter.

AUB and BBK's position with respect to capital adequacy can be a cause of concern for the regulator.

NBB needs to be little careful regarding its lending decisions as in some of the significant sub-parameters like loan loss reserve to gross loans LLP/NIR, impaired loans to equity and cost to income, its performance was very low compared to its peers. Though it is understandable that NBB cannot be completely profit driven in its operations especially lending, compromising quality and efficiency in the current scenario will be costly in the long run.

Through-out the CAMEL analysis, Albaraka, BisB, BMI and Ithmar in the group couldn't ensure their presence in any of the parameters or sub-parameters.
In most of the ratios, Ithmar has continuously been pushed to 6th position.

Overall there are significant differences in the performance across the banks in CAMEL parameters even though they work under the same socio-economic-political-legal and regulatory framework.

Though the selected conventional and Islamic banks work under the same framework there are marked differences in the intra as well as interbank performances. The empirical results based on CAMEL ranking as well as statistical study based on ANOVA, validates this preposition.

Conclusion, suggestion and areas for further research

The present study is an attempt to examine the financial performance of selected conventional and Islamic Retail banks using CAMEL framework in order to assess the efficiency of these major banks in Kingdom of Bahrain.

It is an exploratory study conducted with special reference to selected 10 retail commercial banks. Comprehensive review of literature has enabled the researcher to identify the following research gaps:

The conclusions derived by the earlier researchers were contradictory to each other.

Parameters and sub-parameters chosen to measure efficiency were not uniform.

Most of the earlier studies which have adopted CAMEL framework, used absolute values to measure financial performance thus distorting the results and

To resolve the above issues and to smooth the inconsistencies, this study has been undertaken.

The study through the CAMEL ranking system has inferred that contrary to earlier findings in the rest of the world, Islamic Banks performed well in all of the parameters and sub-parameters. Except for NBB, other conventional banks like BBK, AUB couldn't compete with the Islamic banks and throughout the analysis BMI was pushed to low ranks.

Inferences drawn

What are the indicators of financial performance and what are the models used to measure it?

Financial performance can be gauged by measuring efficiency. CAMEL rating or ranking methods are used to measure financial performance. Current study has used CAMEL ranking method.

Were there any significant differences in the inter-group and intra-group financial performance of Conventional vis-à-vis Islamic banks with reference to CAMEL ratios? (within the groups and across the groups)

As detailed out in section 5, there are significant differences in the inter as well as intra performances of the banks under study.

What are the suggestions and recommendations for policy formulations?

Detailed in section 6.2

Suggestions and Recommendations

BMI, Ithmar, BisB and Albaraka should critically review their loan portfolio, assess the credit worthiness of its borrowers and try to reduce their LLP/GL, IL/GL and IL/E ratios.

KFH and Alsalam need to be appreciated for maintaining high asset quality in spite of working in the same business environment as its peers do.

The banking practices of these banks should be a lesson for other members in the group.

An area of Improvement for the Islamic banks is CTI ratio, they need to critically review their cost structure and measures taken to control it. In this connection the cost control measures of the AUB, NBB and BBK should be a lesson for other members in the group.

Banks keeping high liquidity has both merits and drawbacks. After the advent of e-banking and internet banking any amount can be transferred from one bank to another within a fraction of seconds. Therefore there is no need to keep excess liquidity, (instead the amount can be invested profitably) and whenever need arises JIT (Just-in-Time) model be used to meet the customers demand for cash.

In this connection there are two diametrically opposite views regarding the quantum of liquid Assets (conservative school advocating higher ratio to meet the customers demand for cash) whereas the Neo-Banking school advocating the use of e-transactions to meet the customer's demand for cash (JIT model) and more profitable investment of the excess liquidity to earn higher income.

Small banks with respect to asset size like KHCB, KFH and Alsalam performed much better than big banks like AUB and Albaraka. It will be interesting for the management to check whether this adverse performance is attributed by the advent of scales diseconomies.

Directions for Further Research

The mean IL/E ratio for the group was 42.45 percent which is high as per the bank Management standard. The reason for such high ratio should be an area for further study.

Wide variations across and within the banks in the CAMEL sub parameters should be an area for further study. It is interesting to note that the variations in making provision for the loan loss across the banks were more pronounced thus indicating differing perception of the individual banks regarding loan loss. The reasons for such higher provision may be an area for

further research.

Cost reduction is one of the best generic strategies and hence the cost model of the AUB, NBB and BBK was really fascinating and therefore it should be a lesson for some of the Islamic banks.

It is encouraging to note that in 5 out of 10 banks, LLR/GL ratio was around 3 percent. But in case of BMI (9.2 percent), Ithmar (8.7 percent), BBK (5.1 percent), the loan loss perception was higher. The reasons for the higher proportion of doubtful loan should be an area for further study.

In a conservative system, net placer of funds was considered more liquid and in a liberalized regime, need based liquidity might be more appropriate than excessive locking up of funds in anticipation of demand for cash (liquidity). With so much advancement in e-transactions and net banking the second method viz: JIT (Just in time) appears to be more efficient and profitable than the conventional system. The trade-off between liquidity and profitability of the two different systems may be an area for further research.

It is evident from the analysis that the Islamic banks have outperformed the conventional banks which reinforces the conclusions already drawn in section 5 that there are significant differences in the intra and inter performance of Islamic and Conventional banks in kingdom of Bahrain. In spite of working under the same framework there are marked differences in the intra as well as interbank performances of the conventional and Islamic banks under study. The empirical results based on CAMEL ranking as well as statistical study based on ANOVA, validates this preposition. This result has disproved the popular conception that conventional banks perform better than the Islamic banks. 2 of the Islamic banks have done better than the oldest bank in Bahrain, NBB as well as other conventional banks under study. Alsalam bank has better performed than the BBK and AUB. Thus contrary to conclusions drawn in other studies by Samad, Hasan, Maher Mohammed, Dirdi and Rosnia, in Bahrain, Islamic banks have better performed than the conventional banks.

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Appendix 1

Table 1. Capital Adequacy Table:

Composite Capital Adequacy											
T C R		T 1 R		E/TA		E/NL		E/TL		Overall Rank	
Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank
Retail Banks											
KHCB	33.3	1	37.3	1	27.8	1	72.8	3	41.5	1	1.4	1
Al Salam	22.1	4	23.5	3	23.4	3	93.0	1	30.9	3	2.8	2
KFH	23.0	3	17.8	4	24.5	2	59.6	4	34.5	2	3.0	3
NBB	26.4	2	23.8	2	12.1	6	32.4	5	13.8	6	4.2	4
BMI	17.9	5	17.6	5	12.5	5	21.7	8	14.7	5	5.6	5
BISB	13.2	8	10.8	8	14.0	4	26.3	6	17.0	4	6.0	6
Albaraka	N/A	10	N/A	-	10.6	9	73.7	2	11.9	9	6.7	7
Ithmaar	12.8	9	12.1	7	11.1	7	25.3	7	12.5	7	7.4	8
AUB	15.3	7	10.3	9	10.8	8	19.7	9	12.4	8	8.2	9
BBK	17.4	6	13.1	6	9.9	10	18.7	10	11.3	10	8.4	10
Average	20.2		18.5		15.7		44.3		20.0			
Standard Deviation	6.73		8.69		6.77		27.63		11.17			
Coefficient of Variation	33.38		47.07		43.22		62.34		55.72			

Table 2. Asset Quality Table:

Composite Asset Quality											
	LLR/GL		LLP/NIR		LLR/IL		IL/GL		IL/E		Group Rank	
	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank
Retail Banks												
Al Salam	0.9	1	56.7	7	75.8	4	1.7	1	2.6	1	2.8	2
KFH	2.5	3	2.5	2	322.9	1	3.0	3	4.6	2	2.2	1
NBB	2.5	4	5.5	3	109.1	3	4.1	4	10.6	3	3.4	3
Khaleeji	4.9	6	-12.2	1	72.2	5	7.1	5	16.1	5	4.4	5
AUB	2.9	5	24.1	6	130.1	2	2.2	2	11.8	4	3.8	4
BBK	5.1	8	19.6	5	72.0	6	7.4	6	42.2	6	6.2	6
BISB	4.9	7	78.4	9	35.9	9	21.8	9	140.7	9	8.6	9
BMI	9.2	10	67.1	8	66.2	7	14.9	7	81.5	8	8.0	7.5
Ithmaar	8.7	9	274.4	10	54.0	8	15.9	8	71.8	7	8.4	7.5
Albaraka	2.3	2	18.5	4	-	10	-	-	-	-	-	10
Average	4.39		53.46		104.23		8.68		42.45			
Standard Deviation	2.76		83.05		86.62		7.18		47.06			
Coefficient of Variation	62.96		155.34		83.10		82.75		110.87			

Table 3. Management Efficiency Table:

Composite Management Efficiency											
	REP		NOI/NI		E/TA		OP/RWA (%)		CTI		Group Rank	
	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank
Retail Banks												
AUB	2.1	5	-12.8	4	10.8	8	1.8	3	32.3	1	4.2	4
BBK	2.3	3	-24.3	3	9.9	10	1.7	5	43.9	3	4.8	5
NBB	2.2	4	-4.6	5	12.1	6	1.8	3	34.5	2	4.0	3
BMI	0.6	8	17.5	10	12.5	5	-0.9	7	81.1	8	7.6	8
BISB	1.9	6	13.1	8	14.0	4	-1.4	9	64.2	6	6.6	7
Albaraka	0.2	9	15.3	9	10.6	9	-	-	93.3	9	9.0	10
Khaleeji	3.1	1	-101.0	2	27.8	1	2.2	2	73.2	7	2.6	2
KFH	2.6	2	-156.8	1	24.5	2	2.5	1	57.4	5	2.2	1
Al Salam	1.8	7	8.8	7	23.4	3	1.0	6	52.5	4	5.4	6
Ithmaar	0.0	10	-2.8	6	11.1	7	-0.9	8	102.5	10	8.2	9
Average	1.66		-24.76		15.67		0.85		63.49			
Standard Deviation	1.06		57.97		6.77		1.52		23.98			
Coefficient of Variation	63.56		-234.12		43.22		177.68		37.76			

Table 4. Earning Quality Table:

Composite Earning Quality											
	NIM		NIR/AA		OOI/AA		ROAA		NIE/AA		Group Rank	
	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank
Retail Banks												
AUB	2.2	8	2.0	7	1.1	8	1.4	6	1.5	2	6.2	8
BBK	2.8	3	2.4	3	1.5	5	1.5	5	2.2	4	4.0	2
NBB	2.6	5	2.5	2	0.9	9	2.0	2	1.3	1	3.8	1.5
BMI	2.5	7	2.3	5	0.8	10	-1.2	10	4.1	10	8.4	10
BISB	2.6	4	2.4	4	1.6	4	-0.4	8	3.9	9	5.8	7
Albaraka	3.7	2	1.4	8	1.3	6	-0.1	7	2.9	5	5.6	3.5
Khaleeji	5.3	1	4.7	1	1.3	7	1.9	3	3.1	7	3.8	1.5
KFH	2.6	6	2.2	6	3.4	1	2.3	1	3.0	6	4.00	2
Al Salam	1.6	9	1.2	9	2.2	3	1.6	4	2.0	3	5.6	3.5
Ithmaar	0.1	10	0.1	10	2.7	2	-0.8	9	3.6	8	7.8	9
Average	2.6		2.1		1.7		0.8		2.7			
Standard Deviation	1.32		1.18		0.84		1.28		0.97			
Coefficient of Variation	50.69		55.06		49.98		159.40		35.46			

Table 5. Liquidity Table:

Composite Liquidity											
	IBR		NL/TA		NL/TDB		LA/TSF		LA/TD & B		Group Rank	
	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank	Average	Rank
Retail Banks												
AUB	68.4	8	54.7	7	64.3	7	22.4	7	21.4	3	6.4	8
BBK	100.9	7	53.3	6	61.7	5	25.8	6	22.9	4	5.6	5
NBB	146.7	4	40.7	2	46.6	2	27.2	5	27.2	5	3.6	2
BMI	144.8	5	58.7	9	69.7	8	34.7	4	32.1	8	6.8	9
BISB	132.4	6	55.4	8	-	10	21.5	8	-	-	7.3	10
Albaraka	404.4	1	63.9	10	72.9	9	18.9	10	13.8	1	6.2	7
KHCB	168.4	3	42.8	4	64.0	6	38.6	3	29.9	6	4.4	3
KFH	55.4	9	40.9	3	61.1	4	47.7	2	30.8	7	5.0	4
Al Salam	198.6	2	27.7	1	36.6	1	73.3	1	72.5	9	2.8	1
Ithmaar	34.6	10	43.8	5	51.2	3	19.0	9	18.8	2	5.8	6
Average	145.5		48.2		58.7		32.9		29.9			
Standard Deviation	104.84		10.84		11.65		16.99		17.08			
Coefficient of Variation	72.07		22.49		19.85		51.64		57.08			

The Impact Of Analysts' Recommendations On The Cost Of Debt: International Evidence

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Abstract

The purpose of this paper is the determination of the link between analysts' recommendations and bonds' ratings. The study for this paper took 12 years and was based on a sample of 26 countries. The aim is to identify the positive relationship between analysts' recommendations and the rating of bonds. Thus, a probit regression analysis was made for this purpose. Therefore, it was strongly stated that there is an intense correlation between the recommendation and the bond's rating. In other words, the more the company is able to receive positive analysts' recommendations, the better is the rating of its bonds. More confirmation to the creditors' rights shields was added through our outcomes, in addition to its impact on the cost of debt.

