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-RESEARCH ARTICLE-

FINANCIAL NON-NEUTRALITY; A LINK BETWEEN INCOME INEQUALITY AND AGGREGATED DEBT CHARACTERISTICS IN THE UNITED-STATES

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─Abstract─

This paper studies socio-economic dynamics of deposit-taking institutions and their ability to affect inequality through the access and depth of the financial channels using a unique data set of aggregated statewide socio-economic indicators and banking data obtained from the Federal Deposit Insurance Corporation. Panel data econometric application to the data combined with a unique interpretation of the Gini and the median income indicators facilitates our understanding of inequality within the income distribution resulting from changes in loan through the ARDL technique. The major recommendation from this investigation is that financial activity is fundamental to the understanding of inequality dynamics.

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1. INTRODUCTION

The study of inequality in current times is pressing as we see inequality indices climb (Roser et al., 2013). This pattern is apparent at the national and at the state level in the United States. In an international survey looking into societal concerns, respondents from North America and Europe perceived "inequality" as a top societal risk factor (Murray, 2014). The academic study of inequality has grown exponentially in the past century, yet conclusions often set opposing realizations leading to ambiguity. The direction of existing literature suggests that inequality in the United States is suboptimal and undesirable for economic growth. The long-run persistence of inequality in the U.S. over the period 1950-2010 negates the validity of an economic advantage of inequality (Apel, 2015). If income inequality and economic activity are both buoyant at the same time, then economic inequality would engender incentives for the poor to mobilize resources to reduce inequality. The persistence of both inequality and growth demonstrates that the correlation between the two forces is positive and hence inequality cannot be addressed by remaining passive. Since economic inequality in general is associated with economic inequality of opportunity then it must also follow that policies and conditions that hurt one, hurt the other (Brunori et al., 2013). It may however be argued that societal inequalities could grow while increasing or uplifting the living standards of all members of society.

This paper focuses on the American banking system and makes the case that addressing American inequality is within the reach of monetary policy through the financial intermediary channel. This study's intra-national evidence suggests that more equality among citizens is achievable simply by easing credit constraints without compromising growth. To analyze inequality through the financial market mechanism and to draw conclusions and make recommendations for the Federal Reserve, it is important to make some fundamental links between the two topics. A Bruegel Policy Report from June 2015 summarizes the link between inequality and monetary policy (Claeys et al., 2015). This link works out for two reasons: one, because asset prices and the interest rates are robustly linked, and two, interest rates affect inequality as a credit constraint. To understand banking from the viewpoint of credit constraints, a crucial distinction must be made between community and non-community banks. The former accounts for 94%

of total banks in the U.S. and 14.54% of total American banking assets, whereas the latter accounts 3.8% of total banks in the U.S. and 54.44% of total American banking organization assets (FDIC, 2012). Based on the literature and the recommendations of this paper, we are inclined to the understanding that promoting and fostering of relationship lending is economically efficient.

The results of this research suggest that yield curve changes in curvature and is an effective tool against credit constraints and in turn income inequality. The "unusual" monetary policy implemented in post 2008 requires an appropriate understanding of socio-economic repercussions. Economic growth, full employment, financial and price stability are today's pillars of monetary policy, yet equality of opportunity and equalization of wealth and income are just as indispensable to promoting these priorities as they are to influencing inequality. This paper gauges this effect at the macroeconomic level and supplements the literature by using a uniquely constructed panel data of the United States by state. The intra-national study is a natural setting for isolating fundamental inequality drivers, especially the credit constraints associated to interest rates, financial depth, and loan maturity. When these credit constraints are removed or eased, we should expect to see a reduction in inequality measures. This is only true to a limit at which point the looser financial conditions can only benefit higher quality borrowers who are typically stronger earners, have greater wealth.

Section 2 of this paper covers the literature linking monetary policy, banking, and economic inequality. Sections 3 and 4 present and develop the data and empirical models used to derive the results in Section 5. Section 6 ties all the above to justify the inclusion of inequality in the policy debate.

2. LITERATURE REVIEW

The seminal work of Kuznets (1955) uncovers the first link between growth and inequality and is the basis of a generalized regression model where inequality depends on growth. Economic growth benefits all members of society but not at the same rate and economic improvement from additional growth does not translate equally to all income classes. Kuznets cross-country observation of a curved distribution that he separated into a left and right-hand-side. This vein of the literature is typically of the conclusion that growth alleviates inequality up to a certain level of economic development.

Inequality leading growth has also been postulated based on the incentivization of inequality. This notion has a parenthood with "trickle-down economics" see, for example (Stiglitz, 2015). This argument is sound but the existence of poverty traps and

the persistence in economic inequality makes it difficult to defend the argument; and as such, the results are not unanimous. This typically takes on a reduced form regression type of analysis evaluating the impact of inequality on growth.

The mixed result of previous research brings us to the third general topic of inequality embodied in the channels of transmission. Four underlying channels are possible: A- financial market imperfections e.g. access to credit, credit constraints, financial breadth of service and depth of reach; B- aggregate savings through dynamics of socio-economic classes as popularized by Piketty (2018); C- socio-political instability as defined by financial systems and environmental factors such as regime type, economic conditions, rule of law; (La Porta et al., 2008); D- fiscal policy effectiveness in addressing inequality (Hayes et al., 2015).

This paper falls under financial market imperfections within the inequality nexus. For an extensive review of the literature, the reader should refer to Neves et al. (2014) and the meta-analysis by De Dominicis et al. (2008). Beck et al. (2010) directly address credit features and this study aims to supplement their work with more precise definitions of the variables to gather a more in-depth understanding of the underlying channels and their link to economic inequality.

