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Stock Markets and Income Inequality: A Cross-Country Study

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ABSTRACT

This paper conducts a comprehensive analysis to understand how stock market ratios affect net income inequality. The study of how finance impacts income distribution is relevant as the income distribution of a nation influences savings decisions, resource allocation, innovation incentives and public policy and hence impacts the process of economic development. Using a cross-sectional data set of 68 countries and panel data set of 61 countries from 1975 to 2005, I apply cross-sectional OLS and panel regressions to look at how stock market size, liquidity, and activity impact income inequality. While stock market size is found to strongly impact income inequality in an inverse-U manner, weak evidence is found for stock market liquidity in reducing income inequality. No strong evidence is however found for stock market activity to affect income inequality.

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I am grateful to a lot of people for helping me accomplish the task at hand. First, I would like to express my sincere gratitude to my supervisor Prof. Hoon Hian Teck for accepting me as a student and guiding me whenever required. I would like to mention my appreciation for Prof Yang Zhenlin's comments and suggestions. I would like to thank Prof Rashmi Barua, Prof Davin Chor, Prof Quoc-Anh Do and Prof Ken Yamada for their timely advice and valuable inputs. I would also like to thank Rozana Bte Osman and Lilian Seah for their administrative support. Further, I would like to commend the efforts of the research librarians at the SMU library for their valuable research assistance.

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1. Introduction

*"For one thing, it (**finance**) enriches the poor more than any other system humanity ever has had,"* - Sir John Marks Templeton.

Not surprisingly, much work has focused on the impact of financial development on economic development, and of late, specifically on its benefits to the poor. As Ross Levine (2004) explains, studying the link between finance and income distribution helps in understanding the development process since the income distribution of a country affects resource allocation, innovation incentives, savings decisions and policy making. While the banking system of a country can indicate who gets access to credit and who does not, the evolution of equity markets can also be looked at to study how wealth shifts between different income groups. This paper tries to take a comprehensive look at how stock market size, liquidity and efficiency impact net income inequality across countries over time. A bigger stock market could indicate greater financial development in a country and thus, it is interesting to see how this affects income inequality over time. This paper tries to answer questions such as: Does a bigger stock market size result in a shift in income distributions? Does a more liquid and efficient stock market result in higher or lower income inequality?

Financial development can impact income inequality through its impact on economic growth, which is referred to as an indirect effect (discussed in detail in the literature review). According to Ross Levine (2005), financial development has a significant influence on economic growth through five channels:

a) Providing ex-ante information on the best investment possibilities and capital allocation,

b) Monitoring investments and exerting corporate governance,

c) Enabling risk-sharing, diversification and risk-management,

d) Mobilizing savings into a common pool, and

e) Facilitating the transfer of goods and services.

A natural question which arises is how to define a financial system of a country. Is financial development better represented by the banking sector of an economy or the stock and bond markets, or both? The dilemma highlighted above has been the subject of Ross Levine's paper: "Bank-Based or Market-Based Financial Systems: Which is Better?" He presents three alternative theories: the *bank-based, market-based and financial services view.*

"The bank-based view highlights the positive role of banks in mobilizing capital, identifying good projects, monitoring managers, and managing risk" [Levine 1997]. The proponents of this view consider markets to be inefficient as they reveal information to the public too soon - discouraging individual investors from finding other potential avenues for investment, and provide high liquidity - encouraging short-sightedness and impeding corporate control.

On the other hand, "The market-based view highlights the positive role of markets in enhancing risk management, information dissemination, corporate control, and capital

allocation" [Levine and Zervos, 1998]. A more liquid stock market enables investors to exit the market when they want and makes it an attractive investment avenue in the long term as well. This encourages firms to invest in long-term and more productive projects given this source of capital. This higher-productivity capital raises return on the investment, encouraging more saving and more investment in physical capital, leading to faster economic growth (Levine, 1997). The market view proponents criticize the efficiency of banking systems stating that if banks tie up with powerful and large firms, it could hamper growth by stifling competition and preventing effective corporate governance.

The financial services view rises above this conflict and recognizes the importance of both banks and markets as complements rather than substitutes. Instead, it looks at what is important to aid the development of both simultaneously, and hence the *law and finance view* (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, henceforth LLSV, 1998) looks at legal systems being crucial in determining the development of banks and markets in a country. Levine's paper finds that cross-country evidence does not support the bank-based or market-based views specifically but confirms the complementarities of the two in the law and finance view.

Rather than adding to the large literature on the relationship between financial development and growth, this paper adds to the recent interest on how markets affect income inequality. Most of the literature on the impact of financial development and income inequality has focused on the bank-based view and looked at how banking

development affects income inequality. This paper tries to break away from the norm by looking instead at market-based systems and how income inequality is affected. The paper draws support from the view that it is not banks alone that determine financial development in a country. Thus, the paper's focus is how stock markets impact income inequality across countries over time. This attempt seems even more relevant in an era where stock markets are increasingly becoming an important avenue for investment apart from banks. The impact on income inequality seems relevant in current times where volatility in the markets could significantly shift wealth distributions across income groups.

This paper takes a comprehensive look at how stock market development proxied by size, liquidity and activity affect the level of net income inequality over time. I use a cross-country data set and employ cross-sectional and panel techniques to do the same. The results indicate the presence of an inverse-U relationship between stock market size and income inequality, while the results for stock market liquidity and activity are not indicative of a clear relationship. The paper also accounts for a measure of banking development and does not find it to be significant in regressions. The remainder of the paper is organized as follows. Section 2 reviews the relevant literature while section 3 deals with the data. Section 4 explains the econometric specifications, section 5 presents the results and section 6 concludes the intent of the paper.