Keywords: Analysts' recommendation, Credit ratings, Default risk

Introduction

For the stock market to function efficiently, it needs accurate information. Once the appropriate information concerning the firms is merged with the prices, the securities are fairly priced. In fact, financial analysts work on highlighting new information related to the firm which will

help them in this process, credit rating is one of them. The investment decisions are usually taken by the stock market participants using the research reports of analysts, their projections, and recommendations as precise information. Jensen and Meckling (1976) propose that financial analysts, regarded as information intermediaries, have the ability to lessen the agency problems that firms are facing. The market value of an enterprise is a growing function of the width of investor attentiveness as Merton (1987) claims. In order to raise the responsiveness of an investor concerning a company, conventional wisdom recommends one technique to realize this which is the positiveness of analysts' recommendations. Satt (2014) asserts that the credit rating of a business is a positive function of the number of positive analyst recommendation regarding the same company

In this paper, we trace the relationship between analysts' recommendations and credit rating; we assume that both, credit rating agencies and analysts are both financial specialists of the same level; however, we have the intuition that positive analysts' recommendations concerning a firm lessen its cost of debt. External financing costs for companies decline when analysts issue positive recommendations. And this scenario is due to the consciousness that the company is capable to pay back creditors and shareholders at any time and hence, they demand for lower return. A positive analyst recommendation might affect many other sides of the company such as the positive influence on the ratings of bonds. Company has higher rating bonds, consequently the call for lower returns by creditors. Generally, some studies have been directed vis-à-vis the effect of default risk levels on cost of debt of companies. Still, no study was conducted to assess the following hypothesis: Do rating agencies value the positive analyst recommendation on a company when rating firms' bonds? If our outcomes support this hypothesis, a positive analyst recommendation may cause then lowering the costs of debts.

The objective is to study the relationship between the positive analyst recommendation and the cost of debt for companies and how each affects the other. This means the correlation between the rating agencies decisions and

the analyst recommendation on a company, whether it is positive or negative.

Literature review

Information is significant to point to efficient functioning of the stock markets. Securities get priced correctly when pertinent information about companies get merged into the prices. Financial analysts play an essential role in this process by carrying out new information about companies. These analysts are capable to decrease agency problems within the company Jensen and Meckling (1976). Merton (1987) claims that the market value of a firm is an increasing function of the breadth of investor awareness.

Satt (2015) stated that when a company is perceived to be highly performing in "the eyes" of the financial analyst, the risk of default is very low, so the more the company is performing the better will be its credit quality, hence higher the quality credit terms. It is also found that when the overall market believes in the good performance of a company, this latter will have the pressure to keep its positive performance.

Prior literature documents optimistic bias in analyst recommendations (Lin & McNichols, 1998; Barber *et al.,* 2007; Lai & Teo, 2008). Jegadeesh *et al.* (2004), for example, report that average analyst recommendation is close to a Buy recommendation. They also show that Underperform or Sell recommendations make up less than five percent of all recommendations. In another related study, Jegadeesh and Kim (2006) document similar findings by reporting that almost half of analyst recommendations are either Strong Buy or Buy in the G7 countries. They also show that unfavorable recommendations (Underperform or Sell) constitute less than fifteen percent of total recommendations. Prior literature identifies numerous reasons behind why analyst recommendations are skewed towards favorable recommendations (Das *et al*., 1998; Lin & McNichols, 1998; O'Brien *et al*., 2005). Most of these reasons are related to certain features of the work environment that encourages analysts to issue favorable recommendations.[9] Jackson (2005), for instance, argues that the

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[9] Lin and McNichols (1998) note that investment banking pressures result in optimistic bias

pressure to generate brokerage commissions can induce analysts to issue optimistic recommendations.[10] Given that favorable recommendations generate more brokerage commissions than unfavorable recommendations, analysts are under considerable pressure from their employers to issue optimistic recommendations (Eames *et al*., 2002).[11]

Analysts' recommendations and the Cost of Debt

Many characteristics are supposed to influence the company's cost debt, we suspect that analysts' recommendations are one of the important variables that affect the cost of debt. Giving numerous factors (refer to table 1 for more information about these factors), a scale from 0 to 5 was given to the analysts' recommendations. Results revealed that when there is a rise in the score, there is a decline in the cost of debt.

We have the following hypothesis:

H1: Generating positive analyst recommendation will lower the company's cost of debt financing.

H2: Generating positive analyst recommendation leads to higher bonds ratings.

The study we are conducting is going to bring more value since the existing one is very limited. The first goal is to evaluate the perception of the

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in analyst recommendations. They show that lead underwriter analysts issue more favorable recommendations than unaffiliated analysts. McNichols and O'Brien (1997) argue that analysts are tempted to be optimistic because firms select those underwriters that are more optimistic.

[10] Analyst's compensation, partly, depends on trade generated by him.

[11] A competing strand of literature associates behavioral biases with optimistic bias in analyst recommendations. Cornell (2001), for example, finds that analysts are reluctant to recognize negative changes in corporate fundamentals. He argues that cognitive processing biases affect formation of analyst recommendations. Similarly, Abarbanell and Lehavy (2003) consider cognitive obstacles as the main reason behind analyst's reluctance to downgrade his opinion.

corporate bond market of the quality of the company's liquidity. The second objective, the study we are making is not the same as Jenzazi (2010) and the other studies because it will stress on the international framework when it comes to this issue. That is to say that not only we will have a better understanding of the functioning of the different debt markets around the world, but this will enable us to perceive in a way the external governance mechanisms (such as the legal and extra-legal institutions) relate to the semi-internal mechanisms (in our case analysts' recommendations) in order to improve the entire governance quality in one country.

Methodology
Specifications

The purpose of the research is to determine the relationship between analysts' recommendations and bonds' ratings. The following general specification will be used for this purpose.

Bond Rating = f (Analysts' Recommendations, Issuer Characteristics, Issue Characteristics)

The determinants used to make the study are the three following: Analysts' recommendations, Issuer Characteristics, Issue Characteristics. Issue Characteristics variable refers to the profitability of the company computed using the company's return on assets, the company size which measured by the company total assets, the company risk that is measured by the company variability of earnings, and the leverage that is measured by the debt to equity ratio. This variable is composed of issue size or the size of the bonds, the bonds maturity, and the convertible provision (an option enabling a bondholder to exchange the bonds for shares).

The rating bonds used are from seven distinct ordering categories (exemplified by the S&P ratings). The last statement signifies that since the bond rating is an ordinal variable, we can use the Ordered Probit Model.

Data Sources and Variables

Our sample is made of 600 companies selected from 26 different

countries. Table 2 represents the description of this sample between year 2002 and 2014. The ratings bonds used have a range from AAA to D, taken from S&P credit rating and they represent companies' credit worthiness. This enable to distinct between the companies that can repay back their loans at due dates and those who cannot. Appendix reveals that the proposed ratings obtained from S&P have been converted to ordering numbers ranging from 1 to 7, 1 representing the lowest rating and 7 the highest one. To convert the ratings we used the research that was conducted by Ashbaugh, Collins, and LaFond (2006). The data of bonds ratings were obtained from F- Database. See Table 2 in annex.

The value of 1 is given to the dummy variable that is the analyst recommendation if it is positive (buy or strong buy) and 0 otherwise.

To provide more clarification about the bonds ratings, to control variables were added to the model that are the issue and issuer variables. More details concerning these variables are provided in Table 1. The control variables data were acquired from W.S Database.

Following the research papers of Anderson, Mansi and Reeb (2003) and Boukhari and Ghouma (2008), the computation of the bonds ratings, the convertible provision, and the issue size (the issue characteristics) was based on a portfolio approach. We collected the entire company issues associated to each year, and the size of the issue to the total issues represented the weight used in the computation of the average bonds ratings, the convertible provision, and the issue size related to each company over every year of the duration of our research.

The model of the bond rating can be presented this way:

Prob. (Bonds Ratings=X) = F (b_1. Analysts' Recommendations + b_2. Company Profitability + b_3. Company Size + b_4. Company Risk + b_5. Bonds Maturity + b_6. Convertible Provisions + b_7. Issue Size + b_8. Leverage + Institutional variables + Year Dummies+ Industry Dummies + ei); Where X belongs to {1, 2, 3, 4, 5, 6, 7}

Empirical results

Panel (A), table 3 represents the descriptive statistics related to the variables used in our study that starts with the credit rating variable with a mean equal to 4.432 and that represents an S&P rating of BBB+. See Panel A in annex. The first variable in the issuer characteristics variables represents analysts' recommendations with a mean equal to 0.71. This means that approximately 71% of the companies of the sample are having a positive recommendations. A result that confirms what Jegadeesh *et al.* (2004) presented, claiming that most of analysts' recommendations are close to "buy" recommendations, the same phenomenon was discussed by Satt (2014). The average mean for the return on assets concerning the profitability of the company is 4.03. 65 million dollars, which was calculated by averaging the total assets of the 600 companies composing the sample, represent the mean of the company size. 5.44 years state the mean average for the bonds maturity based on the issuance variables. The second variable is represented by the convertible bonds option; it has a mean equal to 8.5% which means that 8.5% of the companies gave this option to their bondholders.

Panel (B1) from Table 3 illustrates the relationship between the bond rating taken as the dependent variable and the other independent variable that are the analysts' recommendation, the issue characteristics variables, and the issuer characteristics. Consequently, there is a strong relationship between the dependent variable and the various other independent variables.

The analysts' recommendation, the company performance, the company size, and the convertible option are positively correlated to the dependent variable at important levels of less than 1 percent.

Additionally, it was shown that the company leverage is interrelated positively at a significant level of 5 percent. Nevertheless, only one variable that is represented by Bonds maturity was found negatively related to the Bond Ratings at an important level of less than 1 %. On the other hand, it was revealed that there is no significant relationship between the two variables, the issue size and the company and the bonds ratings. See Panel

B1 in annex.

To verify the first hypothesis a mean comparison tests was conduct and the sample was divided into sub groups. The first one represents companies with positive recommendation and the second was about the remaining. A T-test affirms the hypothesis knowing that the first group's mean has a higher value (4.7) compared with the second group's mean (4.1). Moreover, both the T-test and the Wilcoxon-Mann-Whitney test approve the difference between the two means that is significantly different from zero (5% significance level).

This information indicates that this company is one of those with positive recommendations that benefits from higher credit ratings. See Panel B2 in annex.

Panel A from Table 4 represents the results of the ordered Probit estimation about bonds rating. These results are the same as the results we expected from the study. The results clearly state that there is a positive relationship between bonds ratings and analysts' recommendations with +0.4 at a significance level of 5%. Thus, this confirms the first hypothesis made about the study saying that there is a positive correlation between analysts' recommendations and bonds ratings. Both the company profitability and size impact positively the bonds ratings. Nevertheless, concerning the convertible bonds option, it is the only variable that is capable to have a meaningful positive effect on companies' bonds ratings. On the other hand, no significant effect on the bonds ratings is caused by the other issue and issuer variables. See Table 4 in annex.

The study showed that there is a significant positive relationship between analysts' recommendations and bonds ratings on an international context. A company that was able to generate a positive analyst's recommendation will automatically experience higher rating bonds. This explains that the costs of debt, in the form of bonds, are reduced because creditors request quite lower premium to lend their money.

Limitations

One major limitation was observed about the sample chosen. In point of fact, F-Database and W-Database provided us with the bonds ratings data and recommendations' data, respectively. These two databases enabled us to gather 600 observations that follow the distribution presented in Table 2. In fact, this statement could have affected our sample representativeness.