Financial market imperfections are shortcomings of the financial system that will hinder it from connecting viable projects to funding. The imperfections fall under two principal categories: asymmetric information (ex-post, monitoring, and limited liability) and moral hazard (screening, interest rate risk and self-selection, ex ante). It should be evident that these imperfections will affect socio-economic classes unevenly. Consider, amongst other things, the fact that collateral, income security, and access to peripheral services, like lawyers and accountants, are directly associated with income and wealth levels. Low-income and minority groups are more likely to be denied credit (Weller, 2007). Financial market imperfections have been proxies by private credit-to-GDP and loan-to-value banking data. Both variables estimate the financial depth of an economy and are easily obtainable across countries but lack the depth to analyze further sub-channels. The assumption is that the deeper or more leveraged an economy, the greater the level of financial competition. This should, in turn, reduce credit constraints across the board, even if disproportionately.

This paper endeavors to specify more precisely financial imperfections and to gauge the unequal distribution of financial channels. With a better understanding of financial constraints, we are better equipped to discern and design financial policies. The recommendations are developed to alleviate financial access in such a way as to reduce

market imperfection and to increase access to credit without compromising economic growth considering the equity-efficiency trade-off.

2.1 Financial Depth and Competition

Financial depth is estimated by "total private bank credit/GDP" and gauges the amount of credit in the economy. As credit expands naturally from secure to less secure loans, the expansion of credit through the economic classes can alleviate credit constraints and potentially translate into better inequality statistics. This proxy is popular as it is because it is easily obtainable at national and geographic definitions, is commensurable internationally, and is well suited for long-term cross-country analyses. It is a broad variable and reflects two distinct forces: market competition and financial depth. This confluence is difficult to dissociate because of the high correlation between these two variables. Furthermore, the theory suggests that these two forces work in the same direction with regards to alleviating credit constraints. Greater competition reduces general financing obstacles (Beck et al., 2004), which in turn pushes lenders to rely on screening rather than on collateral (Hainz et al., 2013), and as a whole can potentially create greater stability (Anginer et al., 2013; Schaeck et al., 2009).

How is credit classified with respect to loan characteristics and which loan characteristics most effectively alleviate credit constraints and in turn reduce inequality? This issue is problematic as lower socio-economic agents may borrow money to smooth consumption, however, since this debt generates no income, it pushes them further into poverty. It is worth noting the distinction between productive credit and consumer credit. The former is preferred but the data cannot distinguish between the two.

2.2 Relationship vs. Transactional Lending

Transactional lenders are defined as creditors with a numeric/algorithmic screening process who rely on "hard" data to determine an application's eligibility; the opposite of which would be a relationship lender. The latter are typically creditors who rely on soft information to screen potential debtors and loans for eligibility. This dichotomy is not restrictive as both may overlap (Petersen et al., 1994). This roughly translates into a banking system as follows: community banks are relationship lenders, and large banking institutions are transactional lenders. Community banks are more receptive to debtor "soft" information and can capitalize on that knowledge in a reduction of the risk mitigating tools used by transactional lenders. These risk-mitigating tools, as we will see, are interest rate premiums, collateral requirements, and maturity restriction (Allen N Berger et al., 2005; Hassan et al., 2015). The 2012 Community Banking Study by the Federal Deposit Insurance Corporation (FDIC) emphasizes the importance of smaller relationship banks. The American economic reality as of 2011 is that 46% of private

sector loans to small farms and businesses are provided by community banks. In contrast, only 14% of the banking industry's assets are held by those banks. In 2010, the number of firms within the US that employs less than 20 workers account for almost 98% of all firms. The juxtaposition of these statistics is intended to highlight the importance of community banks and the credit constraint alleviation role they play. Although the FDIC and the Federal Reserve Banks acknowledge the important role these banks play, the number of community banks is shrinking and the gap in credit provision between community and non-community banks is widening. This is fundamentally important to consider when evaluating the effectiveness of monetary policy that disproportionately favors larger commercial by the more diversified nature of their operations which are less restricted to commercial banking.

2.3 Interest Rates

Monetary policy acts on the yield curve level and curvature and is defined by the asset class under the program. Sales and purchases of assets directly benefits the parties involved in the transaction and indirectly those holding the assets in which prices have moved. This phenomenon is analyzed at length in a report drafted by the Bank of England entitled "Distributional Effects of Asset Purchases" in 2012.

Monetary policy transforms the yield curve and in return commercial banks need to make changes for the sake of asset-liability management. For example, banks have three options when they sell assets for cash: they can hold the liquidity, they can replace their assets with assets of a similar risk, or they can increase the risk profile of substitutable asset. It is most likely that the adjustments made will be a preference for liquidity and risk reduction; neither case will likely reduce credit constraints.

2.4 Collateral

Collateral and its quality are an effective way of dealing with opaque borrowers and risky projects. It requires that the borrower "put his skin in the game", i.e., address limited liability. Naturally, this mechanism will reflect the wealth structure of an economy playing in favor of those who have assets to back their credit. Collateral, or the lack thereof, can be partially compensated for in terms of risk exposure by adjustments in maturity, interest rates, and screening. Collateral can also be dealt with by capitalizing on soft information in cases of relationship lending.[1]

[1] The premise of Hernando de Soto's book "The Mystery of Capital"

2.5 Maturity

Maturity is the keystone on which all other variables depend. In essence, finance is the dealings of capital through time or the actualization and exchange of temporal cash flows. Interest rates are the temporal exchange rates of this timely capital. Furthermore, the contractual concepts of limited liability and asymmetric information are subject to time as well. It should be clarified that each characteristic of credit is inherent in time, i.e., maturity. In addition to credit definition, banks are more generally responsible for the maturity transformation of short-term liabilities into long-term assets while uncompromising market liquidity. In the following two sections, loan maturity is expanded into two effectual subsets.