2. Related Literature

How does financial development impact inequality? It can do so through a *direct* and an *indirect* channel. The **direct** way in which financial development helps the poor is by allowing them access to credit which enables investment in productive avenues and reduces their vulnerability to shocks. This is particularly important as it enables them access to better education and health facilities. Galor and Zeira (1993) and Banerjee and Newman (1993) build theoretical models where the lack of access to credit prevents the poor from investing in higher education or more productive activities. Moreover, credit-market imperfections work to aggravate this problem resulting in wide income disparities and the entrepreneurial class being dominated by the wealthier sections while the wage earners are composed of the poor. They predict a linear inverse relationship between financial development and income inequality. However, Greenwood and Jovanovic (1990) tell a different story and predict a *Kuznet's curve between financial development and income inequality*. In the early stages of financial progress, the income gaps widen as the rich grow richer and the poor remain crippled by the lack of access to credit. With time, during later stages of financial development, these income gaps are lowered as the barriers to financial access for the poor are slowly broken.

The **indirect channel** is through the effect financial development plays on enhancing economic growth, as mentioned in the introduction. A lot of work has focused on this aspect and in particular, Beck and Levine (2002) have shown that both banks **and** stock markets have a positive impact on growth from a cross-country study, even after taking care of simultaneity and endogeneity issues. The issue of reverse-causality arises since

economic growth is also known to impact financial development. Levine (1997) states that stock markets provide liquidity and the opportunity of trading risks while banks give important information about firms and management. Thus, both banks and stock markets aid economic growth and should not be considered in isolation.

Atje and Jovanovic (1993) specifically look at how stock markets impact economic development. To study how stock markets impact the growth rate of economic activity, they use the Greenwood-Jovanovic model, and to study the level effects of stock market development on economic growth, they rely on the Mankiw, Romer and Weil model (MRW, 1992). They find a substantial impact of stock markets on economic development, much more than the effect of bank lending. They conclude that it is surprising that stock markets are not a focus in many countries to speed up the process of economic development.

Many empirical studies have tested the alternative theories regarding how finance affects inequality. The main focus has been in understanding how greater access to credit – measured by the issue of credit by banks and other financial institutions to the private sector – has impacted income inequality. Some of the studies include the paper by Clarke, Xu and Zou (2006) which tests for an inverse-U hypothesis in a cross-country study using OLS and random effects estimation. Although evidence of the inverse-U shape is not confirmed, the paper does conclude that greater financial intermediary development does work to reduce income inequality over time, thus supporting a linear rather than a quadratic trend. Beck, Demirguc-Kunt and Levine (2007) take note of the direct and

indirect effects that financial development play in affecting income distributions in that greater financial development aids efficient capital allocation and promotes economic growth, while better financial access removes credit constraints for the poor, thus lowering income inequality. They specifically look at how access to private credit affects changes in income distributions and how both absolute and relative poverty levels change and conclude that financial development benefits the poor over and above its effects through economic growth, lending support to the direct effect.

None of the above papers have tried to include stock market indicators to account for financial development. However, Zietz and Zhao (2008) look at the short run effect of the U.S. stock market boom in the 1980s and 1990s on income inequality. They also find a **direct** and **indirect** channel through which stock markets impact income inequality. The **direct** channel refers to cases when stock price appreciation increases capital gains to stockholders or if dividends go up. The **indirect** channel refers to Tobin's Q-theory which ties stock prices to the real economy through investment. Stock price increases lead to greater investment, which in turn lead to higher production and employment. The paper distinguishes between stock holding and non-stock holding households and finds that stock market booms only have a temporary impact on raising income inequality in the U.S. and should not be used to target policy change.

On a different note, in a recent paper by Favilukis (2008), it is observed that labor income inequality has been increasing over the last 25 years while equity returns have been high. This has been accompanied with no increase in consumption inequality and only a

moderate increase in wealth inequality. Moreover, equity premiums have declined and stock market participation has been on the rise. He builds a general equilibrium model to show that all these trends are inter-linked. The reason that wealth and consumption inequality do not rise with increasing wage inequality is due to the fall in stock market participation costs, as witnessed by the rising market participation. Thus, the fall in participation costs and greater demand for equities have led to the decrease in equity premiums, greater market participation and subsequent lack of substantial increases in consumption and wealth inequality.

Some studies have also tried to understand how the stock market affects specific income groups. Das and Mohapatra (2003) have looked at how equity-market liberalization impacted shifts in income distributions in a few countries and found that the gains from stock-market liberalization seem to be skewed to the upper quintile at the cost of the middle quintiles. They also found that the lowest income quintiles did not seem to be affected by the opening up of domestic stock markets. Sawhney and DiPietro (2006) look at stock market wealth proxied by stock market capitalization and its impact on the Gini coefficient, income share of the top and bottom quintiles and GDP per-capita. They do a cross-sectional study on 73 countries for the year 2000, and find that stock market wealth has a positive impact on income inequality. In particular, a higher stock market capitalization ratio raises the Gini coefficient, raises the income share to the upper quintile and lowers share to the bottom quintile. They do not look for evidence of a quadratic trend though.

Bonfiglioli (2005) built a theoretical model on the relationship between investor protection, financial development and income inequality and tested the model using cross-sectional and panel regressions. The paper suggests an inverse-U relationship between investor protection and income inequality. Greater investor protection is said to affect income distributions in two ways: by encouraging sharing of risks it lowers income inequality, while by raising returns to ability and increasing the number of people involved in risk-taking, inequality is heightened. Unlike the models of Banerjee and Newman (1993), Galor and Zeira (1993) and Greenwood and Jovanovic (1990), Bonfiglioli does not consider income inequality to arise from differences in initial wealth and credit-market imperfections. She instead looks at differences in entrepreneurial ability and how that translates into differences in income inequality. The model predicts that investor protection works to aid stock market development, and income inequality and stock-market size are related in an inverse- U manner and the only impact investor protection has on income inequality is through stock-market size.

Bonfiglioli's paper is also unique as it does not look at financial development as defined by the private sector's access to external finance but looks at how equity-like financial instruments that besides helping in access to finance also encourage risk-taking and risk-sharing. Bonfiglioli tests the predictions of the model empirically and focuses on the ratio of stock market capitalization over private credit to represent stock market development. Her results do confirm the inverse-U hypothesis between stock market development and income inequality. Thus, the paper finds that equity-based finance works to raise inequality at first, while increasing credit to the private sector works to lower it.