Conclusion

The study in this paper aims to show that there is a positive relationship between analysts' recommendations and the bonds rating. For this purpose, a sample of 600 companies picked from 26 different countries s used. The data used for the sample is from 2002 to 2014, a period of 12 years. Our expectations go with the results of the Ordered Probit regression. Consequently, a company able to generate a positive analyst's recommendation is cable to have higher bonds rating. In other words, a good performing company is a company with high level of bonds ratings and this affect also the cost of debt by making it lower. Knowing that there are no previous studies done to explain the purpose discussed in our paper, the research done will bring more value even in the international context. When the firm is generating positive analysts' recommendations, it gives a positive signal about the company translating the faith of analysts by issuing a positive recommendation to the faith of creditors, making the firm under talk benefiting from a low cost of debt.

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Table 1: Variables Description and Sources

Variable	Description	Source
Bonds Ratings	Appendix A gives detailed information about this ordinal variable. The bond ratings that are used by S&P are converted to a range from 1 to 7 where 1 is the lowest rating and 7 the highest rating. The rating of bonds depends on the company bonds portfolio.	F-Database
Company' average recommendation	A dummy variable that is assigned 1 if the company's yearly average recommendations is positive and 0 otherwise.	W-S Database
Company Profitability	A variable that measures the profitability of the company by dividing its net income to its total assets	W-S Database
Company Size	The company size is determined by its total assets in dollar amounts.	W-S Database
Company risk	The company's risk is measured by the standard	W-S Database

	deviation of the net income of every company in the sample.	
Bonds Maturity	A variable that measures the log maturity in years. The weights are determined by the size of the issuance of the maturity class to the total size of the issuance for a given year. Then, the weights are multiplied to the respective maturity and added to get the bonds weighted average maturity.	W-S Database
Convertible Provisions	A dummy variable that gives 1 to companys with convertible provisions and 0 to companys with no convertible provisions. These provisions allow the bondholder to convert his or her bonds to shares.	W-S Database
Issue Size	A variable that identifies the size of the issuance.	W-S Database
Leverage	A variable that identifies the leverage of the company; measured by dividing the company debts to its equity.	W-S Database
Creditors Rights	This variable is an index that ranges from 0 to 4. When a country imposes restrictions in the favor of creditors, 1 is added to its score. When the secured creditors ensure that they will get their investment back, the score becomes 2. When the secured creditors are the first to receive their money in case of bankruptcy, the score becomes 3. At the end, when the secured creditors don't wait till the problems are solved to get their money back, the score becomes 4.	Djankov et al. (2005)
Public Registry	Public registry is a database that is developed by public authorities. This database includes all the debt positions of borrowers in the economy. The collected information is available to all financial institutions. The variable is assigned 1 if the country has a public registry and 0 otherwise.	Djankov et al. (2005)
Efficiency of Bankruptcy Process	When a company incurs bankruptcy costs, theses costs are deducted from the company terminal value and this value is discounted to get the present value. The higher the value, the better the company.	Djankov et al. (2007)
News Circulation	Daily newspapers sold divided by the number of citizens	Dyck and Zingales (2004)
Manufacturing	Dummy variable that equals 1 if the company operates in the Manufacturing industry; 0 otherwise	
Trades	Dummy variable that equals 1 if the company operates in the Trades industry; 0 otherwise Trades	
Finance	Dummy variable that equals 1 if the company operates in the Finance industry; 0 otherwise Finance	
Utility	Dummy variable that equals 1 if the company operates in the Utility industry; 0 otherwise.	

Table 2: Sample Description

The panels below give a description of the sample that was used to derive the outputs. Panel A specifies the countries that companies in the sample operate in. Panel B gives the distribution of the observation on a yearly basis (starting from 2002 to 2014). Panel C gives a description of the observations based on the industry.

Panel A: Sample Distribution per Country

Country	Number	Percent
Argentina	8	1.33
Australia	11	1.83
Austria	8	1.33
Brazil	23	3.83
Canada	136	22.67
Chile	7	1.17
Colombia	1	0.17
Denmark	7	1.17
Finland	7	1.17
France	23	3.83
Germany	35	5.83
Hong Kong	12	2.00
Indonesia	3	0.50
Israel	4	0.67
Italy	27	4.50
Japan	12	2.00
Korea (South)	22	3.67
Malaysia	2	0.33
Mexico	14	2.33
Netherlands	13	2.17
New Zealand	1	0.17
Norway	6	1.00
Philippines	6	1.00
Poland	2	0.33
Portugal	10	1.67
Singapore	10	1.67
South Africa	1	0.17
Spain	8	1.33
Sweden	19	3.17
Switzerland	15	2.50
Taiwan	13	2.17
Thailand	4	0.67
Turkey	1	0.17
United Kingdom	123	20.50
United States	6	1.00
Total	600	100.00

Panel B:Sample Distribution per Years

Years	Number	Percent
2002	2	0.33
2003	23	3.83
2004	22	3.67
2005	55	9.17
2006	80	16.67
2007	120	20.00
2008	100	20.33
2009	55	9.17
2010	45	7.50
2011	43	7.17
2012	22	5.23
2013	20	5.43
2014	13	2.17
Total	600	100

Panel C: Sample Distribution per Industries

Industry	Number	Percent
Manufacturing	230	38.33
Transport	10	1.67
Trades	40	6.67
Financial Services	243	40.50
Utility	77	12.83
Total	600.00	100.00

Table 3: Summary Statistics

The table is split into three panels. Panel (A) illustrates the descriptive statistics, Panel (B) illustrates the correlation analyses, and panel (C) gives a mean test comparison using the T-test and the Wicoxon-Mann-Whitney tests. The variables that are used are the following: Bond Ratings which is an ordinal number that ranges from 1 to 7 as the later being the highest rating and the former the lowest rating. Analysts average recommendations: a dummy variable that assigns 1 to companies that have a positive average recommendation for a given year and 0 otherwise. Company Profitability: the company profitability measured in term of its return on assets. Company Size: the total assets were used to get the size of the companies that are included in the sample. Company Risk: it is measured by the standard deviation of net income. Bonds Maturity: the average maturity for the bonds portfolio issued by a company; weights were assigned on the basis of the size of the issuance to the total issuances. Convertible Provisions: a dummy variable that gives 1 to companies with the convertible option and 0 otherwise. Issue Size: it represents the size of the issuance in term of dollars. Leverage: the company leverage is measured by the debt to equity ratio. The stars that appear in the tables mean the following: *** for a significance that is lower than 1%, ** and * are for a significance that is lower than 5% and 10% respectively.

Panel A: Descriptive Statistics

Variable	Observations	Mean	Standard Deviation
Bonds Ratings	600	4.432	1.321
Average Recommendations	600	0.423	0.342
Company Profitability	600	4.134	23.543
Company Size (in million of U.S Dollars)	600	89.89	1.54
Company risk	600	435,534.7	654,087.3
Bonds Maturity (in years)	600	6.43	0.543
Convertible Provisions	600	0.034	0.457
Issue Size	600	746,923.4	4,687,234
Leverage	600	432.367	1,432.674

Panel B1: Correlation between the average analysts recommendation and Bonds Ratings

Variable	Bonds Ratings	Average recommendation	Company Profit	Company Size	Company risk	Bonds Maturity	Convertible Provisions	Issue Size	Leverage
Bonds Ratings	1.000								
Average recommendation	0.1305 (0.0016)***	1.000							
Company Profitability	0.1156 (0.0006)***	0.0568 (0.02340)**	1.000						
Company Size	0.3688 (0.0005)***	0.0543 (0.0334)*	-0.1433 (0.887)	1.000					
Company risk	0.0209 (0.4534)	-0.0432 (0.3645)	-0.0366 (0.5976)	0.6789 (0.0004)***	1.000				
Bonds Maturity	-0.2345 (0.0003)***	0.321 (0.2342)	-0.0033 (0.8766)	-0.3456 (0.0000)***	-0.0854 (0.4434)	1.000			
Convertible Provisions	0.2345 (0.0000)***	0.0322 (0.6300)	0.0543 (0.5324)	-0.0543 (0.0065)***	0.0654 0.3324	0.0432 (0.0322)**	1.000		
Issue Size	0.0480 (0.1690)	-0.0212 (0.5431)	0.0057 (0.8700)	0.0268 (0.4432)	0.1655 (0.0000)***	-0.0751 (0.0312)**	-0.0174 (0.6175)	1.000	
Leverage	0.0865 (0.0345)**	-0.0643 (0.0778)*	-0.0083 (0.6753)	0.1045 (0.0123)***	0.0001 (0.8654)	-0.1144 (0.0064)***	-0.0539 (0.1345)	0.0045 (0.9753)	1.000

Panel B2: Correlation between the Bonds Ratings and the Institutional Variables

Variable	Bonds Ratings	Creditors' Rights	Public Registry	Efficiency of Bankruptcy Process	News Circulation
Bonds Ratings	1.000				
Creditors' Rights	0.1567 (0.0000)***	1.000			
Public Registry	0.1556 (0.0003)***	-0.3453 (0.0000)***	1.000		
Efficiency of Bankruptcy Process	0.0554 (0.4325)	0.5643 (0.0000)***	-0.8765 (0.0000)***	1.000	
News Circulation	0.1255 (0.0000)***	0.6543 (0.0000)***	-0.1245 (0.0000)***	0.6543 (0.0000)***	1.000

Table 4: The Effect of company's positive recommendation on Bond ratings

The table gives the output for the Ordered Probit Regression of the Bond Ratings as being the dependent variable. The variables that are listed below are: Bond Ratings which is an ordinal number that ranges from 1 to 7 as the later being the highest rating and the former the lowest rating. Company's recommendation: a dummy variable that assigns 1 to companies that have a positive average recommendations and 0 otherwise. Company Profitability: the company profitability measured in term of its return on assets. Company Size: the total assets were used to get the size of the companies that are included in the sample. Company Risk: it is measured by the standard deviation of net income. Bonds Maturity: the average maturity for the bonds portfolio issued by a company; weights were assigned on the basis of the size of the issuance to the total issuances. Convertible Provisions: a dummy variable that gives 1 to companies with the convertible option and 0 otherwise. Issue Size: it represents the size of the issuance in term of dollars. Leverage: the company leverage is measured by the debt to equity ratio. Concerning the other variables, more description is given in table 1. The stars that appear in the tables mean the following: *** for a significance that is lower than 1%, ** and * are for a significance that is lower than 5% and 10% respectively.

Dependent Variable = Bonds ratings	Expected Sign	Model
Analysts average recommendation	+	0.341 (0.044)**
Company Profitability	+	0.0123 (0.005)***
Company Size (in billions of U.S Dollars)	+	55.6 (0.000)***
Company risk (in millions of U.S Dollars)	-	-232 (0.765)
Bonds Maturity	-	-0.543 (0.345)
Convertible Provisions	+	0.600 (0.000)***
Issue Size	-	3.65×10^9 (0.678)
Leverage	-	-0.000 (0.234)
Creditors Rights	+	0.244 (0.056)**
Public Registry	+	1.432 (0.000)***
Bankruptcy Efficiency	+	0.006 (0.003)***
News Circulation	+	0.235 (0.075)*
Manufacturing		0.344 (0.333)
Trades		-0.008 (0.876)
Finance		0.788 (0.003)***
Utility		0.624 (0.054)*
N		600
Pseudo R²		13.67%
LR – Chi²		234.77
Significance		(0.0000)***

Appendix A: S&P Credit Ratings Conversion

S&P Bonds Ratings	From D to CCC+	From B- to B+	From BB- to BB+	From BBB- to BBB+	From A- to A+	From AA- to AA+	AAA
New Ratings	1	2	3	4	5	6	7

Economic Factors Affecting Girls Academic Performance (Kcse) In Mixed Secondary Schools: A Case Of Nakuru Municipality

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Abstract

This study intended to investigate Economic factors affecting girls' performance in mixed secondary schools. The objectives of the study were to determine Economic factors, which affect girls' academic performance (KCSE) in mixed secondary, to suggest the possible strategies to counter the Economic factors which affect girls' academic performance. The study sampled mixed Secondary Schools which are twelve in number using simple random technique to select six schools. From the sampled schools, an equal numbers of students were selected from form four classes in each school totaling 160. Sixty (60) teachers were included in the study and six (6) head teachers .Data was collected using questionnaires for students and teachers. Interviews were for head teachers. The research employed a mixed method design technique.   Data was analyzed using descriptive statistics i.e. frequencies, percentages, mean and Standard deviation. Scientific Package for Social Sciences (SPSS) was also used. The findings of the study were to provide to the education stakeholders to come up with strategies for

countering the Economic factors affecting girl's academic performance in KCSE in Nakuru Municipality. From the research findings, it was established that Economic factors affecting girls' performance were poverty levels, system of giving bursaries, and ignorance of available resources.   The recommendations made were increased bursaries, inviting resource persons to talk to girls, providing basic needs and organizing parents meeting to discuss various issues affecting the girl student.

