Electoral institutions, credit, and political responses to economic polarization

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Abstract

The workhorse models of democratic political economy assume politicians will respond to widening income gaps with fiscal redistribution, yet prominent accounts of the global financial crisis have argued the politicians in the United States of both parties responded to widening income gaps and decreased economic mobility with policies designed to equalize consumption (rather than income) by extending credit further down the income distribution. We argue that politicians respond to widening income disparities in the most (politically) cost-effective ways, given the institutional structure in which they are embedded. Politicians' responses to exogenously widening income gaps will be conditional on the electoral system: PR systems will exhibit greater fiscal redistribution while SMD systems will resort to credit and consumption stimulus. We examine these expectations using OECD data from 1980-2010 and find that SMD systems are indeed more significantly likely to expand credit as pre-fisc inequality grows while no such relationship is visible in PR systems. Our findings have implications for the financial system risk: SMD democracies are marginally more prone to credit booms and financial crises than countries functioning under PR systems.

JEL codes: E02, E21, E44, G01, G18, G21, G28, P16, D31

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1 Introduction

Income and wealth gaps in the United States have widened to become chasms separating the very top from everyone else. In 1976, the top 0.1% of tax payers took home about 2% of national income. That figure had grown to about 8% by 2008 (Piketty and Saez, 2006). The growth in inequality at other points in the distribution, while less dramatic, is no less important. Over the 1979-2005 period, real pre-tax income growth for an American household in the bottom fifth of the income distribution was essentially flat, averaging about 1%. Households in the fourth quintile saw their pretax incomes grow about 23% over the same period while those in the top fifth averaged a 75% increase (Congressional Budget Office, 2010; Mishel et al., 2012).

The causes of this shift in relative earnings are much debated. But the consequences are what concern us here. In high-profile and widely read works, several prominent academics and journalists have independently argued that the widening income and wealth disparities were at the root of the 2008-09 financial crisis (Chinn and Frieden, 2011; Hacker and Pierson, 2010; Lewis, 2010; Rajan, 2010). Each emphasized different policy levers (housing finance, financial market regulation, taxation) pulled by politicians. At the risk of sacrificing nuance, the arguments go more-or-less as follows: widening income gaps will induce pressure on politicians as voters see themselves falling further behind while others reap spectacular fortunes. Elected policy makers will respond in the most politically "efficient" ways, i.e., using policies that cost them or their parties the least in terms of votes or political conflict. It is argued that policies stimulating immediate consumption–those that extend credit further down the income distribution–are more politically palatable than fiscal redistribution. For example, Rajan (2010:31) states that

> [S]triving to rectify the inequality [through fiscal redistribution] may precipitate the very conflict the citizenry wants to avoid. Politicians have therefore looked

> for other ways to improve the lives of voters. Since the early 1980s the seductive answer has been easier credit...Easy credit has large, positive, immediate, and widely-distributed benefits whereas all the costs lie in the future.

Similarly, Chinn and Frieden (2011:15) argue that

> [D]ebt-financed consumption had attractive political features for the party in power. For thirty years working-class and middle-class Americans had seen their incomes stagnate while the country's rich and super-rich have gotten even better off...In this context it is easy to understand why there was so much latent anger over the gap between the rich and the rest. Access to easy credit and easily financed consumption helped take the edge off this resentment.

Recent work bolsters the second half of these claims, namely that large, rapid increases in credit are associated with major financial crises (Jorda, Schularick and Taylor, 2010; Mendoza and Terrones, 2008; Schularick and Taylor, forthcoming). These arguments become all the more compelling when we draw parallels with the Great Depression, which was precipitated by the bursting of an asset bubble inflated by government policies designed to increase private sector lending–this time to farmers–in a period of high an increasing income inequality (Eichengreen and Mitchener, 2003). Kumhof and Ranciere (2010) present the most formally articulated argument linking the distribution of income to financial fragility. They construct a general equilibrium model in which increased inequality leads to increased savings by the rich and hence greater credit availability.[1] "By doing so, they allow workers to limit their drop in consumption following their loss of income, but the large and highly persistent rise of workers debt-to-income ratios generates financial fragility which eventually can lead to a financial crisis." They conclude that "Because crises are costly, redistribution policies that prevent excessive household indebtedness and reduce crisis-risk ex-ante can be more desirable

[1] An important implication of the model is that the needs of both the rich and the poor yield increased demands for financial intermediation.

from a macroeconomic stabilization point of view than ex-post policies such as bailouts or debt restructurings." (Kumhof and Ranciere, 2010:3).