This paper differs from the rest in the literature by taking a comprehensive look at stock market indicators and how they impact income inequality. Unlike the existing literature, the focus is not on specific income groups or on a specific set of countries. The focus is not on a certain period or phase of transition in countries either. This paper focuses on the market capitalization ratio – value of listed shares as a ratio to GDP – to represent stock market size and understand its impact on net income inequality. This paper also looks at how stock market liquidity and stock market efficiency affect income inequality. In doing so, I consider quadratic relationships between stock market indicators and income inequality. I also address the question of whether the relationships remain when the banking development measure, as indicated by private credit ratio, is controlled for.

I use three measures – turnover ratio, total value traded and market capitalization over GDP and look at how they work to affect income inequality as measured by the net Gini coefficients. Beckaert and Harvey (1997) and Levine and Zervos (1998) use the market capitalization as a ratio to GDP to indicate the size of the domestic equity market, a larger ratio indicating a bigger market relative to the size of the economy. Levine and Zervos (1998) also provide support for the relationship between stock market liquidity and economic growth and use the value traded ratio and the turnover ratio (value traded/market capitalization) to signal stock market liquidity.

3. Data

The dataset includes one cross-section with data on 68 countries from 1975 to 2005. The panel dataset covers 61 countries over the same time-period. The main dependent variable is the net Gini coefficient taken to represent net income inequality. I utilize the dataset used by Campante and Do (2007) who use estimates from the World Income Inequality Database (WIID) version 2.0 published by the UNU-World Institute of Development Research (WIDER). This dataset is comprehensive in the sense that details of whether the income or expenditure definition is used to define inequality, whether the methods of the underlying survey are correct etc are given clearly. Campante and Do use only observations which are of highest quality or where the income concept or the survey methods are well-established. They collapse the dataset to include one observation for each country, year and type of data. They also find that the consumption based Gini coefficients are lesser than non-consumption based measures by 2.2 points, and hence I add 2.2 points to the consumption based Gini values to get equivalent net values. Also, the difference between gross and net income inequality is found to be 1.9 points and the subtraction of this value from gross measures gives the equivalent net coefficient.

The main independent variables are stock market indicators to represent stock market development: *Turnover ratio*, *value traded* and *market capitalization* over GDP.

Total value traded (TVT) is the ratio of the total value of trades of domestic equities on national stock exchanges to GDP. It measures trading activity relative to the size of the economy and can be used as a measure of stock market liquidity and activity. One caveat

deserves mention here: stock prices can rise simply due to speculation and thus the value of stock trades could be priced upwards causing a hike in the TVT ratio, without any real drop in transaction costs or change in the actual number of transactions taking place. One method of controlling for this is to consider the market capitalization ratio which includes the price in the numerator as well, since any hike in stock prices will affect this ratio in a similar manner (Levine, 2003). Thus, if one finds a significant relationship between stock market liquidity and inequality even after controlling for market capitalization ratio, the price effect alone cannot be said to impact the relationship between the two.

The **market capitalization ratio** (MCAP) is defined by the value of listed shares divided by GDP, and can be used as a measure of stock market size. The **turnover ratio** (TOR) measures the total value of trades of domestic shares to total value of listed shares, i.e.: TVT/MCAP. It can be used to indicate trading volumes relative to the size of the stock market, and can also be considered as a measure of liquidity. A small but active market implies a high TOR while a large but less active market results in a low TOR. TOR also does not suffer from the possible bias due to the price effect as mentioned before as the price enters both the numerator and denominator. All the three measures are taken from the 2006 updated version of the database by Beck et. al. (2000).

The conditioning information set includes all the variables that are known in the literature to have an impact on income inequality. The simple controls include real GDP per capita and its square value to test for the Kuznet's inverse-U hypothesis. The data is sourced from the World Bank's WDI database. To account for human capital, the average years

of secondary school attainment measure is taken from the Barro and Lee (2003) dataset. The additional controls include the inflation rate to account for macroeconomic fluctuations, the degree of openness captured by the ratio of sum of exports and imports over GDP (trade ratio), and an indicator of government consumption (government expenditure/GDP), all taken from the WDI database.[1] An additional control is a variable denoting ethno linguistic fractionalization from Alesina et al (2003). To control for the level of banking development in a country, the ratio of private credit by deposit money banks and other financial institutions to the GDP is included in some regressions. The private credit ratio is sourced from the Beck et al. database on financial structure (2006). The regional dummies are sourced from Campante and Do (2007).

The measures of stock market development could be endogenous due to reverse causality in that the level of income inequality could also affect the level of stock market development. Inequality affects financial development through the effect on unequal access to resources. With weak institutions in place, inequality encourages vested interests to monopolize and control the access to the financial system (Rajan and Zingales, 2003; Perotti and Volpin 2007). In order to extract the exogenous component of stock market development, a usual procedure is to use instruments and conduct 2SLS regressions. In the search for appropriate instruments, the literature of La Porta et. al (1998) is insightful. They find that the legal system determines how well protected shareholders in a market are and in this respect, the legal origin of a country plays a crucial role. In fact, La Porta et al (1997) show that countries with lesser investor

[1]Note: In the tables in the appendix, trade ratio refers to the measure of international openness while the value-traded ratio refers to the indicator of stock-market liquidity.

protection and rights have lesser developed debt and equity markets. Thus, the legal origin of a country – whether it be French, British, Scandinavian or German– determines how enforcement mechanisms work in different countries and this in turn impacts the development of financial systems. Thus, these can act as appropriate instruments for the stock market indicators and are known to be certainly exogenous. These indicators are available from LLS (2006).