Keywords: School based factors, KSCE, and girls

Introduction
Background to the study

Over the past three decades, there has been ongoing debate about the advantages of mixed schools and single-sex education for children's socio-emotional and educational development. This debate started with the early British findings reported by Dale (1969;1971; 1974) which suggested that mixed schools were better placed to meet the social and educational needs of young people (Dale, 1974). Up until this time, there had been a strong tradition of single-sex schooling at the secondary level, with mixed schools being less common (Cocklin, 1982). However in response to Dale's findings and increasing social concerns about the importance of cross gender socialization, most Western countries moved away from single-sex secondary education towards a commitment to mixed schooling for both boys and girls. In response to changing patterns of school organization and strong criticisms of the evidential basis upon which Dale based many of his assertions (Lee & Bryk, 1986; Marsh, 1989; Schneider, Coutts, & Starr, 1988), there has been renewed interest in the extent to which single-sex and mixed schools affect children's academic development. A lot of studies are now available which compare the educational achievement of children attending single-sex and mixed secondary schools. The results of these studies have been inconsistent, with some providing support for the benefits of mixed schools (Marsh, 1989; Marsh, Smith, Marsh, & Owens, 1988),

while others support single-sex education (Astin, 1977; Lee & Bryk, 1986; Riordan, 1985), and yet others finding no achievement differences between children attending single-sex and coeducational schools (Miller & Dale, 1974; Rutter, Maughan, Mortimore, & Outson, 1979). This issue has been further complicated by claims that school type may have and differential effect on girls and boys achievement, with boys tending to perform better in a mixed school environment, while girls tend to fare better in a single-sex school environment (Finn, 1980)

Gender parity in formal education is not only a major concern for parents, educators and policy makers, but also a basic human right, a key indicator of achievement of education for all, and a source of economic growth (Bank, Delmont and Marshall, 2007). Among the serious obstacles to female education, premature departures or dropping out from schools by female students is notable in Sub-Saharan Africa. Early departures of girls from schooling certainly result in wastage. When we talk of wastage, it means the inefficient utilization of both human and economic resources by the education system (Njau and Wamahiu, 1998). The interruption of schooling by female students is also expensive in terms of the quality of life of those who drop out as well as to the society at large. It is challenging to provide education for all citizens and to observe the Universal Declaration of Human Rights that entitles everyone to the right to basic education. As per the 2012 EFA Global Monitoring Report, Sub-Saharan Africa has the lowest total secondary enrolment (UNESCO, 2012) save for exceptional cases like Rwanda ,Lesotho where boys are more disadvantaged than girls (UNESCO,2012).Every modern society considers high girl-child completion rate in education crucial . This is because education is one of the most effective instruments a nation has at its disposal for promoting sustainable social and economic development (MoEST, 1999). It leads to increased productivity of the educated as a means of human resource development for communal benefit (MoEST 2002). Girl-child education raises economic productivity, reduces poverty and fertility rates, lowers infant and maternal mortality, and improves health, nutrition and environmental management

(World Bank 2002).

Analysis of KCSE examination results in Nakuru Municipality indicated that academic performance of girls in mixed day public secondary schools was low compared to counterparts in girls boarding public secondary schools. Table 1. As a result, the researcher sought to examine   economic factors that affected girls" academic performance in mixed day public secondary schools in Nakuru Municipality. The KCSE results show that   girls from single sex boarding schools in Nakuru district as a whole performed better in KCSE as compared to those in mixed day public secondary schools in the same area. If females manage to complete their education it is equal to investing in future progress and better standards of living with multiplier effects.   To make efforts that improve wastage due to dropouts requires a clear understanding of the extent, causes, consequences, and policy responses made to the problem of female dropouts. This understanding will be used as benchmark for policy makers to start new actions. This study is likely to create such an understanding as far as the promotion of girls' education is concerned.

NAKURU MUNICPALITY KCSE GENDER RESULTS ANALYSIS (2003-2006)

SCHOOL	2003						2004						2005						2006					
	MSS	GRADE	BOYS	GRADE	GIRLS	GRADE	MSS	GRADE	BOYS	GRADE	GIRLS	GRADE	MSS	GRADE	BOYS	GRADE	GIRLS	GRADE	MSS	GRADE	BOYS	GRADE	GIRLS	GRADE
MENENGAI	7.56	B-	8.315	B-	6.804	C+	7.226	C+	7.95	B-	6.5	C+	7.534	B-	8.29	B-	6.78	C+	7.485	B-	8.23	B-	6.74	C+
NAKURU DAY	6.33	C	6.963	C+	5.697	C	6.457	C+	7.1	C+	5.81	C	6.055	C	6.66	C+	5.45	C-	6.537	C+	7.19	C+	5.88	C
LANGALANGA	6.05	C	6.655	C+	6.655	C+	5.445	C-	5.856	C	6.44	C	5.965	C	6.56	C+	5.37	C-	5.913	C	6.5	C+	5.32	C-
FLAMINGO	5.4	C-	5.94	C	4.86	C-	4.987	C-	5.49	C	4.49	C-	5.941	C	6.54	C+	5.35	C-	5.263	C-	5.79	C	4.74	C-
ST XAVIER	5.58	C	6.138	C	5.022	C-	5.052	C-	5.56	C	4.55	C-	5.87	C	6.46	C+	5.28	C-	7.919	B-	8.71	B	7.13	C+
LANET	4.41	D+	4.851	C-	3.969	D+	5.549	C	6.1	C	4.99	C-	5.07	C-	5.58	C	4.56	C-	4.75	C-	5.23	C-	4.28	D+
MOI	4.17	D+	4.587	C-	3.753	D+	4.79	C-	5.27	C-	4.31	D+	4.902	C-	5.39	C-	4.41	D+	4.573	C-	5.03	C-	4.12	D+
KENYATTA	5.37	C-	5.907	C	4.833	C-	5.41	C-	5.95	C	4.87	C-	5.15	C-	4.22	D+	4.772	C-	5.25	C-	4.295	C-	4.3	D+
NAKURU WEST	3.75	D+	4.125	D+	3.375	D	4.159	D+	4.58	C-	3.74	D+	4.587	C-	5.05	C-	4.13	D+	4	D+	4.4	D+	3.6	D+
UPPER HILL	4.53	C-	4.983	C-	4.077	D+	4.303	D+	4.73	C-	3.87	D+	4.448	D+	4.89	C-	4	D+	4.242	D+	4.67	C-	3.82	D+
AFRAHA	3.57	D+	3.927	D+	3.213	D	3.28	D	3.61	D+	2.95	D	4.009	D+	4.41	D+	3.61	D+	5.053	C-	5.56	C	4.55	C+
NAKURU HIGH	7.58	B-	8.338	B-	6.822	C+	7.638	B-	8.4	B-	6.87	C+	7.486	B-	8.24	B-	6.74	C+	8.108	B-	8.92	B	7.3	C+
AVERAGE MASS	5.4	C-	5.89	C	4.82	C-	5.39	C-	5.9	C	4.9	C-	5.55	C	6.1	C	5	C-	5.718	C	6.3	C	5.15	C-
MSS	5.5	C																						
BOYS MSS	6.1	C																						
GIRLS MSS	5	C-																						
MSS Mean standard Score																								

Source: Ministry of Education NAKURU DISTRICT 2007 DISTRICT EDUCATION DAY 2006 KCPE/KCSE ACTIVITIES TROPHIES AND AWARDS PRESENTATIONS.

Source: Nakuru Municipality Education office-KSCE Analysis

Table 1: Nakuru Municipality Gender Results Analysis (2003-2006)

Objectives of the study

a) To determine Economic factors, which affect girls' academic performance (KCSE) in mixed secondary schools in Nakuru Municipality.

b) To come up with possible strategies to counter economic factors which affect girls' academic performance.

Research Questions

The study was guided by the following research question;

How do Economic factors affect girls academic performance

What possible strategies can counter the Economic factors, which affect girls' academic performance?

Literature Review

Economic Factors

The Economic Constraints to Educational advancement for women is closely related to cultural and structural Constraints. Parents opt to take boys to school due to financial constraints. When girls are constantly sent home for school fee, they give boys the priority to attend school. Much has been done to investigate how family background affects students' performance. The dropout of girls from schooling has been found to have links with socio-economic factors by several studies in Africa South of the Sahara. According to Odaga and Heneveld (1995), and Njau and Wamahiu (1998) the most important of these factors include direct and opportunity costs of schooling, limited employment opportunities, socio-economic status, parental/family investment behaviour, the economic value of girls, rural/ urban residence, and the level of parental education.

Direct schooling costs have been found to be the major reason parents offer for not educating girls or for removing them from the school. The charges range from, tuition, fees for registration and admission, examinations, boarding, school building fund, parent and school association fees, book rental, money for of uniforms, the provision of furniture and remedial fee . Reasons for the increasingly prohibitive cost have been

discussed from several perspectives. Graham-Browne (1991) and Nejema (1993) argue that poverty and the fiscal crises which force families to cover shortfalls have a devastating impact on households and the education system as far as girls' education is concerned. Kinyanjui, 1993, Namuddu, 1994 and Palme, 1993 link the severity of direct costs with the shift of educational costs to parents in the name of cost sharing. In Kenya these reports raise critical questions about whether government bursaries reach intended beneficiaries and in so doing expand access for those who are excluded, or whether the government reinforces the exclusion of the poor by awarding bursaries to financially able groups whose children are already in secondary school. Since children from the bottom wealth quintiles have fewer chances to enroll in secondary school than children from the top wealth quintiles, it is important that government bursaries reach the poor. A study by Njeru and Orodho (2003) on the bursary scheme in Kenya found that although there were students who benefited from bursaries, this had no significant impact on enrolment by the poor. Since children from the bottom wealth quintiles have fewer chances to enroll in secondary school than children from the top wealth quintiles, it is important that government bursaries reach the poor

Most studies are of the opinion that the direct costs or financial constraints hold back more girls than boys from schooling. The opportunity costs of girls' schooling are associated with resources/services lost due to sending the child to school. In many Sub-Saharan rural homes, it is hard to do without child labour with girls demanded more than boys (Odaga & Haneveld, 1995). The need for domestic labour has grown also with the rapid growth of urban areas. They further note that poor rural parents responded by sending their daughters into the domestic labour market in exchange for regular cash. The continuing importance of bride price, polygamy, adultery fines, and value accorded to marriage and motherhood depress the demand for female education in Sub-Saharan African societies. The prospects of low economic return for girls reinforce dropout rates in Africa. A research study carried out by Wanjiru (2007) in Mombasa on factors contributing to school drop out in public secondary schools revealed that 52.4% respondents valued

boys' education better than that of girls. Families which cannot easily afford to send both sons and daughters to school reckon that financial returns on the expenditure for girl's education are a good deal smaller than those of boys.

Historically, formal education has been linked to employment, particularly in the civil service sector in this region. There are cases where females are excluded from the labour market due to economic policies, in such circumstances boys are sent to school and girls are kept at home. In some scenarios, legal or regulatory barriers to women's participation in the labour force or policies have restricted women's access to information and resources. This perpetuate the tradition that girls stay home from school to do more domestic chores Herzl, 1991.It has also come out that many girls perceive marriage as an escape from family poverty, and mistakenly believe that pregnancy will help them to "hook" husbands (Odaga & Haneveld, 1995).

Girls from rich or average homes who live in urban areas, and whose parents are better educated are more likely to enroll and remain in school longer than those from poorer homes and rural areas. In areas where overall enrolments are low, the gender gaps in participation are wider (Cammish & Brock, 1994; Davison & Kanyika, 1992). The parental perceptions or investment behaviour concerning the irrelevance of girls' education influences both the enrolment and persistence of female pupils in schools. Odaga and Heneveld (1995) indicate that the educational investment behaviour or decisions of most African families is based on gender-differentiation, birth-order and number of siblings. Boys are seen as better investment than girls and that they are also better at school. This further stressed by Davison (1993) who indicated that parental decisions to educate boys are also influenced by patrilineal inheritance systems where boys are prime beneficiaries. He says there is a strong belief among families that, once married, girls become a part of another family and the parental investment is lost. Ombongi (2008) in his study carried out in Isiolo Kenya one of the ASAL districts, found that early marriages influenced participation in education as girls in standard 4 or between 12 and 14 years were

withdrawn from school to be married off to wealthy men in the community in exchange for dowry.