Filter capital. The use of a limited amount of credit to reveal ex-post information about a borrower (Flannery, 1986). Both, the borrowers, and lenders can benefit from this reduction in risk as it can potentially lower default probabilities and reduce the cost of capital. When shortening the loan maturity, the lender reduces temporal risk and interest rate risk all the while reducing the cost of monitoring over the long run as asymmetries in information are reduced when debt is rolled over. This level of risk is non-monotonic and displays an upward slope leveling-off in the future (Diamond, 1991). The interest rate risk and liquidity risk associated with the use of filter capital is contingent on renewal. Liquidity risk can force default even if the project is viable and interest rate risk can work either way. Therefore, a general shortening of a bank's loan maturity structure could potentially alleviate inequality by allocating at least part of the short-term credit to "filter" riskier borrowers, who are typically poorer economic agents. The use of filter-capital is more common in transactional lending where this tool can be used to overcome pressures from asymmetric information. Unfortunately, the empirical evidence does not consistently substantiate the hypothetical reasoning of risk and maturity. Research finds negative relationships between risk and maturity (Allen N. Berger et al., 1990), no relationship (Booth, 1992) or a positive one (Angbazo et al., 1998). The general understanding is that the self-selection of borrowers skews the data. Good quality borrowers choose short-term debt to reveal *ex ante* their quality. Hence, on the short side of bank credit two agents are operative. The first is the creditor that uses shorter terms to reduce risk and reveal good information, i.e., filter capital, and good borrowers that are self-selecting short-term loans as a signal to the creditor. Depending on the proportion of each agent, the relationship between risk and maturity will change.[2]

[2] The theoretical reasoning referred to in this section is a compilation of the following academic publications (Ortiz-Molina et al., 2008), (Dennis et al., 2005),(Allen N Berger et al., 2005).

Debt Burden. Debt burden is the periodic repayment of debt (a function of loan size, down payment, interest rate, and maturity) relative to income. Intuition and evidence suggest that debt maturity is the greatest contributing factor to the debt burden, and in turn can be very effective in alleviating credit constraints. Observe Equation 1 and note that debt burden, income, interest rate, and time to maturity are periodic. The partial derivatives of the above equation with respect to interest rates and maturity do not help us understand intuitively or conclusively the relative effect of either variable on the debt burden. To simplify matters we take only the effect within the parentheses, the multiplier, a.k.a. the inverse of the present value interest rate factor of an annuity, PVIFA.

$$Debt\_Burden = \frac{Principal}{Income}\left\{\frac{i(\tau)}{1-(1+i(\tau))^{-\tau}}\right\} \qquad (1)$$

We can posit that maturity extensions have a greater impact on reducing the debt burden than interest rates. We call this the debt burden effect of maturity. In other words, for a given amount of debt, the extension of maturity increases the denominator and reduces the periodic debt payment relative to the borrower's income. To substantiate this theoretical understanding of the debt burden effect of maturity, Pásztorová (2013) also conclude from an empirical study that maturity has a greater impact than interest rates on financial decisions.[3]

Filter-capital addresses *ex ante* asymmetric information whereas the debt-burden is an *ex-ante* criterion for evaluating loan risk. Filter capital and debt burden effects are opposing forces, leaving the net effect of maturity on inequality ambiguous. In addition, filter capital is difficult to identify empirically because of the self-selection issue discussed earlier. Even though both forces are acting in opposite directions, the regression results should pick up the net effect such that a positive result could imply that an increase in maturity increases inequality and therefore filter capital, which shortens maturity to alleviate constraints, and outweighs the effect of increasing maturity to alleviate constraints. The opposite will be true for a negative coefficient sign on maturity's effect on inequality; a negative sign will read that an increase in the maturity structure will decrease inequality and therefore the debt burden effect outweighs the filter capital effect.

[3] Message echoed by (Albertazzi, 2007) and (Attanasio et al., 2008)

3. JUSTIFICATIONS OF VARIABLES

Deininger et al. (1998) highlight the importance of focusing research on country or region-specific subsets as it removes cross-country variability. This was also one of the concluding remarks of Neves et al. (2014). The recommendations of the late nineties remain largely unheeded. When this issue is addressed, the results help us gauge the effectiveness of the variables of interest. By focusing on intra-national data, the state level within the US, to focus on inequality dynamics and finance, we eliminate variability associated to varying nature of the fiscal policy, monetary policy, legal regime, and the business cycle.

3.1 Inequality Dependents

Theoretical evidence points to the use of wealth proxies as lenders are more likely to lend against physical capital than they are against future stream of earnings. It is also the case that investment/saving decisions are largely determined by wealth and not income. However, Persson et al. (1994) demonstrate that all the measures of inequality are highly correlated and hence statistically comparable. Due to availability, the annual and state level Gini index from the American Census Bureau (ACB) between 2006 and 2016 is used. The ACB data is supplemented with data from Galbraith et al. (2008) who consolidate and interpolate the Gini index at the U.S. state-level between 1969 and 2004. The result is an annual and state level Gini index that has data between 1992-2016, where 2005 was estimated projecting the trend on the Galbraith and Hale data. A dummy variable is used to control for inherent measurement differences in the two sources of data. An alternate measure of inequality used in this analysis is the ACB's annual and per state median income data from 1992-2016. The combination of the two measures used in parallel better describes the demographic changes at play.

3.2 Financial Conditions

Three measures that describe the credit conditions faced by borrowers are obtained from the Federal Deposit Insurance Corporation (FDIC) data sets that have been aggregated from the quarterly bank level to the annual state level. The first financial variable is "Private Bank Credit to GDP" that measures in a general sense the credit environment and the importance of the financial system within an economy. The data is available from 1992 to 2016.

Second, "Share of Secured Credit", defined as assets and loans that are secured by first lien. This general variable is distributed by maturity. These maturities are the following: three months or less, between three months and one year, between one year and three

years, between three years and five years, between five years and fifteen years, and over fifteen years.