4. Econometric Specifications

4.1. Cross-sectional regression

The cross-sectional OLS helps to understand the relationship between stock market development and inequality across countries.[2] Here, data is averaged across time from 1975 to 2005 to give one observation per country. As Clarke, Xu and Zou (2006) state, the cross-sectional regressions could help understand the long-run effects between the variables of interest. Following Bonfiglioli (2008), we use the following equation to specify the econometric model:

$$G_{i(t-k,t)} = \alpha + \beta' X_{i(t-k,t)} + \delta_1 smdev_{i(t-k,t)} + \delta_2 \left(smdev_{i(t-k,t)} \right)^2 + \varepsilon_i$$

$G_{i(t-k,t)}$ stands for the average net gini coefficient, $X_{i(t-k,t)}$ is the vector of control variables, $smdev_{i(t-k,t)}$ denotes the different measures of stock market development and ε_i is the error term. Subscripts i (t - k) indicate the average of a variable observed in country i in the period between t- k and t, i.e. between 1975 and 2005. The additional control variables include real GDP per capita and its square, the measure of schooling, trade ratio, government consumption as a ratio of GDP, the inflation rate and the index of ethno linguistic fractionalization. Private credit as a ratio to GDP is also included in some

[2] If there is an issue of heteroskedasticity, GLS is known to be more efficient than OLS. However, the Breusch-Pagan LM tests did not show evidence of heteroskedasticity in the cross-section sample.

regressions to control for banking development. The real GDP per capita and schooling values are the initial values. GDP per capita and its square are in log values to control the dominance of wealthier countries.

To control for the possibility of reverse causality and endogeneity of stock market indicators, I use the legal origin variables as a set of instruments.

4.2. Panel regressions

The equation used to specify the econometric model (Bonfiglioli, 2008) is as below:

$$G_{it} = \alpha + \beta' X_{it} + \delta_1 smdev_{it} + \delta_2 \left(smdev_{it} \right)^2 + \eta_i + \nu_t + \varepsilon_{it}$$

Here, the Gini coefficient and all independent regressors are averaged over 5-year periods (i.e. for each country *i* over the 5-year period *t*) to create 5 year panels between 1975 and 2005. The averaging helps to smooth out the business cycle fluctuations present in the stock market data. The real GDP per capita and schooling measures are values taken at the beginning of each 5-year period. η_i , ν_t and ε_{it} are the country-specific, time-specific effects and error term respectively. The panel regressions help to account for the time-series nature of the data, as opposed to cross-sectional analysis.

The next question which arises is how to conduct the panel analysis. While the fixed effects analysis captures the trends within each country across time, random effects could be more effective as they use both within and between-group variations. As Clarke, Xu and Zou (2006) state in their paper, the problem with fixed effects is that adding country

dummies eliminates the cross-sectional variation. However, the level of inequality which is of main interest varies a lot across countries, while it varies only modestly within countries across time. Thus, the fixed effects estimator will fail to capture the cross-sectional variation in inequality. They also point out that fixed effects estimation could aggravate issues related to measurement error. They emphasize that income distribution is often subject to measurement errors which may be different in different time periods. Thus, the fixed effects estimator might result in capturing very little variation in inequality, while capturing a greater variation of measurement error.

The random effects estimator however has a strong assumption that the unobserved effects are uncorrelated with the regressors and follow the normal distribution. Under the assumption that there is no good reason to believe that the unobserved country effects should be correlated with the regressors, the random effects estimation would be more appropriate. Moreover, the random effects estimation allows for country-specific time-invariant regressors, which is otherwise ignored in the fixed effects estimation. Thus, the random effects estimation allows for inclusion of ethno-linguistic fractionalization which is time-invariant. The random effects estimation was done using regional dummies to account for regional fixed effects. Time dummies were also used in some specifications.

Although the arguments above seem to highlight the benefits of using random effects regressions, the fixed effects estimation was also conducted for robustness. Even if the random effects model is valid, fixed effects is always consistent. If the assumption that the unobserved effect is uncorrelated with the regressors is violated, random effects

estimates will be inconsistent. The fixed effects estimation relaxes this assumption as it allows for correlation between the unobserved heterogeneity and regressors. In the fixed effects regressions in this paper, the estimations include country fixed effects for all specifications and time fixed effects in some specifications.

5. Results

5.1. Cross-sectional Analysis

Turnover Ratio: It is found to be negative and significant at the 5% significance level (column 1 of Table 3) and at the 10% level (column 2). This result holds at the 5% level (column 3) even when private credit is used as a control variable, to account for banking development. This implies that a more liquid stock market works to lower income inequality. No evidence is found for a quadratic relationship. (Refer to Table 3 in appendix)

Value Traded ratio: It is found to be insignificant in all specifications, even when a quadratic term is included. (Refer to Table 4 in appendix)

Market Capitalization Ratio: It is found to be positive and significant at the 10% level in all specifications, with no evidence of a quadratic relationship. Thus, a unit increase in this ratio tends to increase income inequality i.e. stock market size appears to raise income inequality. (Refer to Table 5 in appendix)

Simultaneous effect of market cap ratio and value traded ratio: As mentioned earlier, to remove doubts that the effect of value traded ratio is being dominated by the price effect, we add market cap ratio as an additional regressor. Value traded ratio becomes negative and significant at the 10% level (column 2 of Table 6) when additional controls, excluding banking development are added. The coefficient on market cap ratio is positive and significant in all specifications at the 1% (column 2 and 3 of Table 6) or 10% level

(column 1). No evidence is found for quadratic relationships. (Refer to Table 6 in appendix)

Other controls: In all the above specifications, GDP per capita and its square value are significant at the 1% level, and evidence is found for the Kuznet's inverse-U hypothesis. As real GDP per capita increase, income inequality first increases but at later stages of development, it decreases. Schooling and ethno linguistic fractionalization are also significant at the 1% level. While schooling works to lower inequality by an average of 2 units, ethno linguistic fractionalization works to increase it by up to 15 units. The other controls appear to be insignificant, except for trade ratio which has a negative coefficient in the specifications which include market cap ratio as the main regressor.

To allow for endogeneity, the legal origin variables were used as instruments. The Sargan's test of over-identifying restrictions confirmed they were appropriate instruments. However, the Durbin-Wu-Hausman tests of endogeneity did not show evidence of endogeneity of the stock market indicators. Thus, there might not be an issue of reverse causality in this sample.