Research methodoly

This section describes the research methodology that was used in the study. It explains the research design, target population, sampling procedure, sample size, research instruments, validation procedures, data collection and analysis procedures.

Research design

The study adopted a mixed method design an approach to inquiry that combines or associates both qualitative and quantitative forms (Creswell, 2007).It is more than simply collecting and analyzing both kinds of data; it also involves the use of both approaches in tandem so that the overall strength of a study is greater than either qualitative or quantitative research (Creswell & Plano Clark, 2007).

Target Population

The target population for this study was 12 public mixed secondary schools within Nakuru Municipality. From the sampled schools, an equal numbers of students were selected from form four classes in each school totaling 160. Sixty (60) teachers were included in the study and six (6) head teachers.

Location

The study was carried out in Nakuru Municipality, of Nakuru District because the problem of girls poor academic performance in KCSE in mixed secondary schools has been phenomenal as evidenced by the poor performance mentioned. Therefore there is a need to carry out study to determine the economic factors responsible and for this to establish the possible strategies that the secondary schools use to address this challenge.

Sample and Sampling Procedure

A sample is a small proportion of a target population. Sampling means selecting a given number of subjects from a defined population as a representative of that population. Any statement made about the sample should also be true to the populations Prewitt (1980). According to Napa (1997) a research should select a sample large enough to improve the likelihood of obtaining results that are similar to what would be obtained using the entire population. A 50% sample is recommended for populations that run in hundreds for population that runs in thousands, 5% to 20% may be drawn. This was the convenient sample for the study.

The study sample was six (6) schools, six (6) head teachers, sixty (60) subject teachers, sixty (60) girls. The school included in the study were selected through simple random sampling techniques, which gave the six (6), head teachers who participated in the study. This technique was used to select these schools because these institutions are of similar characteristics i.e. mixed schools. Purposive sampling technique was used to select the ten (10) subject teachers in every school. The ten (10) subject teachers were those examined in KCSE: Maths, English, Kiswahili, Biology, Chemistry, Physics, History, Geography, Business Studies and Agriculture. The ten (10) girls from every school that were included in the study were selected by using simple random sampling technique because the performance of such students similar i.e. poor performance with a mean grade of C- in almost all the school in the sample.

The total number of respondents included in the study were as shown in table 2 below.

Table 2. Total number of respondents

RESPONDENTS	NUMBERS
Schools	6
Head teachers	6
Subject teachers	60
Form four students	
Female Students (girls)	60

Research Instruments

Two types of instruments were used for the study; questionnaires and interview guide.

a) Students Questionnaires

Sixty (60) students were issued with questionnaires to answer. The students were form fours so it was appropriate for them to answer the questionnaires.

b) Teachers Questionnaires

Questionnaires were administered to form four subject teachers. They are conversant with what goes on in class and outside classrooms.

Head teachers' Interview schedule

The interview guides were used to respond to verbal responses from the head teachers of the six selected schools regarding poor performance of girls. The researcher went for this because the head teachers also teach the students. They are the ones who collect fees so they know the financial problems as they interact with parents personally. They are also directly involved with disciplinary cases involving the students.

Validity of the Instruments

Validity of the instrument to be used for data collection was determined through content validity procedure by seeking expert judgment and discussion with the supervisors and other professionals.

Reliability of the instrument

Reliability of the instrument concerns the degree to which a particular measuring procedure instrument gives similar results over a number of repeated trials.

A test – retest or coefficient of stability method was used to estimate the degree to which the same results could be obtained with a repeated measure of accuracy of the same concept in order to determine the reliability of the instrument. It was assumed that responses to the two tests would be very similar because the latter reflects the same thing (content) for

respondents.

Score obtained by each respondent on the first and second test was quite close. If they were not then the instruments would have been of low reliability.

In order to test reliability of the instrument in the study, following steps were stipulated

a) The developed questionnaire was given to a few identical subjects for the study in four mixed schools in Naivasha Municipality.

b) The answered questionnaire was scored manually.

c) The same questionnaires were administered to the same group of subjects after a period of two weeks.

d) The questionnaire responses were score manually

e) A comparison between answers obtained in b and d above were made.

A Pearson's product moment formula for the test – retest was employed to compute the correlation coefficient in order to establish the extent to which the contents of the questionnaire are consistent in eliciting the same responses every time the instrument is administered.

Data Collection Techniques

The researcher obtained a research permit from the Ministry of Education headquarters at Jogoo House (Nairobi) to seek for permission to visit schools as they fall under it. From the Ministry, the researcher got permission from the District Education Officer, Nakuru District to visit Schools. The researcher then visited six secondary schools in Nakuru Municipality informing them about this study and organizing with school heads to meet the teachers and students. Lastly, there was the actual visit to schools to administer questionnaires to teachers and students in sampled schools and interview session with the head teacher.

Data Analysis

The data collected was subjected to mixed method analysis approach.

The sample size was 132 which can allow the generalization of the study. The researcher used wave analysis to determine response bias that is, the researcher examined returns on select items week by week to determine if average responses change (Creswell 2007). Those who returned surveys in the final weeks of the period were considered nearly all non-respondents. Descriptive statistics like mean, mode, frequencies, percentages and charts were used.

Data presentation and analysis

The principal guiding factor was that data analysis presented in this chapter was the study objectives highlighted as follows.

To determine if there is a relationship between girls' poor performance and Economic factors.

To determine the possible strategies that can counter the Economic factors, which affect girls' academic performance.

The collected data was analyzed using descriptive statistics. Frequency distribution tables and percentages were used to help in cross tabulation of data. According to Orodho (2004), tables and more so dummy tables describe statistical results more clearly and economically than words.

Demographic Data of Study participants

There were five head teachers out of the six intended who participated in the study. Table 3 presents the age, gender, academic and professional qualifications of the head teachers who participated in the study.

Table 3: Head teacher's frequency

AGE BRACKET	FREQUENCY	PERCENTAGE %
31-40 YRS	3.0	60.0
41-50 YRS	1.0	20.0
50 YRS AND ABOVE	1.0	20.0
TOTAL	5.0	100.0
ACADEMIC QUALIFICATIONS		
Dip	1.0	20.0
BA/BSc With PGDE	1.0	20.0
B.ED	3.0	60.0
TOTAL	5.0	100.0
EXPERIENCE		

6-10 YRS	1.0	20.0
11-15 YRS	1.0	20.0
16 YRS and above	3.0	60.0
TOTAL	5.0	100.0
SCHOOL		
DAY SCHOOL	4.0	80.0
FULL BOARDING	1.0	20.0
TOTAL	5.0	100.0
STREAMS		
SINGLE STREAMED	1.0	20.0
DOUBLE	1.0	20.0
TRIPLE	3.0	60.0
TOTAL	5.0	100.0

Source: Head teacher's questionnaire

Their age and academic qualifications are as given in the table. The table shows most of the head teachers, 60% of them are B.ED holders the best requirement for secondary education. The years of experience are quite high-16years and above. This makes them better in handling the girls in school having dealt with them for long. Majority of them, 60% are in triple streamed classes a sign that majority deal with big numbers which is likely to lead to neglect of other students, especially girls who may need special attention.

The study also involved subject teachers.   55 teachers out of the initial sixty from the six schools were involved in the study.   Their demographic data involved age, academic qualifications and experience. This is given in table 4.

Table 4: Teachers Frequency

AGE BRACKET	FREQUENCY	PERCENTAGE %
20-30 YRS	4.0	7.3
31-40 YRS	36.0	65.5
41-50 YRS	15.0	27.2
TOTAL	55.0	100.0
QUALIFICATIONS		
DIP	13.0	23.6
BA/BSC with PGD	15.0	27.0
B.ED	22.0	40.0
M.ED	4.0	7.3
MA/MSC	1.0	1.8
TOTAL	55.0	100.0
EXPERIENCE		
BELOW 1 YRS	2.0	3.6
1-5 YRS	2.0	3.6

6-10 YRS	6.0	10.9
11-15 YRS	27.0	49.2
16 YRS and above	18.0	32.7
TOTAL	55.0	100.0
STREAM		
TRIPLE	40.0	72.7
DOUBLE	11.0	20.0
SINGLE	4.0	7.3
TOTAL	55.0	100.0

Source: Teachers Questionnaire

Most of the teachers fell in the age bracket of 31-40 years i.e. 65.5 %. 23.6 % of them were diploma holders, 27.2 % have BA /BSc with PGD while 40 % were B.Ed. holders. The remaining 1.8 % had Masters Degree. With majority having B.Ed., this was a good sign as that is what is needed for a secondary education. Majority of the teachers – 49.1 % have an experience of between 11-15yrs and another 3.6 below 1 years' experience only 32.7 % have an experience of 16 years and above. Most of the teachers therefore have enough experience a good sign that they can help deal with student's problems. 72.7 % of the teachers are in Triple streamed schools, 20 % in double stream while 7.3 in single streams. This is an indicator that the teachers have their hands full. The study also involved 60 girls all from four classes.

The First objective of this study was to identify the relationship between girls' poor performance and the socio-economic factors.

The head teachers were asked the following questions.

1. Do most of your students have fee problems?

2. In which category do most of your parents fall?

3. Does your school get bursary awards?

4. Is there a relationship between the girl's areas of residence and their academic performance?

The head teachers responded as follows on fee problems.

Table 5: Fees problems 100%

MOST AFFECTED BY FEES PROBLEMS		
GENDER	FREQUENCY	PERCENTAGE%
GIRLS	3	60
BOYS	2	40
TOTAL	5	100

CATEGORY WHERE MOST PARENTS FALL		
LOW INCOME EARNERS	4	80
MIDDLE INCOME EARNERS	1	20
TOTAL	5	100

Source: Head teachers' questionnaire

Out of the head teachers questionnaire 100% of them do agree that most of their students have fee problems. 60 % do agree that the most affected are girls while 40 % say boys are most affected. This confirms what most studies have come up with that is that that the direct costs or financial constraints hold back more girls than boys from schooling. The opportunity costs of girls' schooling are associated with resources/services lost due to sending the child to school. In many Sub-Saharan rural homes, it is hard to do without child labour with girls demanded more than boys (Odaga & Haneveld, 1995) affected. It therefore affects mostly girls. 80 % of head teachers agree that most parents are low income earners while only 20 % don't agree. This could be due to the fact that most of these schools are based in the slums and are all day schools except for Nakuru High school which is a mixed National school. 100 % of heads concur that they get bursaries. As already discussed in the Literature review, girls from rich or average homes who live in urban areas, and whose parents are better educated are more likely to enroll and remain in school longer than those from poorer homes and rural areas. In areas where overall enrolments are low, the gender gaps in participation are wider (Cammish & Brock, 1994; Davison & Kanyika, 1992 Beneficiaries are both girls and boys – 100% but it comes out that the rich are still the beneficiaries. (Njeru and Orodho, 2003).

On Economic factors, the teachers were to answer the following questions

1. How often do students miss school due to school fees?

2. Do students drop out of school due to school fees or other basic needs?

3. Do you think the parent's level of occupation has to do with this?

4. How often do girls fall pregnant in your school?

The teachers responded to the question on missing school by 60 %

saying that they miss school quite often and 40 % saying they don't miss school often. It is therefore clear that they can't cover the syllabus properly as expected then pass examinations.

Table 6: Teachers on socio economic factors

MISSING SCHOOL DUE TO SCHOOL FEES		
RESPONSE	FREQUENCY	PERCENTAGE %
QUITE OFTEN	33.0	60.0
NOT OFTEN	22.0	40.0
TOTAL	55.0	100.0
WHO ARE MOST AFFECTED		
GIRLS	40.0	72.7
BOTH	15.0	27.3
TOTAL	55.0	100.0

Source: Teachers questionnaire

It comes out clearly that girls are most affected as 72.7 % of the teachers responded by saying girls tend to miss school as opposed to 27.3% who say both come late. It could be due to performance of household chores or maybe they can't run as fast as boys now that the schools are day schools. This confirms what a research study carried out by Wanjiru (2007) in Mombasa on factors contributing to school drop out in public secondary schools revealed that 52.4% respondents valued boys' education better than that of girls. Families which cannot easily afford to send both sons and daughters to school reckon that financial returns on the expenditure for girls' education are a good deal smaller than those of boys are already in secondary school.