The last variable, residential mortgages divided by all other types of loans, gauges the credit market's diversification. This data is available from the FDIC 1997 onwards. The definitions are chosen to evaluate the countering forces of maturity structure on inequality, specifically the opposing effects of filter-capital and the debt-burden.

A measure of state specific interest rates is imputed using state average 30-year mortgage rates. The cross-state variations are used to impute historical values based on the Federal Reserve's historical bank prime rate in such a manner to maintain cross-state variations through time yet still pick-up historical interest rate trends. This method has its shortcomings as it assumes cross-state variations are fixed.

The alleviation of credit constraints can be intensive or extensive; intensive is by extending credit to existing clients (incumbents); and extensive is by extending credit to new clients that are previously rejected the credit. The data used in this research does not distinguish between the two. However, coupling the inequality measures, in our case the Gini coefficient and the median income distribution, will be indicative of the targeted economic beneficiaries.

3.3 Controls: Socio-Economic

The controls are retrieved from the literature to have a significant effect on both financial services and inequality measures. As such, the control variables will allow us to set a benchmark model from which we can gauge the incremental significance of the finance variables. The baseline model should consider at least one element of socio-demographic character of economic structure, and of macroeconomic conditions. The first element is from the ACB interdental data on ethnic demographics at the state level from 1992 to 2016. The measure referred to is the percentage of Black Americans per state per year where "black" is defined as being self-identified as having origins in any of the black racial groups of Africa. Studies suggest that this ethnic group has suffered from discriminatory financial practices and displayed self-selectively exclusionary behavior (Weller, 2007).

Capital-intensive industries and in turn economies, require financing of a certain character to operate reflecting both the risk and timeliness of cash flows. The opposite of capital-intensive is labor intensive, which would not require such large investments and would probably use financing more for working capital needs instead of investing needs. The "Manufacturing" variable estimates the manufacturing production as a share of gross state production and reflect the economic structure of the economy. The data is

obtained from the American Bureau of Economic Analysis (BEA) and has been timed to match the dependent variables, 1992-2016.

To evaluate the general health of the economy, unemployment statistics are added to the baseline model. Unemployment statistics are obtained from the BEA from 1992-2016 at the state level and annually. State level unemployment statistics will pick up interstate variation, and measure national systemic risk. A dummy variable is generated to account for the nation-wide business cycle as identified by the National Bureau of Economic Analysis (NBER). The dummy in this case, identifies as "1" in years in which the U.S. experienced a recession, and "0" otherwise.

4. METHODOLOGY

4.1 The Model

The model structure can be condensed by the following general specification:

$$Economic\ Inequality_{it} = \alpha + \beta_{1,it} Controls + \beta_{2,it} Financial + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots (2)$$

Every variable is described by the subscripts "i" and "t", denoting the panel state identifier and the time variable year. Economic inequality measures are the Gini and the Median Income variables. The first model specification will be run with all variables and an account of the coefficients, their significance, and the model R-square will be noted. Model 2 will engage only the non-financial variables and its comparison with Model 1 will help determine and evaluate the marginal and incremental contribution and significance of the financial variables. Model 3 will refer as a baseline case without the financial variables. The regression is a fixed effects panel data specification addressing heteroscedasticity with the natural logarithm of the dependent variables, and auto-correlation tested with the Durbin-Watson statistic addressed with lagged variables. An ARDL specification is also tested to disentangle the short run and long run effects with more accuracy testing dynamics of the data; its methodology is explained later, and the results are displayed in Table 4.

4.2 The Data Requirements

The data is perfectly balanced across all 50 states (excluding the District of Columbia) and continuous annually between 1992-2016 or 1997-2016 depending on the model.

Table 1 lays out a suggested interpretation of the coefficients of each regressors when combining the information obtained by both models. It must be emphasized again that the median of a distribution reflects principally activity in the middle of the distribution whereas the Gini by construction gauges the depth of the inequality gap across the board.

However, when they are combined, the interpretative power of the models can suggest the location of the changes effected by the variables. For example, a positive regression coefficient for a variable in the Gini model pushes inequality up and potentially contributes to worsening inequality in the state. A positive coefficient on the same variable, in the median income models, implies that this variable contributes to an increase in the median income, hence affecting inequality by raising some individuals below the previous median and hence improving the economic state around the "middle." Nevertheless, because the Gini coefficient degenerates, then it must be the case that the rich got richer and/or the poor become poorer.

Table 1: Gini and Median Income Model Results' Interpretations

	⊕MedInc	**⊗MedInc**	**∅MedInc**
⊕Gini	Improvement in the middle of the distribution and worsening in the extremes	Worsening across the board	Exacerbation of the extremes
⊗Gini	Improvement across the board	Improvement in the extremes and a worsening in the middle	Improvement in the extremes
∅Gini	Improvement in the middle	Deterioration in the middle	Either no effect or not significantly measurable

5. RESULTS

5.1 Regression Results

Tables 2, 3, and Table 4 summarize the empirical results of the study. The base unconstrained models are the regressions that include all variables. The constrained models include only the statistically significant variables from the base forms. Since these unconstrained regressions include an autoregressive parameter, we can separate the effect between short term (columns 3) and long term (columns 4). The analysis will be compared to the unconstrained with the regressions with the control variables only and will gauge the contribution of the financial variables' inclusion. Table 2 provides the results for the case when the Log of the Gini coefficient is the dependent variable,

while Table 3 provides the results with the Log of median income as the dependent variable. An F-test is conducted to compare models when the financial variables are omitted from the unconstrained regressions. If the F-value has a relatively low value, then the null hypothesis is not rejected. In this case, it is appropriate to omit the variables. If the F-value is relatively large, then the value added of the financial variables should not be omitted. The critical values for the F-tests are calculated from the marginal significance level and the two sets of degrees of freedom.