5.2. Results for Random Effects estimation

Turnover ratio: Turnover ratio is negative and significant at the 5% (column 2 of Table 7) and 10% (column 1) significance level when time dummies, regional dummies and all control variables except private credit are included. Thus, higher market liquidity seems

to lower income inequality except when banking development is also accounted for. (Refer to Table 7 in appendix)

Value Traded ratio: This ratio was found to be insignificant even at the 10% level for all specifications.

Market Cap ratio: This ratio was found to be strongly significant with a negative coefficient even when regional dummies and all controls were added. Unlike the OLS estimates, evidence was found for a quadratic relationship with the quadratic term being positive and significant at the 1% (columns 1, 2 and 3 of Table 8) and 5% (columns 4,5 and 6 of Table 8) level. Thus, the inverse-U hypothesis is validated in the random effects estimation. A bigger stock market works to increase inequality at first, but lowers inequality after a certain stage of stock market development. (Refer to Table 8 in appendix)

Value traded ratio and market cap ratio *simultaneously*: Value traded ratio and its square term remain insignificant even when stock market size is controlled for. Market capitalization ratio and its square are significant even when year dummies are added. Thus, even after controlling for stock market liquidity, regional dummies, year effects and banking development, evidence is found for the inverse-U relationship between market size and income inequality. (Refer to Table 9 in appendix)

Other Controls: Real GDP per-capita and its square term are highly significant and the sign of the coefficients validate the Kuznets inverse-U hypothesis. Ethno linguistic fractionalization is also very significant and positive, indicating a negative impact on lowering inequality. The schooling measure has a negative coefficient and is significant in some specifications, thus confirming that an additional year of higher education lowers income inequality. None of the other controls seemed to show significance in the random effects estimation.

5.3. Results for Fixed Effects Estimation

Turnover Ratio: Turnover ratio is insignificant in all the specifications, with and without time fixed effects. (Refer to Table 10 in appendix)

Value Traded Ratio: It is insignificant in all specifications, confirming the random effects estimation results.

Market Cap Ratio: In the absence of year dummies, the linear coefficient is positive and significant at the 1% (column 1 and 2 of Table 10) or 5% (column 3) level. The quadratic term is negative and significant at the 1% level. When year effects are added however, only the quadratic term becomes significant maintaining the negative sign. Thus, even with fixed effects estimation, strong evidence is found for the quadratic term for market cap ratio. (Refer to Table 11 in appendix)

Value traded ratio and Market Cap ratio *simultaneously*: When market size is controlled for, value traded ratio continues to be insignificant. In the absence of year effects, market cap ratio and its square term are significant and the inverse-U hypothesis is confirmed. In the presence of year effects, the linear term is significant only in the absence of private credit as a control. The quadratic term continues to be significant and has a positive value similar to the random effects estimation. (Refer to Table 12 in appendix)

Other controls: None of the controls appear significant in any of the specifications. This is surprising especially for real GDP per capita and the schooling measure. Thus, this could be evidence for the concerns relating to measurement error being aggravated and variations to inequality not being captured in the fixed effects estimation. The impact of ethno-linguistic fractionalization cannot be assessed as the fixed effects estimation drops out time invariant variables.

5.4. Summary

Both the random and fixed effects estimations confirm the Kuznets hypothesis between stock market size and income inequality. A bigger stock market could be an indicator of greater financial development in a country and in this light, the hypothesis of Greenwood and Jovanovic (1990) seems to have been proved. Unlike the studies which relied on banking development alone to account for financial progress and found a negative linear trend between private credit ratio and income inequality, the use of stock market capitalization ratio to indicate financial development validates the inverse-U hypothesis rather than a linear trend. As Favilukis (2008) explains, participation in equity markets

entails a fixed entry cost and a per-period dollar cost, both meant to capture the informational and transactional costs. These costs are high in the beginning and it is the rich who almost entirely own stocks in the initial phases of stock-market development. However, over time these participation costs decline and the middle-income groups also start demanding a share in equity markets, lowering equity premiums and raising stock prices. Once the stock market reaches a certain size, the gains to the rich start declining because of lower equity premiums and due to greater participation by the middle-income groups, the gap between these income groups falls. Bonfiglioli (2008) also states that in the initial stages of stock market development, investors indulge in risk-taking more than risk-sharing and this drives income inequality upward. However, after the size of the market for risk-sharing is big enough, this encourages greater risk-sharing than risk-taking, thus lowering inequality as the stock market appears to be a safer investment avenue than before.

The results for stock-market liquidity and efficiency are not indicative of a strong relationship between these indicators and income inequality. Although Levine (1997) stresses that a more active and liquid market works to aid economic growth, the impact does not seem to trickle down to affect income inequality. As Das and Mohapatra (2003) observe in a set of liberalizing countries, higher value traded ratio aids the upper quintile and harms the middle-income groups, with no significant impact on the lowest quintile. They argue that greater equity market activity could indicate greater demand for equities leading to a rise in stock prices, and the gains from stock price appreciation would probably go entirely towards the rich who would dominate the stockholder group in the

liberalizing markets. They also note that the coefficients on the upper quintile share and middle-income groups add up to zero, thus cancelling out the opposing effects on the whole. Thus, greater equity market activity does not seem to have any clear impact on net income inequality as a whole. In this paper, all regressions suggest that the value traded ratio has no significant impact on income inequality.

The result for turnover ratio is not very strong either. Although the random panel regressions suggest a negative linear relationship between this indicator and the net Gini coefficient, the value of the coefficient is not so large and is significant only at the 10% level. Moreover, the result is not robust to the addition of banking development measure. Further, the fixed effects regressions fail to show any statistically significant impact of this ratio on income inequality at the 10% level.