Table 7:Teachers on school fees

DO STUDENTS DROP OUT OF SCHOOL DUE TO SCHOOL FEES & OTHER NEEDS?		
RESPONSE	FREQUENCY	PERCENTAGE %
YES	35.0	61.8
NO	21.0	38.2
TOTAL	55.0	100.0
GENDER		
BOYS	15.0	27.3
GIRLS	40.0	72.7
TOTAL	55.0	100.0
DO PARENT LEVEL OF OCCUPATION CONTRIBUTE TO THIS		
YES	53.0	96.4
NO	2.0	3.6
TOTAL	55.0	100.0

Source: Teachers frequency

61.8 % of teachers agree that students drop out of school due to school fees and girls are most affected as shown on the table. This could be due to low-income nature of the parents together with preference to give boys education first. 96.4 % of them do agree that the parents' level of occupation contributes to this while 3.6 % deny this fact. Where women suffer from differential access and wage discrimination in labour market, there is likely to be detrimental to the expected household return in girls' education .It also comes out that if girls marry out of their own family into their husbands' family the parents may not be able to benefit from their returns to their daughters schooling.

Table 8:Students response on socio-economic factors

WHO PAYS YOUR SCHOOL FEES		
RESPONSE	FREQUENCY	PERCENTAGE%
PARENTS	48.0	80.0
GUARDIAN	8.0	13.3
WELLWISHERS	4.0	6.7
TOTAL	60.0	100.0
IS YOUR SCHOOL FEES PAID ON TIME		
YES	25.0	41.7
NO	35.0	58.3
TOTAL	60.0	100.0

Source: Students questionnaire

Out of student's questionnaire, 80 % of the students admit that it's their parents who pay for their school fees, guardians pay for 13.3 % while 6.7 % are paid by well-wishers. The fee however is never paid on time as 58.3 % of them agree and 41.7 say it's paid on time. This is likely to be an indication of the type of family backgrounds that most students come from.

The second objective focused on the possible strategies that can counter the economic factors affecting girl's academic performance

The following came up as the major economic factors affecting girls' performance in secondary schools in Nakuru district

Lack of school fees. The girls are not paid for school fees on time due to poverty and cultural factors which give boys a priority

Lack of sanitary towels. Most of the girls cannot afford sanitary

towels thus get very uncomfortable sometimes during the month.

Dropping out of school. Girls drop out of school due to school fees, lack of basic needs and early marriage

What the schools have done to counter the problem

They look for sponsors to help the financially unstable students. Several sponsors have come up through guidance and counseling department and the school administration and have been of much help to girls.

Providing basic needs for them such as sanitary towels. Here again the guidance and counseling department keeps things like sanitary towels for needy girls in their offices. They also invite organizations to school who provide girls with such.

Organizing parents meetings to discuss various issues affecting the students. At times the parents don't have the real picture of what the girls undergo as some girls are scared to tell the parents the truth. In school they are told what is happening and how they can cope at home.

Most schools have tried to channel bursaries to the real needy children although corruption in some areas has made this difficult.

Summary of the study findings

The findings indicate that this really affects them as follows;

i) *Fee Problems:* The most affected by this are the girls as opposed to boys. They have to constantly go back home for fees therefore losing academic hours hence not performing well.

ii)*Late Coming:* Most girls come to school late as opposed to boys. They most likely are involved in household chores at home.

iii)*Girls drop out of school* due to school fees problems and other needs.

iv)*Parents level of occupation is low* and contributes greatly to this.

v) Areas of residence where most of the girls come from are places not conducive for learning   as the parents are mostly low-income earners.

Discussion

From the findings of the study it was established that most girls in mixed schools did not perform as well as they were supposed to at KCSE level. This is clear from Nakuru Municipality KCSE gender results analysis (2003-2006). Investment in human capital through equitable distribution of education opportunity may be used as a fuel to redistribute income and raise incomes of the poor (Psacharopoulos 1985). If both boys and girls from such backgrounds successfully exploit educational opportunities and attains quality grades at KCSE, their lives will improve. The researcher's observation revealed very glaring factors leading to this poor performance of girls. The study findings revealed that when it comes to late coming girls take the lead. This is because t girls have to do quite some work at home before or after school. The respondents say most of the parents are low-income earners. Most students who go to mixed days schools are from low income earning households. Maleche (1972) argues that the cultural inhibitions include male prejudice as most parents concentrate more on the sons as opposed to the girls. If the girl is constantly sent away for school fees they drop out of school completely or decline academically. There is the issue of bursary and again here there is no preference to girls or boys as both are given equally. They even get an equal amount of Kshs. 5,000. The teachers, parents and other education stakeholders should strive hard for the perception that girls cannot do well in mixed schools be viewed differently. Girls are not weaker academically compared to boys. For education to be beneficial to both genders, the performance at KCSE must be competitive between both boys and girls.

Recommendations for the study

From the findings and discussions, the following recommendations were made.

The government should increase bursaries allocated to secondary schools in order to cushion students from economically disadvantage families. They should be given more opportunities when it comes to bursary

allocation

Resource persons should be invited to mixed schools to talk to the girls and encourage them. Old girls who have excelled can also encourage them to work hard. This is because some give up early due to the poverty at home.

Parents should be encouraged to discuss the issue of school fees with the school administration and local leaders so that bright needy girls are not left out due to lack of money.

During the bursary awards the gender factor should be put into consideration. This is because parents will try hard for their sons to be in school as opposed to their female counterparts.

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Testing Human Capital theory: a case study of

Canada within the World

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Abstract

Human capital had evolved macroeconomic models removing the single use of TFP when modeling world income disparities. A recent development from Manuelli and Sehadri had suggested that human capital and its evolution can be measured within an income generation framework. Similarly to Ben Porath's models, their model uses returns to human capital and to goods as well as ability and fertility rates, but in addition incorporates years of education and wages. The purpose of this paper is to test the suitability of Manuelli and Seshadri's theory on the Canadian context, first I used their model to estimate total factor productivity and check its ranking across provinces and territories of Canada. Then I return to the global context and attempt to validate the model by comparing estimated variables with their observed (or estimated elsewhere) counterparts. Finally, I test the sensitivity of the model's parameters, to identify to which parameters the modeler shall pay more attention. It was found that returns to human capital and to goods played a vital role. I attempted to estimate their values from world data, only to find that returns to goods seems stable across the world at around 0.37 to 0.40, while world returns to human capital vary largely between countries with world average at 0.14 and Canada or USA values at 0.48, suggesting that human capital used to accumulate more human capital

is key from a development perspective and that countries should encourage learning throughout the life of productive individuals.

Keywords: Human Capital, Income, Sensitivity, Validation

Introduction:

There is a vast amount of literature concerned with the large disparities of wealth (income, output) or development across countries in the world (Hall and Jones 1999, Quah 1996, Freyer 2008). Historically, research on such disparities has built upon two main blocks: technological change (and what it drives it) and human capital. Both build upon modified versions of the Solow's model (1956) and the latter uses some sort of Mincer specification (1974) for validation. Differences in income (or output) have been typically explained by either the role of human capital or total factor productivity. Both approaches have been developed upon such factors and they differ in weather to abandon or expand the neoclassical model based upon Solow (1956) after the expansion done by Mankin, Romer, and Weil (1992). The first method looks into technology to explain differences on total factor productivity and output. The other one focuses on the role of human capital (Hendricks 2002). The main drawbacks of the technology (TFP) approach is the lack of endogenous capability to model individual choices on elements related to human capital formation and technological implementation. The problem of the second revolves around difficulties on measuring human capital stocks typically addressed by using a Mincer specification (Mincer 1974).

It was Hendricks (2002) the first one to suggest that both approaches should not be contradictory but rather complementary. Recent developments hinged on the use of an explicit human factor production function (Klenow and Rodriguez-Clare 1997) to explicitly model the role of education quantity and quality in building human capital stocks and of those in total factor productivity and on income disparities. At the core of such models one finds the aggregation of decision makers selecting the number of years of

education and its quality. One of such works is that of Erosa, Koreshkova and Restuccia (2009) which revolves on measuring investment on schooling (goods) to estimate quality and then to observe the role of TFP to explain cross country differences on income per capita. Another one is that of Manuelli and Seshadri (2014) who follow a similar approach with quantity and quality on the core but with the claim of having pinned down the functional form of a human capital production function which in turn is used to estimate required differences in TFP to explain across country income disparities (output per worker). Manuelli and Seshadri's model contains schooling time (quantity), post-schooling training (quality of skills) and age earnings profile and finds a less dramatic role of TFP as found by others before.

TABLE 1. Human capital and TFP on economic development

Author / year	Model	Findings	Human Capital	T.F.P.
Solow (1956)	Decreasing returns to scale to capital. Savings and population growth are exogenous.	**Steady-state** level of **income-per-capita**. Conditional convergence, countries reach different steady states of **income-per-capita**	NO	NO
Mincer (1974)	Statistical regression	Returns of education and experience can be used to **estimate human capital stocks**. Largely used for calibration.	NO	NO
Mankin, N.G., Romer, D. and Weil, D.N. 1992	Added accumulation of Human Capital (H) to Solow's model	Interactions of human capital and savings (*s*) and population growth (*n*) with income (*Y*).	YES	NO
Klenow, P.J. and Rodriguez-Clare, A. (1997)	**Human capital production function**. Primary/secondary schooling-attainment. School quality to produce measures of human capital.	Cross-country productivity differences explain over 50% of level differences of GDP per worker (1985 data). Differences in productivity growth explain growth rate differences of GDP	NO	YES
Hall and Jones (1999)	Relies on Solow's residual (TFP)	Human and physical capital on output per worker. Social infrastructure explains differences across	NO	YES

		countries		
Hansen, G.D. and Prescott, C.P. 2002.	Overlapping generations, m**aximize profits and utility**. **Role of Technology on** output	From stagnation to growth (production) as land is outshined by human and capital growth (more skilled labor)	YES	NO
Hendricks (2002)	**Human capital accumulation and total factor productivity**	Used immigrants to estimate differences on human capital	YES	YES
Erosa, Koreshkova and Restuccia (2009)	**Human capital investments** (schooling time & expenditure on schooling, use goods as a measure of quality).	Relative importance of time versus good inputs used to explain human capital and see role of TFP as an amplification factor for disparities	YES	YES
Manuelli and Seshadri (2014)	Schooling quantity, training (quality). Role of TFP is smaller than previously predicted	Created Theoretical estimation of **Human capital production function** and used to estimate required TFP to explain countries differences	YES	YES

1.1 Problem Statement

Even though conceptually Manuelli and Sehadri's model has the advantages aforementioned, the model was calibrated only to the United States through five moments, and there is a lack of validation of this framework: it is uncertain how well it predicts observed variables across countries, how sensitive it is to its parameters, and if its applicability can be extended to regions within a country or across countries of the world.

1.2 Objective

The objective of this paper is to study the applicability of Manuelli and Seshadri's model: (1) by validating the model prediction capabilities, (2) by testing the model sensitivity to its parameters and, (3) by testing its applicability within regions of a given country or across countries of the world.

1.3   Method summary

This paper studies the suitability of a recent development to explain income/output differences per worker for regions within a country, in a case study for Canada. This paper employs the model specification recommended by Manuelli and Seshadri (2014) and studies the suitability of such model by: (1) analyzing the sensitivity of the model's parameters, (2) comparing its results with those predicted by other authors and (3) estimating the values of the most sensitive parameters from world data. Some interesting inferences were withdraw from the analysis.