Table 2: Regression results with the natural log of the Gini coefficient Log(Gini) as the dependent variable.

	Unconstrained regression	Constrained regression	Implied long run coefficients	Control regression
Constant	-1.920641	-2.046361	-6.498351	-0.887851
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Log(bank credit)	-0.002817	-	-	-
	(0.2624)	-	-	-
Black	0.005453	0.005656	0.017962	0.002329
	(0.0084)	(0.0056)	(0.0068)	(0.2687)
Log(real GDP)	0.077727	0.089643	0.284668	-
	(0.0004)	(0.0000)	(0.0000)	-
NBER recession	0.006148	0.005623	0.017962	0.004906
indicator	(0.0000)	(0.0001)	(0.0068)	(0.0003)
	0.039548	0.039846	0.126532	0.049142
Gini source	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	0.013949	-	-	0.023632
Log(Manufacturing)	(0.0755)	-	-	(0.0038)
	0.037456	0.040407	0.128315	-
Log(interest rate)	(0.0000)	(0.0000)	(0.0000)	-
	-0.004320	-	-	-0.018263
Log of the	(0.2873)	-	-	(0.0000)
unemployment rate	0.167564	0.188414	0.528458	-
	(0.0000)	(0.0000)	(0.0000)	-
Log(GDP deflator)	0.003720	-	-	-
	(0.5470)	-	-	-
Ratio1	0.029093	-	-	-
	(0.1904)	-	-	-
Ratio2	0.014433	-	-	-
	(0.2162)	-	-	-
Ratio3	0.079285	0.076482	0.242872	-
	(0.0551)	(0.0525)	(0.0582)	-
Ratio4	-0.031545	-	-	-
	(0.4305)	-	-	-
Ratio5	0.024005	-	-	-
	(0.5679)	-	-	-

Ratio6	-0.022156	-	-	-
	(0.7406)	-	-	-
Ratio7	-0.156228	-0.195246	-0.620017	-
	(0.0193)	(0.0011)	(0.0014)	-
Ratio8	0.004008	-	-	-
	(0.9003)	-	-	-
Ratio9	0.267873	0.257388	0.817353	-
	(0.0017)	(0.0023)	(0.0031)	-
Ratio10	0.698391	0.685095	-	0.803311
	(0.0000)	(0.0000)	-	(0.0000)
AR (1)		0.3491		0.0000
			3.175564	
p-value on omitted			(0.0000)	
variables	0.944885	0.944816		0.939328
long term multiplier	-4.967907	-5.027514		-4.957100
	2.140490	2.113161		2.220689
Adjusted R-squared	950	950		950
Schwarz inf. criterion	Panel least	Panel least		Panel least
Durbin-Watson	squares with	squares with	Panel least	squares with
statistic	cross-section	cross-section	squares with	cross-section
Sample size	fixed (dummy	fixed (dummy	cross-section	fixed (dummy
Econometric	variables)	variables)	fixed (dummy	variables)
procedure			variables)	

Two-tailed actual p-values in parentheses.

The actual p-value of the F-value from estimating the base forms with and without the statistically insignificant variables turns out to be 0.3491 in Table 2, which is much higher than the critical marginal significance level of 5%. Therefore, the omission of these insignificant variables from the regression is statistically warranted jointly. The actual p-value of the F-value from omitting the financial variables from the unconstrained regressions is very small (0.0000). This is evidence that these financial variables contribute significantly to the determination of the Gini coefficient. It must be noted that the F-value should be computed by comparing variables with the same sample size, and this is what has been done. The same exercise is carried out in Table 3. This produces an actual p-value for the F-test that has a high marginal significance level (0.1303), implying that the omitted variables are statistically redundant. Removing the financial variables produces the regression in column 5 of Table 3. The actual p-value for the omission of these financial variables is very low (0.0000). The conclusion is that financial variables contribute significantly to determining the path of the median income.

Table 3: Regression results with the natural log of the median income as the dependent variable.

Constant	6.607000	6.618717	11.59037	11.29626
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Log(bank credit)	0.010633	-	-	-
	(0.0518)	-	-	-
Black	-0.015001	-0.014480	-0.025357	-0.019181
	(0.0020)	(0.0026)	(0.0032)	(0.0005)
Log(real GDP)	0.369138	0.375486	0.657532	-
	(0.0000)	(0.0000)	(0.0000)	-
NBER recession indicator	0.008038	0.007653	0.013402	0.005049
	(0.0441)	(0.0485)	(0.0475)	(0.1541)
Log(Manufacturing)	0.001169	-	-	0.021608
	(0.9449)	-	-	(0.3268)
Log(interest rate)	-0.043642	-0.061132	-0.107052	-
	(0.0182)	(0.0005)	(0.0006)	-
Log of the unemployment	-0.044051	-0.052390	-0.091743	-0.082301
rate	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	0.552563	0.539795	0.945262	-
Log(GDP deflator)	(0.0000)	(0.0000)	(0.0000)	-
	-0.017864	-0.018297	-0.032041	-
Ratio1	(0.1533)	(0.1287)	(0.1283)	-
	-0.005398	-	-	-
Ratio2	(0.9158)	-	-	-
	0.012604	-	-	-
Ratio3	(0.6481)	-	-	-
	-0.145706	-	-	-
Ratio4	(0.1555)	-	-	-
	0.057170	-	-	-
Ratio5	(0.0.5676)	-	-	-
	0.205083	-	-	-
Ratio6	(0.0350)	-	-	-
	0.248947	0.349901	0.612730	-
Ratio7	(0.0934)	(0.0085)	(0.0090)	-
	-0.200082	-	-	-
Ratio8	(0.2538)	-	-	-
	0.017536	-	-	-
Ratio9	(0.8327)	-	-	-
	0.133605	-	-	-
Ratio10	(0.5120)	-	-	-
	0.420183	0.428947	-	0.908600
AR(1)	(0.0000)	(0.0000)	-	(0.0000)
		0.1303		0.0000

p-value on omitted variables			1.751151 (0.0000)	
long term multiplier	0.951499	0.951221		0.939161
	-3.080407	-3.135575		-2.939031
Adjusted R-squared	2.027306	2.030511		2.543137
Schwarz inf. criterion	950	950		950
Durbin-Watson statistic				
Sample size				
Econometric procedure	Panel least squares with cross-section fixed (dummy variables)	Panel least squares with cross-section fixed (dummy variables)	Panel least squares with cross-section fixed (dummy variables)	Panel least squares with cross-section fixed (dummy variables)

Two-tailed actual p-values in parentheses.