6. Conclusion

This paper looks at how stock market size, liquidity, and activity impact income inequality. In line with the theory that a bigger stock market and greater fund-raising through the equity markets works to increase income inequality at first, but lowers it once a certain size is reached, this paper finds a Kuznets inverse-U relationship between stock market size and income inequality. The liquidity measure as measured by value traded ratio was not found to have any significant impact on income inequality. A higher turnover ratio, indicating a more efficient market, was found to lower inequality in both the OLS and random effects estimation although the magnitude of the impact was not very large. Moreover, this result did not hold in the fixed effects estimation. Thus, it is hard to establish a concrete inference on how stock market liquidity impacts income inequality.

Further research could be done with a larger dataset on stock market indicators and income inequality. Moreover, to account for potential endogeneity of all the regressors, one could experiment with dynamic panel techniques by including the lagged dependent variables as instruments. However, this requires at least 3 observations per country and calls for a richer dataset than available for this paper. A larger data set would also allow one to focus on specific income groups.

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Appendix: Tables 1 - 12

Table 1 and 2 report statistics for the cross-section sample where data is averaged from 1975 to 2005, resulting in one observation per country.

SUMMARY STATISTICS

TABLE 1

Variable	Obs	Mean	Std. Dev.	Min	Max
Gini	77	38.59997	9.439619	21.9656	59.1
Real GDP pc	77	6442.007	6706.388	140.2619	28205.71
Gov consumption	77	15.80461	5.269822	4.688637	30.89301
Inflation	77	1.583704	8.569938	0.01521	74.83683
Trade ratio	77	81.16883	56.98817	19.77148	411.6681
Market cap ratio	77	.4086682	.4764123	0.0054655	2.669513
Value traded ratio	77	0.2109824	0.3187053	0.000113	1.53161
Turnover ratio	77	.4181001	.4937082	0.011909	3.680838
Pvt credit	76	.5108535	.383629	0.0438786	1.48588
Schooling	68	6.250441	2.619488	0.61	11.43
ELF	75	.380124	.2364604	0.002	0.9302

Note: ELF refers to ethno linguistic fractionalization. Value traded ratio is a measure of liquidity while the trade ratio refers to the measure of openness

PAIRWISE CORRELATIONS

(TVT- Total value traded ratio, TOR – Turnover ratio; P-values in parentheses)

TABLE 2

Variable	gini	Mkt cap	TVT	TOR
Gini	1.0000			
Market cap ratio	-0.0228 (0.8442)	1.0000		
Value traded ratio	-0.1528 (0.1846)	0.8173 (0.0000)	1.0000	
Turnover ratio	-0.3120 (0.0057)	0.1200 (0.2984)	0.3586 (0.0014)	1.0000

TABLE 3: OLS estimation of impact of turnover ratio on net gini coefficient			
Variable	**1**	**2**	**3**
Turnover ratio	**- 6.503**** (2.55)	**- 4.348*** (2.46)	**- 6.217**** (3.07)
Log GDP pc	16.82*** (6.224)	19.68*** (5.376)	23.079*** (6.155)
Log GDP pc square	-1.0296** (.392)	-1.1037*** (.3538)	-1.386*** (.4172)
Schooling	-2.299*** (.4278)	-2.3101*** (.4363)	-2.2075*** (.4452)
Government consumption		-.23116 (.2106)	-.20669 (.220)
Traderatio		-0.01598 (.0125)	-0.0249 (.0149)
Inflation		-0.064 (.6445)	-0.0545 (.287)
ELF		15.57*** (4.347)	14.66*** (4.27)
Private credit			5.2518 (3.299)
No of obsvns	68	66	66
Adjusted R-squared	0.4746	0.5656	0.5776

Note: OLS refers to estimation by ordinary least squares. Robust standard errors are in parentheses. *** indicates 1%, ** 5% and * 10% significance levels respectively

TABLE 4: OLS estimation of impact of value traded ratio on net gini coefficient			
Variable	**1**	**2**	**3**
Value traded ratio	2.596 (3.207)	1.594 (3.617)	- 0.6655 (4.555)
Log GDP pc	22.22*** (7.197)	23.28*** (6.510)	23.745*** (6.8116)
Log GDP pc square	-1.448*** (.4636)	-1.3789*** (.4427)	-1.4260*** (.4705)
Schooling	-2.236*** (.4229)	-2.287*** (.429)	-2.2446*** (.4300)
Government consn		-0.2006 (.2082)	-0.2178 (.2143)
Traderatio		-0.0173 (.01332)	-0.0189 (.01374)
Inflation		-0.0607 (.5636)	-0.0546 (.4169)
ELF		16.613*** (4.268)	16.769*** (4.372)
Pvt credit			3.1609 (3.7108)
No of obsvns	68	66	66
Adjusted R-squared	0.4403	0.5499	0.5468

Note: OLS refers to estimation by ordinary least squares. Robust standard errors are in parentheses. *** indicates 1%, ** 5% and * 10% significance levels respectively. Value traded ratio is a measure of liquidity while the trade ratio refers to the measure of openness

TABLE 5: OLS estimation of impact of market cap ratio on net gini coefficient			
Variable	**1**	**2**	**3**
Market cap ratio	**3.8187*** (1.9286)	**4.5215*** (2.281)	**5.358*** (2.988)
Log GDP pc	22.095*** (6.8417)	25.842*** (6.066)	25.109*** (6.447)
Log GDP pc square	-1.4656*** (.4342)	-1.5976*** (.4145)	-1.538*** (.443)
Schooling	-2.154*** (.411)	-2.179*** (.4182)	-2.193*** (.4133)
Government consn		-0.1518 (.2103)	-0.1478 (.209)
Traderatio		-0.032** (.0154)	-0.032* (.0159)
Inflation		-0.059 (.4113)	-0.062 (.541)
ELF		15.419*** (4.169)	15.27*** (4.283)
Pvt credit			-1.8126 (3.338)
No of obsvns	68	66	66
Adjusted R-squared	0.4649	0 .579	0.573

Note: OLS refers to estimation by ordinary least squares. Robust standard errors are in parentheses. *** indicates 1%, ** 5% and * 10% significance levels respectively