1.4   The model

This section describes the model, for a more detailed explanation the reader is directed to Manuelli and Seshadri (2014). The aim here is to explain the mechanisms built within the model in order to serve as a preamble for the validation/calibration strategy. The model (Equations 1 to 2) generates human capital stocks through an income maximization problem (expanded Ben Porath 1967). The individual maximizes discounted value of net income by selecting the fraction of time (at a given age) used to accumulate human capital ($n(a)$). This amount equals one (100% of the time) up until the end of formal school (age = $6+s$) which depends on each country. The individual also chooses the amount of early childhood (up to the age of 6) investments (x_E) and the amount of market inputs to produce human capital up until current age ($x(a)$). It assumes the same technology for human capital accumulation during schooling and training (on the job).

$$max \int_6^R e^{-r(a-6)}[wh(a)[1 - n(a)] - x(a)da] - x_E - \eta(s)$$

$$(1)$$

$$\dot{h}(a) = z_h[n(a)h(a)]^{\gamma_1}x(a)^{\gamma_2} - \delta_h h(a) \quad and \quad h(6) = h_E = h_B x_E^v$$

$$(2)$$

The solution to the problem is restricted to a law of motion of human capital that considers its depreciation δ_h, market inputs $x(a)$ and fraction of

time $n(a)$ used to acquire human capital in the current period and the individual's innate learning skills z_h. In addition to individual and accumulated human capital stocks, the solution to the problem estimates years of schooling and an earnings profile per country (output per worker) given by Equations 3 and 4.

$$\frac{h_B^{1-\gamma}}{z_h^{1-\nu} w^{\gamma_2 - \nu(1-\gamma_1)}} = m(6 +$$

$$s)^{1-\nu(2-\gamma)} e^{(1-\gamma)(\delta_h + r\nu)s} \left(\frac{\nu}{r+\delta_h}\right)^{-(1-\gamma)\nu} \left(\frac{\gamma_1^{1-\gamma_2}\gamma_2^{\gamma_2}}{r+\delta_h}\right)^{1-\nu} \left[1 - \right.$$

$$\left. \frac{r+\delta_h}{\gamma_1} \frac{(1-\gamma_1)(1-\gamma_2)}{\gamma_2 r+\delta_h(1-\gamma_1)} \frac{1-e^{-\frac{\gamma_2 r+\delta_h(1-\gamma_1)}{(1-\gamma_2)}s}}{m(6+s)} \right]^{\frac{(1-\gamma)(1-\nu(1-\gamma_1))}{(1-\gamma_1)}} \qquad (3)$$

Where $m(6+s) = 1 - e^{-(r+\delta_h)(R-6-s)}$

$$\hat{y}(s,p) = (1-)w \left[\frac{z_h\gamma_1^{1-\gamma_2}\gamma_2^{\gamma_2}}{r+\delta_h}\left(\frac{(1-\tau)w}{p_w}\right)^{\gamma_2}\right]^{\frac{1}{(1-\gamma)}} \left\{e^{-\delta_h}h(6 + \right.$$

$$\left. s)\frac{r+\delta_h}{\gamma_1}\int_{6+s}^{p+6+s} e^{-\delta_h(p+6+s-t)}m(t)dt - \frac{\gamma}{\gamma_1}m(a)^{\frac{1}{(1-\gamma)}}\right\} \qquad (4)$$

The model explicitly considers wages (w) and allow individuals to be more willing to invest in education if their level of skills is higher, it also acknowledge the importance of school quality as oppose to quantity. The other explicit elements on the model are the demographics of the country. The number of individuals at a given age and time $N(a,t)$ is estimated from population growth rate η and life-terminal age T as shown in Equation 5.

$$N(a,t) = e^{-\eta t}\left(\eta\frac{e^{-\eta a}}{1-e^{-\eta T}}\right) \text{ where } \eta = \frac{f}{B} \qquad (5)$$

As in any other model, several coefficients need to be calibrated: ɣ1 returns to labor, ɣ2 returns to input markets, δ_h depreciation, η population growth rate, p_E price of early childhood inputs, p_w cost of on the job-training among others. A relative wage rate for skilled workers was computed based on Hendricks (2002) in order to estimate wage variation and compare it to

the age earnings profile proposed by Manuelli and Seshadri (2014).

Calibration

The model developed by Manuelli and Seshadri is locally calibrated to Canadian provinces. Parameters values from the original model (for the US) and from its calibration to Canada are presented in Table 1.

TABLE 1 Calibration Values and parameters

Variable / Parameter	US	CAN	CAN (model)
Wage rate 55/25	2	2.29	2.29
Years of schooling	12.05	about 13	13.2
Schooling / GDP	4.5%	about 5%	4.76%
Early / GDP	1.1%	Less than US%	0.88%
Income ratio (64/55)	0.79	0.76	0.786
Retirement Age (T)	78.5	81	81
Model's coefficient γ_1	0.486	Not observed	0.4875
Model's coefficient γ_2	0.400	Not observed	0.404

Value of preprimary investment for US is 0.4 and for Canada is 0.2% of GDP

Canada as a country was used as the benchmark for the normalization of provinces and territories; in the original model (Manuelli and Seshadri 2014) the US was used as the benchmark economy and countries around the world compare to it. Canadian provinces and territories were sorted out based on output per worker. Beginning of working age for Canada was set to 25 years, life expectancy to 81 years and fertility rate to 1.66.

Results

The model predicted relative total factor productivity for provinces and territories in Canada (Table 2). I also used Hendricks (2002) model to estimate relative wage rates for skilled labor (I assumed 67% were skilled workers). Table 2 presents the demographic data and output per worker used to estimate TFP and the relative wage.

TABLE 2 Demographics and estimated values for Canada's Provinces or Territories

Province/Territory	Life expectancy	Fertility rates	Output per worker	TFP	Relative wage rate (Hendrick)-skilled

Prince Edward Island	80.5	1.63	0.7	**0.87**	**0.15**
Nova Scotia	80	1.48	0.81	**0.87**	**0.17**
New Brunswick	80.5	1.52	0.82	**0.88**	**0.18**
Quebec	81	1.69	0.84	**0.88**	**0.18**
Manitoba	79.5	1.96	0.9	**0.89**	**0.20**
British Columbia	82	1.52	0.96	**0.91**	**0.21**
Ontario	81.5	1.57	0.98	**0.90**	**0.21**
Yukon	75	1.58	1.12	**0.91**	**0.25**
Saskatchewan	79.5	2.03	1.13	**0.91**	**0.25**
Alberta	81	1.9	1.43	**0.95**	**0.33**
Nunavut	75	2.97	1.46	**0.95**	**0.34**
Newfoundland-Labrador	79	1.46	1.47	**0.95**	**0.34**
Northwest Territories	75	2.11	1.99	**0.99**	**0.48**

1.4.1   The ranking of Canadian provinces and territories from a total factor productivity and relative wages seems to match that expected, resource based provinces with lower population are more productive and individuals earn higher wages.

1.4.2   Sensitivity Analysis

1.4.3   The value of parameter $ɣ_1$ and $ɣ_2$ were explored, only one parameter at the time was changed by holding constant all others. As seen on Tables 3 and 4. Small variations of either parameter produced large impact on the calibration targets, therefore a one percent change was chosen for the sensitivity analysis of $ɣ_1$ and $ɣ_2$. As seen on Table 3 a 1% change in $ɣ_1$, implies a 10.5% change for the wage rate 55/25, a 8.56% on the number of years of schooling, and a 13.6% on the early-education expenditure and 9.24% on the schooling to GDP.

TABLE 3 Sensitivity to $ɣ_1$

Variable / Parameter	-1%	Model CAN	+1%
Wage rate 55/25	2.05	2.29	2.679
Years of schooling	12.07	13.2	14.45
Schooling / GDP	4.32%	4.76%	5.23%
Early / GDP	1.0%	0.88%	0.78%
Income ratio (64/55)	0.786	0.786	0.786
Model's coefficient $ɣ_1$	0.482625	0.4875	0.492375
Model's coefficient $ɣ_2$	0.404	0.404	0.404

TABLE 4 Sensitivity to $ɣ_2$

Variable / Parameter	-1%	Model CAN	+1%
Wage rate 55/25	2.12	2.29	2.535

Years of schooling	12.39	13.2	14.10
Schooling / GDP	4.41%	4.76%	5.12%
Early / GDP	0.986%	0.88%	0.79%
Income ratio (64/55)	0.787	0.786	0.786
Model's coefficient γ_1	0.4875	0.4875	0.4875
Model's coefficient γ_2	0.39996	0.404	0.40804

Manuelli and Seshadri claimed that the model exhibit variations according to the fertility rate. A base rate of 1.66% and variations of 40% is presented in Table 5. As seen neither income ratios nor years of schooling are affected, the larger variations are observed for early childhood and schooling investments as percentages of GDP.

TABLE 5 Sensitivity to η

Variable / Parameter	-40%	Model CAN	+40%
Wage rate 55/25	same	2.29	same
Years of schooling	same	13.24	same
Schooling / GDP	4.72%	4.76%	4.81
Early / GDP	0.877%	0.88%	0.897%
Income ratio (64/55)	same	0.786	same
Fertility rate η	1.00%	1.66%	2.33%

Variations to total factor productivity (TFP) and level of innate ability (Z_h) were explored: a 10% on TFP approximately corresponded to variations of 5% on Z_h as shown on Table 6 and 7.

TABLE 6 Sensitivity to z_h ability

Variable / Parameter	-5%	Model CAN	+5%
Wage rate 55/25	1.92	2.29	2.77
Years of schooling	11.76	13.24	14.42
Schooling / GDP	4.27 %	4.76%	5.16
Early / GDP	1.11%	0.88%	0.73%
Income ratio (64/55)	same	0.786	same
Zh ability	0.3173	0.334	0.3507

TABLE 7 Sensitivity to TFP

Variable / Parameter	-10%	Model CAN	+10%
Wage rate 55/25	1.93	2.29	2.81

Years of schooling	11.78	13.24	14.49
Schooling / GDP	4.33 %	4.76%	5.12
Early / GDP	1.07%	0.88%	0.75%
Income ratio (64/55)	same	0.786	same
TFP	0.9	0.334	1.1

In summary (Table 8), the model is very sensitive to γ_1 and γ_2, a 1% change in γ_1 and γ_2 requires about 10% changes in TFP or 5% changes in innate ability (z_h) to produce similar results. Hence, a large effort should be concentrated in estimating the values γ_1 and γ_2, Solow (1956) suggested that the success of modeling lies in the model mechanisms being capable of abstracting by much the phenomena at hand without being heavily affected by the parameters. Hence in this sense, Manuelli and Seshadri (2014) model fails unless a reliable approach for the estimation of returns to scale in the human capital production function, that is, the role of labor in production of human capital γ_1 and the role of goods in the production of human capital (γ_2) could be found. Total factor productivity and z_h impact more early investment as ratio of GDP values so could be used to adjust such variable.

Table 8. Sensitivity summary

Variable / Parameter	5% Z_h	10%TFP	1% $\gamma1$	1% $\gamma2$	40% η
Wage rate 55/25	16.2%	15.7%	10.50%	7.40%	Same
Years of schooling	11.1%	11%	8.56%	6.13%	Same
Schooling / GDP	10.3%	9.03%	9.24%	7.35%	0.84%
Early / GDP	26.1%	21.6%	13.60%	12.05%	0.4%

1.4.4   Comparison of predicted versus observed results

We built several indicators from observed data and compared them with those predicted by Manuelli and Seshadri's model. The only exception is that of *Human capital per worker* which was constructed from the estimation of human capital per output based on 1985 data by Klenow and Rodriguez-Clare (1997). Data used for this comparisons included gross domestic product (GDP) for the year 1985 and 1990, expenditure of education on GNI and GNI for the year 1990 and labor force data (number of workers) for the year 1990 all from the World Bank. Manuelli and Seshadri's