Since the regressions include an autoregressive term, the estimated coefficients can interpret short run effects. The long run estimates are presented in columns 4 of Tables 2 and Table 3. As expected, the impact of this is a positive multiplier, which is commensurate to theory: long run adjustment is stronger than short run adjustment. The conversion from short to long run does not affect the sign of the estimated coefficients but only their magnitudes.

The results of these tests suggest that this definition of the financial variables adds value to the literature explaining both the Gini coefficient and the median income. More evidence on this comes from comparing the Schwarz information criterions (SIC). For the Gini coefficient regression, the SIC criterion falls from -4.9571 to -5.0275 by including the financial variables, and for the median income regression the SIC criterion falls from -2.9390 to -3.1355. A lower value for the SIC criterion means better the specification.

5.2 Socio-Economic Controls

Table 2 and Table 3 depict the models to facilitate the comparison and understanding of distributional changes of the inequality measures suggested by Table 1.

Ethnicity. The models in columns 3 and 5 of Table 2 pick up a positive and a highly significant and persistent effect of ethnicity on inequality as measured by the Gini coefficient. The negative and significance of the "black" variable in the median income models (models in columns 3 and 5 of Table 3) suggest that the differential financial realities faced by black ethnic groups is an important economic channel. In the labels in Table 1 it is shown to be as a "worsening across the board." This reality faced by different ethnic groups has also been observed in a recent research paper by Bloome

(2014). Both, persistence, and inaccessibility to financial services are consistent with the literature supporting the importance of this control in financial inequality models.

Table 4: ARDL estimations

	Log(Gini)		Log(median income)	
	Cointegration regression	Error-correction regression	Cointegration regression	Error-correction regression
constant	-	-1.021819	-	1.833505
	-	(0.0000)	-	(0.0000)
Interest	-	-	0.915242	-
	-	-	(0.0110)	-
Δ(interest)	-	-	-	0.276397
		-	-	(0.3128)
Log(interest)	0.061010	-	-	-
	(0.0000)	-	-	-
Δ[Log(interest)]	-	0.034099	-	-
	-	(0.0000)	-	-
Log(real GDP)	0.190884	-	0.623058	-
	(0.0000)	-	(0.0000)	-
Δ[Log(real GDP)]	-	0.020456	-	-0.023062
	-	(0.5081)	-	(0.7367)
Log(GDP	0.251972	-	0.535210	-
deflator)	(0.0000)	-	(0.0000)	-
	-	-0.024429	-	0.001535
Δ[Log(GDP	-	(0.4705)	-	(0.9825)
deflator)]		-0.323138		-0.561667
Lagged		(0.0000)		(0.0000)
cointegration				
residual	-6.798232		-13.47606	
Kao Residual	(0.0000)		(0.0000)	
Cointegration Test				

Two-tailed actual p-values in parentheses.

Industrial Composition of the Economy. The share of the manufacturing production as a share of total state GDP is not always a significant regressors in the models. It is significant in the regression column 5 in Table 2, which includes only the control variables. This is likely explained by the collinearity of the financial variables with the economic structure as they are likely inherently intertwined.

5.3 The Macroeconomic State of the Economy

Unemployment. The unemployment rates enter significantly in almost all models with the expected negative sign. This is intuitive because the employment level is directly linked to the median income, thereby producing a negative coefficient and impact of the workless rate. The negative coefficient of the unemployment rate on the Gini coefficient means that unemployment improves the extremes in the income distribution. The rich become less rich, and the poor become better off or at least not worse. Consequently, and paradoxically, more unemployment seems to benefit the lower classes at the detriment of the middle and upper classes.

Business Cycle. The second variable controlling for the state of the economy is the "recession" variable, which measures the recessionary periods of the business cycle. This variable enters all models positively and significantly in Table 2 and Table 3, suggesting that the business cycle is not neutral. In other words, the business cycle affects economic groups in the low-earners class more than others. There is evidence that the recession increases inequality of those at the lower extreme of the distribution of income to the advantage of the rich and the middle-earners. This pattern is explosive: the poor get poorer while everybody else gets better. The third economic variable is real GDP. This variable has been found to elevate median income quite strongly but leading to a deterioration in the distribution of income. Hence, those that benefit from long run prosperity are the high and middle earners. The effect of real GDP reinforces the effect of a recession. The state of the macro economy is already controlled by the previous two variables i.e., recession and the unemployment rate.

5.4 Financial Variables

Financial Depth. The bank credit to GDP ratio does not enter significantly in either model or in either specification. This seems reasonable because the lower income earners are too precarious to really benefit from a growth in the credit market, and the highest income earners are most likely already included. It seems likely, therefore, that extending credit, or the financial depth, is neutral on the United States. No class seems to benefit or lose more than another from an expansion of credit.

Collateral. The variables estimating the amount of tier one quality collateral between one to three years and between three months and one year (the ratios lnrs1t3 over lnls and lnrs3t12 over lnls, or ratio8 and ratio10 in Table 2) produce negative and significant coefficients in all the Gini models of Table 2 and negative and insignificant coefficients in the median income models of Table 3. The combined and opposite effect in Table 2 suggests that improvements of equality happened in the extremes of the distribution and not in the middle. This is a difficult empirical result to reconcile with our knowledge of

collateral and borrower quality. If poorer and riskier borrowers typically have less collateral, then how can increases in the collateralized loans benefit the poor-income earners at the expense of high-income earners?