TABLE 6: OLS estimation of simultaneous impact of market cap and value traded ratios on net gini coefficient			
Variable	**1**	**2**	**3**
Market cap ratio	**7.325*** (4.345)	**9.354***** (3.154)	**9.258***** (3.347)
Value traded ratio	-6.929 (8.003)	**- 9.3946*** (5.403)	-9.569 (5.747)
Log GDP pc	18.67*** (6.875)	21.343*** (6.003)	21.42*** (6.164)
Log GDP pc, square	-1.226*** (.4398)	-1.272*** (.4075)	-1.279*** (.4194)
Schooling	-2.1369*** (.414)	-2.1329*** (.4142)	-2.129*** (.4146)
ELF		15.39*** (4.116)	15.428*** (4.2569)
Govt Consumption		-0.2143 (.2032)	-0.2163 (.2075)
Traderatio		-0.0351** (.01718)	-0.0351** (.01735)
Inflation		-0.0586 (.4889)	-0.0578 (.4949)
Private credit			0.4019 (3.477)
No of obsvns	68	66	66
Adjusted R-squared	0.4697	0.5954	0.588

Note: OLS refers to estimation by ordinary least squares. Robust standard errors are in parentheses. *** indicates 1%, ** 5% and * 10% significance levels respectively. Value traded ratio is a measure of liquidity while the trade ratio refers to the measure of openness.

TABLE 7: Random effects estimation of impact of turnover ratio on net Gini coefficient			
Variable	**1**	**2**	**3**
Turnover ratio	**- 1.4685*** (.8324)	**- 1.863**** (.8767)	**- 1.2287** (.9002)
Log GDP pc	16.345** (7.621)	16.163*** (6.028)	13.651** (6.819)
Log GDP pc square	-1.1249** (.45981)	-1.014*** (.3753)	-.8718** (.4146)
Schooling	-1.0756** (.4414)	-.9593** (.4626)	-.9425** (.4372)
Government consumption		-.1667 (.1156)	-.1217 (.1205)
Traderatio		-.0291 (.0178)	-.02704 (.0167)
Inflation		.00545 (.1012)	-.0688 (.1098)
ELF		18.275*** (5.019)	18.457*** (5.2616)
Private credit			.25245 (1.1635)
Time dummies	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes
No of observations	182	173	164

Note: *** indicates 1%, ** 5% and * 10% significance levels respectively, standard errors are clustered at country level and are represented in parentheses. There are six time dummies to account for the six 5-year time periods from 1980 to 2005. There are 8 regional dummies to account for regional fixed effects.

TABLE 8: Random effects estimation of impact of mkt cap ratio on net Gini coefficient						
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Market cap ratio	**10.303*** **	**10.309*** **	**8.799*** **	**5.229** **	**5.849** **	**5.719** **
	(2.374)	(2.588)	(2.599)	(2.520)	(2.411)	(2.507)
Market cap ratio, square	**- 4.3131*** **	**- 4.527*** **	**- 3.952*** **	**- 2.672** **	**- 3.054** **	**- 2.928** **
	(1.063)	(1.181)	(1.17)	(1.131)	(1.189)	(1.179)
Log GDP pc	18.312**	16.804***	13.752**	18.846**	17.99***	14.066**
	(7.109)	(6.102)	(6.279)	(8.018)	(6.243)	(7.035)
Log GDP pc square	-1.295***	-1.1068***	-.9434**	-1.291***	-1.1466***	-.9182**
	(.431)	(.387)	(.3885)	(.480)	(.3806)	(.418)
Schooling	-.3958	-.3687	-.4642	-1.1736***	-1.026**	-.9935**
	(.390)	(.4089)	(.4012)	(.4448)	(.4461)	(.4321)
Government consumption		-.1793	-.1598		-.1845	-.1444
		(.1283)	(.1287)		(.1302)	(.131)
Traderatio		-.0117	-.014		-.0241	-.0215
		(.0205)	(.0185)		(.0223)	(.0206)
Inflation		.0032	-.1165		.02517	-.0574
		(.1063)	(.0987)		(.0933)	(.1126)
ELF		20.106***	19.454***		18.415***	18.375***
		(5.328)	(5.42)		(4.947)	(5.17)
Private credit			1.434			.3185
			(1.148)			(1.16)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	No	No	No	Yes	Yes	Yes
No of obsvns	182	173	164	182	173	164

Note: RE refers to random effects estimation, *** indicates 1%, ** 5% and * 10% significance levels respectively, standard errors (in parentheses) are clustered at country level. There are six time dummies to account for the six 5-year time periods from 1980 to 2005. There are 8 regional dummies to account for regional fixed effects

TABLE 9: RE estimation of simultaneous impact of value traded and market cap ratios on net Gini coefficient						
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Market cap ratio	**13.291*** **	**13.935*** **	**11.226*** **	**5.455** **	**6.545*** **	**8.506** **
	(3.094)	(3.489)	(3.436)	(2.584)	(2.463)	(3.385)
Market cap ratio, square	**- 5.565*** **	**- 5.811*** **	**- 4.866*** **	**- 2.5297** **	**- 2.747** **	**- 3.767** **
	(1.516)	(1.64)	(1.578)	(1.14)	(1.153)	(1.608)
Value traded ratio	-4.688	-5.690	-3.6579	-.699	-1.735	-4.6969
	(3.462)	(3.62)	(3.573)	(1.623)	(1.749)	(3.386)
Value traded ratio, square	2.657	2.779	1.871			2.043
	(1.706)	(1.697)	(1.702)			(1.69)
Log GDP pc	19.126***	16.34***	13.69**	18.096**	16.409***	12.27*
	(7.0454)	(6.109)	(6.45)	(7.91)	(6.271)	(7.331)
Log GDP pc square	-1.347***	-1.078***	-.934**	-1.2448***	-1.046***	-.8037*
	(.4251)	(.3837)	(.3992)	(.4721)	(.3802)	(.4371)
Schooling	-.3685	-.3617	-.460	-1.1642***	-1.009**	-.9618**
	(.389)	(.4073)	(.3989)	(.4418)	(.4434)	(.4318)
Government consumption		-.2045	-.1799		-.1945	-.1635
		(.1286)	(.1306)		(.1273)	(.13168)
Traderatio		-.0076	-.0108		-.0256	-.01672
		(.0198)	(.0181)		(.022)	(.0205)
Inflation		.0411	-.0891		.0523	-.0125
		(.1050)	(.1057)		(.0925)	(.1219)
ELF		19.31***	19.068***		18.45***	18.119***
		(5.214)	(5.343)		(4.961)	(5.101)
Private credit			1.1816			.0533
			(1.216)			(1.246)
Time dummies	No	No	No	Yes	Yes	Yes
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes
No of obsvns	182	173	164	182	173	164