(2014) model was used to estimate the same indicators. All graphs plot the 45 degree perfect-equivalence reference-line. The results of relative human capital shown on Figure 2 over-predict human capital as predicted by Klenow and Rodriguez-Clare (1997). Schooling showed a better spread around the one to one equivalence but was also slightly overestimated.
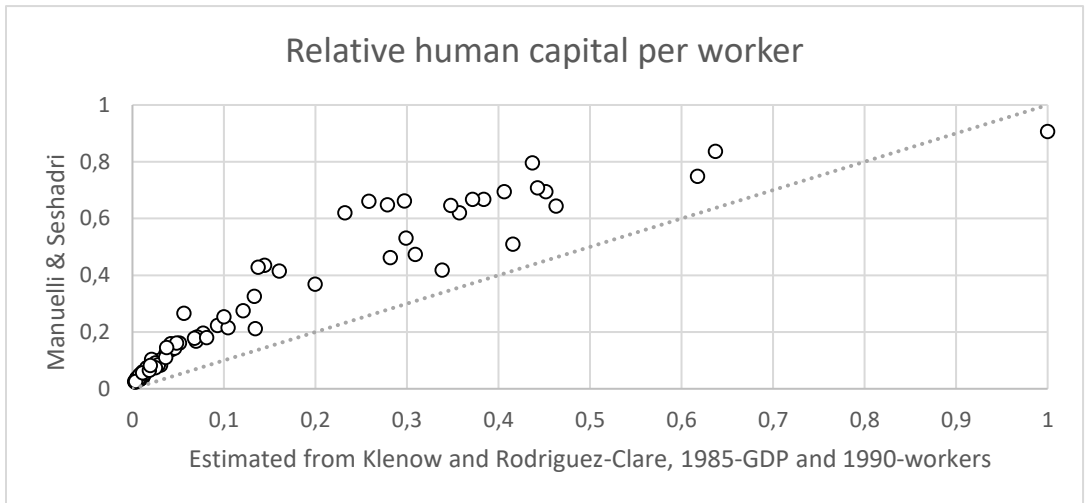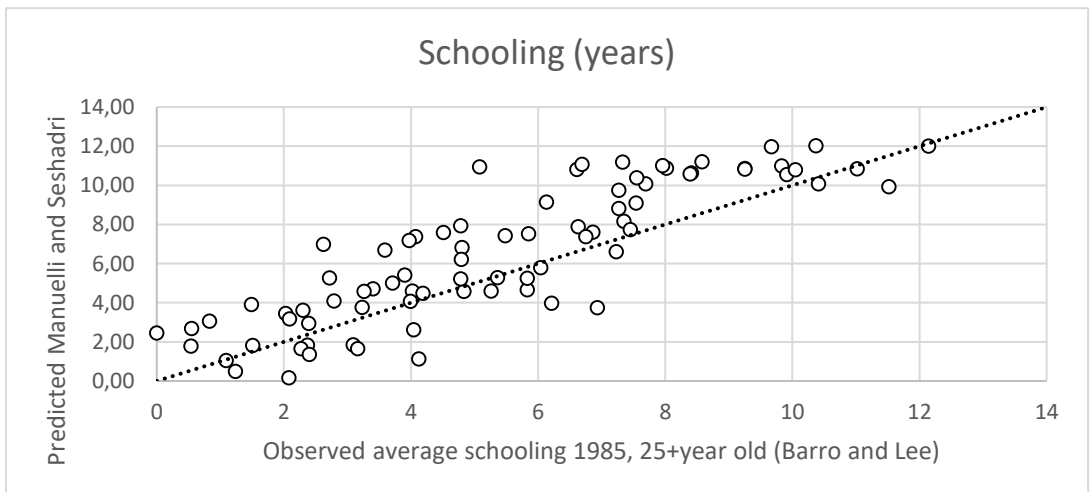

Figure 2. Relative Human Capital per worker, H_US = 1

Figure 3. Schooling in number of years

Penn World table 8.0 contains estimates of total factor productivity, which

have been compared to those estimated by Manuelli and Seshadri in Figure 4. Clearly Manuelli and Seshadri overestimates the values presented by the Penn World Table 8.0.
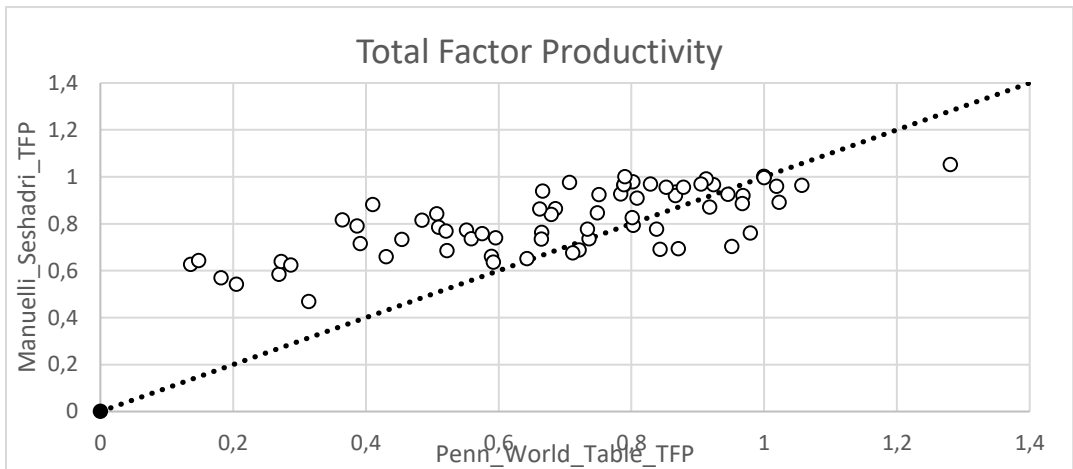

Figure 4. Total Factor Productivity

A large spread was observed when comparing observed investment in education as percentage of GDP with predicted values, however, we built observed expenditure from expenditure as ratio of GNI and had to bring it back in terms of GDP with 1990 data, 1985 data was unavailable.
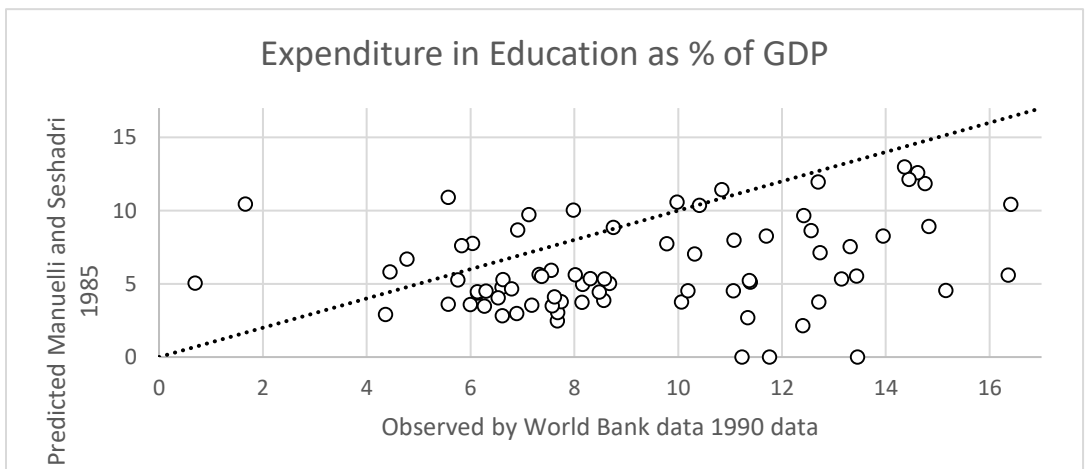

Figure 4. Expenditure in Education as % of GDP

Estimation of parameters

The ultimate goal of the model (Manuelli and Seshadri 2014) was to

estimate human capital, in that respect and as compared to the estimates from Klenow and Rodriguez-Clare (1997), the model overestimates such values, the problem is that human capital is a variable we do not observe and hence once we track down the model capability in terms of years of schooling or expenditure in education as percentage of GDP, the model does a better job. The question now turns to the model ability to be calibrated to replicate world data. As it turns out, one of the key features of the model is its heavy reliance on the values of γ_1 and γ_2. Is there a method to learn the value of such parameters from the data? As it turn out a Full Bayesian regression guided by a Markov-Chain-Monte-Carlo (Gibbs-Sampling) with a non-informative prior could do this job. However, current model is highly dimensional and several attempts to estimate it using commercial software (OpenBUGS) failed. A simplified version of the model -presented below- was used for such a purpose.

A simplified Ben-Porath (1967) law of motion of human capital in steady state (Equation 6 instead of Equation 2) along with first order condition for x (Equation 7), resource constraint (Equation 8) and first order condition for schooling (Equation 9) from an income maximization problem similar to the one in Equation 1 were used to estimate the returns to human capital γ_1 and from investment in education γ_2 from data of 81 countries of the world. Equation 10 presents the FOC w.r.t. n.

$$\delta^h h = z_h [nh]^{\gamma_1} x^{\gamma_2} \tag{6}$$

$$\frac{1}{\beta} = 1 + H_1 - \delta^h \qquad \text{Where } H_1 \text{ is the FOC of Equation 6 w.r.t. } n \quad (7)$$

$$c + x + \delta^k k = y \tag{8}$$

$$\frac{H_1}{H_2} = (1 - \tau)w \qquad \text{Where } H_2 \text{ is the FOC of Equation 6 w.r.t. } h \quad (9)$$

$$H_1 = z_h \gamma_1 n^{\gamma_1} h^{\gamma_1 - 1} x^{\gamma_2} \tag{10}$$

I solved for three unknowns: the amount of time spend acquiring human capital (n), the investment in goods for human capital (x) and the amount of human capital (h).

From Equation 7 and taking the derivative one can find Equation 11

which contain three unknowns *n*, *h* and *x*. Take now the derivative of Equation 11 with respect to h and use Equation 9 to obtain Equation 12 which only contains two unknowns, take now Equation 6 and plug in Equation 12 to obtain Equation 13, finally take Equation 8 and plug it into Equation 13 which solves for n. The system given by Equations 11 to 13 can be used to solve for the amount of human capital (Equation 15).

$$\frac{\frac{1}{\beta}-1+\delta^h}{z_h} = \gamma_1 n^{\gamma_1} h^{\gamma_1} x^{\gamma_2} \tag{11}$$

$$h = (1-\tau)wn \tag{12}$$

$$n = \frac{z_h x^{\gamma_2}}{\delta^h (1-\tau)^{1-\gamma_1} w^{1-\gamma_1}} \tag{13}$$

$$n = \frac{z_h (y-\delta^k k-c)^{\gamma_2}}{\delta^h (1-\tau)^{1-\gamma_1} w^{1-\gamma_1}} \tag{14}$$

$$h = \frac{z_h (y-\delta^k k-c)^{\gamma_2}}{\delta^h (1-\tau)^{-\gamma_1} w^{-\gamma_1}} \tag{15}$$

I concentrate the attention now to the estimation of γ_1 and γ_2. A full Bayesian estimation using OpenBUGS (reference) was run to estimate their values from the observed data, a non-informative prior was used to learn from the data the probabilistic distribution for the 95% CI of the values of γ_1 and γ_2. Values of human capital estimated by Manuelli and Seshadri's model were used on the left-hand-side of Equation 15 and values of observed output per capita, capital per capita and consumption per capita were used to build human capital and the system was target with estimating the two unknown parameters as stochastic nodes. Income taxes were estimated for the countries and both depreciation rates were set to 0.075.

Figure 5 illustrates the model used with 55 countries for which data was available. Human capital per worker was obtained from Klenow and Rodriguez-Clare (1997), data for labor income tax was fixed it to 0.3 for all countries (this needs to be revised in future research), physical capital per worker and output per worker were obtained from the world bank database, consumption was fixed to 80% of output for all countries. Results from the estimation are also shown on Figure 5. As seen an estimation of the values of

ɣ1 and ɣ2 from 55 countries of the world yields very dissimilar results than those estimated by Manuelli and Seshadri (2014). Value of ɣ1 observes a huge discrepancy (E(ɣ1)=0.1452 versus g1=0.48) meanwhile values of ɣ2 are much closer (E(ɣ2)= 0.3729 versus 0.4 in the original model).

Conclusion

Manuelli and Seshadri's model predictions seems to match well productivity of Canadian provinces and territories. In a world context their model seems to accurately replicate observed years of education and to overstate relative human capital per worker as compared to classical specifications. Their model is very sensitive to returns to human capital and to goods (ɣ1 and ɣ2). Returns to goods (ɣ2) across countries of the world does not seem to vary much. Returns to human capital invested to produce more human capital vary largely; the world average does not suggest that such return contributes as largely as observed in the US or Canada, this results seems to align with the belief that quality of the education plays a very significant role even more in developed countries and that the impact of education on income ranges a lot among countries.

```
model {
zh <- 0.334
dk <- 0.075
dh <- 0.075
tao <- 0.3
for(i in 1 : 55) {
h[i] ~ dnorm(mu[i],tau)    #H= human capital per worker
mu[i] <- zh*pow(y[i]-dk*k[i]-c[i],g2)*pow((1-tao)*w[i],g1)/dh
}
sigma <- sqrt(1/tau)
ɣ1 ~ dnorm(0,0.010)
ɣ2 ~ dnorm(0,0.010)
tau ~ dgamma(0.001, 0.001)
}
```

list(ɣ1=0.1, ɣ2=0.7,tau=0.001) #chain initialized with prior for ɣ1=0.1 and ɣ2=0.7

list(ɣ1=0.7, ɣ2=0.1,tau=0.001) #chain initialized with prior for ɣ1=0.7 and ɣ2=0.1

	mean	sd	MC_error	val2.5pc	median	val97.5pc	
start	sample						
ɣ1	0.1452	0.08712	1.647E-4	0.01273	0.1342	0.3438	1
2204000							
ɣ2	0.3729	0.02942	5.594E-5	0.3057	0.3765	0.4199	1
2204000							

Figure 5. Full Bayesian Model and estimated returns to human capital and to goods

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