Maturity Structure of Bank Loans and Bank Assets. An increase in the variable, short-term bank loans/ gross total bank loans and leases (the ratio lnot3t12/lnls, or ratio4), implies an increase in the numerator or a decrease in the denominator. Earlier we have seen that the total bank credit does not affect either the Gini models or the median income models. Hence, the regression results in Table 2 suggest that a shortening of bank loans and bank assets positively affects the Gini models, inequality increases, but it is neutral on median income. This suggests that shortening loan maturities helps in principle the high-earners at the expense of the low-earners, leaving median income unaffected. The ratio bank loans between one year and three years of maturity over gross total bank loans and leases (the ratio lnrs1t3/lnls, or ratio8), in the regression results of Table 2 suggests that a mild lengthening of bank loans and assets negatively affects the Gini models, and inequality decreases, but is neutral on median income. This means that lengthening slightly loan maturities helps in principle the low-earners at the expense of the high-earners likely stemming from the effects of debt burden and filter capital as the two forces work in opposite directions. Recall that the debt burden effect may reduce equality by increasing maturity whereas filter capital effect may contribute to increased equality by shortening maturity. The debt burden effect explains the fact that lengthening maturity increases inequality, while the filter capital effect explains the fact that shortening maturity increases equality. The net effect of these forces on median income is a neutralizing one.

An increase in the variable (lnotov15/lnls, or ratio7) indicates a lengthening over fifteen years of the maturity structure of all banking assets including loans, and the existence of good quality collateral. In the Gini model (Table 2) this variable is opted out of the regressions, while in the median income models (Table 3) positive coefficients are observed and they are found to be significant statistically. This suggests that the lengthening of the maturity structure helps redistribute income around the middle of the median income distribution instead of at the extremes. This is consistent with the deduction that the debt burden effect is outweighed by the filter capital effect. However, the fact that the model results of this variable suggest no change in the extremes of the income distribution whereas the previous variable definitions, in the precedent paragraph, implied no change around the middle of the income distribution, is difficult to reconcile.

Interest Rates. This variable is perhaps the most delicate by assumption of its construction. This precaution stems from the fact that the variable expresses a very large

and significant effect in the median income models and in the Gini models, in both Table 2 and Table 3, which should imply that the interest rates heavily affect the middle class, and the income distribution. This suggests that high interest rates destroy the economic fabric by deepening the inequality at the extremes, while decreasing median income for the middle class. Therefore, high interest rates are detrimental to the interests of the middle class and the poor but is favorable to the interests of the rich segment of the population. This can be explained as follows: high interest rates raise personal income of the rich as they have more savings. The middle class and the poor are adversely affected because they have relatively little or no savings and strong liquidity constraints. However, caution should be the rule. In the following part, and using a different econometric technique, interest rates are found to benefit the rich and the medium income-earners at a very great expense to the poor.

Real GDP. Real GDP elevates median income quite strongly (Table 3), but equally strongly leads to a deterioration in the distribution of income (Table 2). Hence, those that benefit from long run prosperity are the high and middle earners, doing so at the drastic detriment of the poor.

The price levels. The price level is proxied by the ratio of state nominal GDP to state real GDP (GDP deflator). This variable does not initially belong to the system, neither as a control variable nor as a financially augmented variable. Upon the insistence of one of the authors, this was corrected. If there is doubt as to whether the Fed can steer real GDP at will there is widespread agreement that the price level is targeted, or at least it was in the recent period for which we have data. The effect of the price level is similar in all respects to that of real GDP. The price level deteriorates equality and pushes median income higher. As a result, the rich get richer, the poor and the unemployed get poorer, and the middle class does not complain but is also rewarded. Another piece of adverse news is that the Fed, knowing this effect of the price level, will have a policy bias consisting of preferring higher rather than lower inflation. Added to that, the danger that the fruits of prosperity are skewed towards the middle and high classes; this prompts us to reject with force the notion that financial and monetary variables do not belong to the set that explains income distribution. This paper shows that monetary policy is quite effective in maneuvering the economy towards less equality. And since the Fed controls the yield curve to a great extent, risk taking by banks, real GDP, and the price level, it can therefore control distributional effects. What is even more worrisome is that the impact of real GDP and that of the price level on income equality is a long-term one. This effect should be counteracted by suitable and far-sighted measures and policies, which in turn, requires both, will and policy-oriented acumen on the part of the stakeholders.

5.5 Long Run and Short Run Effects

In this section, a subset of the variables is analyzed: Log (Gini), Log (median income), interest rates, Log (interest rates), Log (real GDP), and Log (GDP deflator). Preliminary analysis shows that by applying panel unit root tests, all the upper variables are non-stationary in the level (for the interest rate series) or log-level (for the others) but are stationary in first differences. For details on these tests, the author recommends readings User's Guides of the statistical package EViews 9.5. Having established non-stationarity, two cointegration regressions are run, one with Log (Gini) as the dependent variable, and the other with Log (median income) as the dependent variable. The only change is that the Log (interest rate) enters the first regression and the interest rate per se enters the second regression. The econometric procedure adopted is a panel ARDL (Autoregressive Distributed Lag model). Table 4 presents the results for the two cointegration regressions, which are long run relations, and the error-correction models, which are short term regressions.