Note: RE refers to random effects estimation, *** indicates 1%, ** 5% and * 10% significance levels respectively, standard errors are clustered at country level. There are six time dummies to account for the six 5-year time periods from 1980 to 2005. There are 8 regional dummies to account for regional fixed effects

TABLE 10: Fixed effects estimation of impact of turnover ratio on net gini coefficient

Variable	1	2	3
Turnover ratio	-1.176 (.773)	-1.336 (.8022)	-.8037 (.858)
Log GDP pc	9.515 (11.446)	10.078 (11.901)	-.3819 (9.129)
Log GDP pc square	-.7749 (.6745)	-0.829 (.70188)	-.2083 (.5650)
Schooling	-.5684 (.5195)	-.4603 (.566)	-.4128 (.5381)
Government consn		-0.1493 (0.118)	-.01556 (.1254)
Traderatio		-0.0165 (0.019)	-.00378 (.0179)
Inflation		0.0647 (0.077)	-.0452 (.1217)
Private credit			1.198 (1.148)
Year dummies	Yes	Yes	Yes
No of obsvns	182	180	171

Note: FE refers to fixed effects estimation; standard errors are robust standard errors (in parentheses). There are six time dummies to account for the six 5-year time periods from 1980 to 2005

TABLE 11: Fixed effects estimation of impact of mkt cap ratio on net gini coefficient						
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Market cap ratio	**7.3119*** **	**7.878*** **	**6.505** **	3.2321	3.7068	3.638
	(2.453)	(2.582)	(2.593)	(2.831)	(2.923)	(3.061)
Market cap ratio, square	**- 3.521*** **	**- 3.852*** **	**- 3.324*** **	**- 2.219***	**- 2.576***	**- 2.449***
	(1.055)	(1.076)	(1.079)	(1.31)	(1.301)	(1.243)
Log GDP pc	8.03	7.453	-1.287	11.37	10.806	-1.1885
	(10.29)	(11.11)	(8.041)	(12.9)	(13.821)	(10.373)
Log GDP pc square	-.6025	-.5900	-.1373	-.9326	-.929	-.2126
	(.6020)	(.6470)	(.4913)	(.7589)	(.8122)	(.6235)
Schooling	.2431	.2002	.0722	-.5962	-.5474	-.4641
	(.5014)	(.5414)	(.5442)	(.5275)	(.56704)	(.5545)
Government consumption		-.0571	-.0284		-.1836	-.0782
		(.1101)	(.1270)		(.1135)	(.1234)
Traderatio		.0094	.0127		-.0021	.0099
		(.0259)	(.022)		(.0278)	(.0244)
Inflation		.04207	-.0769		.07675	-.0429
		(.08846)	(.1003)		(.0775)	(.1186)
Private credit			1.937*			1.4359
			(1.1215)			(1.112)
Year dummies	No	No	No	Yes	Yes	Yes
No of obsvns	182	173	164	182	173	164

Note: FE refers to fixed effects estimation; standard errors are robust standard errors (in parentheses). There are six time dummies to account for the six 5-year time periods from 1980 to 2005.

TABLE 12: FE estimation of simultaneous impact of value traded and market cap ratio on net gini						
Variable	1	2	3	4	5	6
Market Cap ratio	**7.595*** **	**8.252*** **	**6.854** **	5.383	**6.691** *	6.3038
	(2.505)	(2.757)	(2.762)	(3.4985)	(3.783)	(3.945)
Market Cap ratio, square	**- 3.459*** **	**- 3.803*** **	**- 3.279*** **	**- 2.935** *	**- 3.529** **	**- 3.34** **
	(1.045)	(1.054)	(1.06)	(1.702)	(1.751)	(1.65)
Value traded ratio	-0.494	-0.546	-0.5087	-3.113	-4.319	-3.857
	(1.442)	(1.558)	(1.379)	(3.016)	(3.276)	(3.3047)
Log GDP per capita	7.287	6.586	-2.195	10.94	9.365	-2.74
	(10.46)	(11.37)	(8.225)	(13.07)	(14.05)	(10.789)
Log GDP per capita, square	-0.548	-0.527	-0.0726	-0.8806	-0.807	-0.0818
	(0.6066)	(0.658)	(0.506)	(0.764)	(0.818)	(0.651)
Schooling	0.236	0.1957	0.072	-0.4908	-0.4157	-0.3536
	(0.496)	(0.538)	(0.541)	(0.56)	(0.615)	(0.5911)
Govt. consumption		-0.0615	-0.032		-.1916*	-0.092
		(0.1105)	(0.126)		(0.114)	(0.116)
Trade ratio		0.0086	0.0122		0.0032	0.0156
		(0.0261)	(0.0223)		(0.029)	(0.026)
Inflation		0.0468	-0.0708		0.1136	-0.0116
		(0.0912)	(0.1056)		(0.0781)	(0.1345)
Private Credit			1.9174			1.225
			(1.146)			(1.156)
Year dummies	No	No	No	Yes	Yes	Yes
No of observations	182	173	164	182	173	164

Note: FE refers to fixed effects estimation; standard errors are robust standard errors. There are six time dummies to account for the six 5-year time periods from 1980 to 2005