For the error-correction model, with Log (Gini), only the change in the log of the interest rate has explanatory power, and the pertaining coefficient is positive and highly significant statistically. In contrast, the error-correction model, with Log (median income), presents no short run effects. Therefore, we can conclude that in the short run, a higher interest rate increases inequality at the extremes but does not affect middle-income earners. The implication is crucial because the interest rate is a policy objective, and inequality at the extremes can be lowered by an engineered fall in the interest rate. It bears to note that the lagged cointegration residuals enter negatively and are highly statistically significant in both models, as expected.

The ARDL panel procedure, which ascertains cointegration by the reported Kao residual test results in the bottom of Table 4, finds all variables highly significant statistically, and all variables, three in each regression, carry positive coefficients. This means that in the long run, high levels of interest rates, positive real growth, and more inflation exacerbates income inequality while benefiting the middle-income earner. Increased inequality arises from the deterioration of the Gini coefficient and benefits the rich at the expense of the poor. Moreover, the middle-income earners area rewarded. Low interest rates, low real growth, and low inflation reduce inequality at the extremes but are to the disadvantage of the middle class. This is more serious than it appears. A cointegration regression shows a long run relation, and hence if policy is to be reoriented the change in policy must be persistent to produce long run effects. This is especially important because the earners that benefit from the reduction in inequality are the poor, at the expense of the rich and the middle-income earners.

The required policies are contradictory. Low interest rates and low inflation are logical policy objectives, however, lower income growth, or lower prosperity, cannot be a policy choice. Therefore, there is a trade-off. Finally, there is also a political challenge, which comes about by the fact that republicans and democrats have differing political and social agendas, and political swings would destroy the compliance to a constant and persistent policy. Moreover, even if the same party stays in power, policymakers may renege their current policy in the future. A reversal of policy as new conditions come to surface is quite likely. This is the highly acclaimed time-inconsistency problem of public policy (Kydland et al., 1977).

6. POLICY IMPLICATIONS & CONCLUSION

The objective of this study is to highlight the importance of financial variables in explaining real indicators, specifically the Gini coefficient, and the median income. The lessons to draw are as fundamentally important as the generally accepted forces in finance: financial depth, collateral, maturity, prosperity, inflation, and interest rates. The U.S. financial crisis in 2008 prompted the Fed to implement an "ultra-monetary policy" to counter the zero-interest rate bound by modifying the yield structure in the longer end of the yield curve. This policy effectively transformed the maturity structure of financial institutions naturally responding to the changes in the yield curve. However, this paper shows that changes to maturity structure have two opposing effects on inequality. The trade-off is worsened by the paradoxical role of real GDP. The reality of the issue is that monetary policy sees itself as separate from social values such as inequality. To quote a former chairman of U.S. Federal Reserve, Ben Bernanke: "We cannot draw any firm conclusions about the extent to which policy should attempt to offset inequality in economic outcomes; that determination inherently depends on values and social trade-offs and is thus properly left to the political process." [4]

The separation of monetary policy and socio-economic dynamics is to voluntarily create an incomplete picture of the channels that connect the objectives of the central bank and the requirements of a healthy society. The US Fed's objective and operational mandate is to support economic growth, job creation, financial stability, and price stability. If we know that significant inequalities hinder economic growth, and create financial and price instabilities, then inequality must be part of the plan to addressing the tenets of the central bank. More fundamentally, if effective monetary policy is to be pursued, the issue of the non-neutrality of monetary policy should guide policymakers.

[4] Ben Bernanke before the Greater Omaha Chamber of Commerce, Omaha, Nebraska. February 6, 2007. The Level and Distribution of Economic Well-Being.

Numerous solutions have been put forward along these lines. We suggest focusing on an already successful market equalizing mechanisms, that of community banks. Countless studies encourage the support of community banks for they are capable of alleviating credit constraints specifically with respect to interest rates and maturity agreements because of a competitive advantage identified as "relationship lending" that allows them to capitalize on "soft" information and provide preferential loans to those who would otherwise be credit constrained.[5] Yet the operations of the Federal Reserve through Federal Open Market Committee (FOMC) and other programs (Term Securities Lending Facility, Commercial Paper Funding Facility, and Term Asset-Backed Securities Loan Facility) help disproportionately bigger banks, which hold a large part of financial assets involved in the transactions targeted by the Federal Reserve. New policies to aid financial liquidity and credit availability extend beyond the traditional banking sector, reducing the competitive advantage and equalizing role of community banks even further. If we do not include inequality in the dialogue, the support for fading community banks is less justified.

When commercial banks sell assets to the Federal Reserve in periods of quantitative easing, they are most likely to replace the assets with others of equal or lesser risk (assuming that it is a period of distress for quantitative easing to be in effect). This risk substitution is coupled with the fact that asset concentration is at the top of the income distribution such that stimulus must necessarily increase the value of those assets. Credit expansion will therefore reinforce safe borrowers at the top of the distribution while hurting the middle class and deteriorating the Gini index. A final point to be made is that the addition of the socio-economic layer to policy analysis is made within a context of efficiency-equity trade-off. Although semantically misleading for there is an implication that one is achieved at the expense of the other, we know this to be an incomplete story. The promotion of equity must be done within the framework of growth as growth must be done within the framework of equity. The financial forces that act on both inequality and growth, can drive policy to objectively address growth and inequality in such a manner that growth promotes equality, and that equality fosters growth. This paper highlights the importance of the inequality debate to monetary policy and offers additional tools aiding the understanding of inequality dynamics with respect to financial issues. Inequality is certainly an issue of social value and is, to a certain extent, a fundamental economic engine for long-term growth and economic health and resilience. Monetary policy, as it is played out presently, influences interest rates, prices, maturity, and balance sheet risk without an understanding of the implications on socio-economic

[5] Ben Bernanke address to the Community Banking and Community Bank Supervision (March 8th, 2006) conference and The Financial Crisis and Community Banking (March 20th, 2009) conference.

demographics. This paper shows that central bankers and other public servants can benefit from the knowledge of inequality dynamics theory providing them with a more compressive picture.

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