But all of this is incomplete, or at least puzzling. If, as Kumhof and Ranciere (2010) highlight, redistribution is a more efficient means of financial stabilization than ex-post alternatives, how did we get ourselves into this mess? After all, the workhorse models of democratic political economy (e.g., Meltzer and Richard (1981)) imply that politicians will respond to widening income gaps with fiscal redistribution, not credit expansion. The Rajan Hypothesis, as we dub it, relies on the claim that (American) politicians, especially those of the center-left, pursued credit-based consumption-enhancing policies because they were politically blocked from pursuing fiscal redistribution on a sufficiently large scale. Exactly what these blockages are or how they function is unspecified. Similarly, we have seen greater dispersion in pre-tax incomes in numerous countries. Why did the financial crisis emerge in the US, UK, Ireland and Iceland rather than Germany or France?

We believe that if the Rajan Hypothesis is on the right track then there is an institutional story to be told. The highly developed literature on the political economy of electoral institutions contains a possible solution to the puzzle. First, there is abundant empirical evidence (Persson and Tabellini, 2005) as well as elegant theoretical models (Austen-Smith, 2000) showing that fiscal redistribution is substantially easier and more common in countries with proportional representation (PR) electoral systems compared to those with plurality/single member district (SMD) institutions. Second, other scholars argue that policies in SMD countries tend to be more responsive to the consumption preferences of the median voter than in PR countries(Chang et al., 2010; Rogowski and Kayser, 2002; Rosenbluth and Schaap, 2003). PR countries tend to provide a greater role for organized economic interests, especially labor market insiders. An implication receiving some empirical support is that SMD countries will have lower overall prices, including for financial services, than countries with proportional electoral institutions.

Our argument is simple: elected politicians will respond to widening gaps in market income and consumption opportunities in the most politically cost-effective ways, given the institutional structure in which they are embedded. While there will surely be a mix of both fiscal redistribution and government credit policies in all countries, at the margin fiscal redistribution is an easier path to follow in PR countries when income and consumption gaps widen. SMD (majoritarian) systems make redistribution more difficult, but policies that increase credit and reduce financial regulation are easier to enact. It is also worth noting that PR countries tend to have labor market[2] and corporate governance institutions[3] that reduce the growth in pre-fisc income inequality. We therefore expect the relationship between inequality in market income and private sector credit to be conditional on electoral institutions. Our claim that politicians must respond to widening income gaps, yet may still fail to engage in significant fiscal redistribution resonates with the astounding lack of empirical support for the standard political-economy models of inequality and redistribution.

Evaluating the Rajan Hypothesis requires a comparative perspective, rather than simply a narrative about policy and credit in the United States. To that end we construct a panel time series data set to test these propositions, examining the interactive effect of economic inequality and electoral system on aggregate credit supply, conditional on a variety of other plausible relationships. In this admittedly preliminary version of the paper we try a variety of modeling approaches to deal with the dependence and likely endogeneity issues. While we begin the process of evaluating the empirical models here, future iterations of the paper will include further refinements and present a more unified statistical voice. Nevertheless, across the three major families of models we explore we find strong evidence that pre-tax inequality is only related to the availability of private sector credit in countries with SMD/majoritarian electoral institutions. We conclude with implications for our understanding of the relative

[2]strong unions and more coordinated wage bargaining (Ahlquist, 2010; Hall and Soskice, 2001; Iversen and Soskice, 2009; Rueda and Pontusson, 2000)

[3]for example, worker representation on corporate boards (Gourevitch and Shinn, 2007)

roles of credit and redistribution in shaping voter welfare in an era of increased inequality.

2 The political economy of electoral institutions and credit

In this section we examine existing work on the connections between electoral institutions and (a) redistribution and (b) price levels before developing our argument about the trade-off between redistribution and credit provision and how it is differentially resolved under varying electoral circumstances.

2.1 Existing Literature

There is voluminous literature on the purported effects of electoral institutions. Two strands of this literature inform our analysis: the relationship between electoral institutions and fiscal policy, especially redistribution and the link between electoral institutions, regulation, and, ultimately, consumer prices. The first draws connections between proportional representation and higher levels of redistribution. Much of this literature builds on the well-known Meltzer-Richard (MR) model of redistributive preferences and the size of government (Meltzer and Richard, 1981).The MR model predicts (a) that poorer citizens (those with income below the mean) will demand higher redistributive spending under any non-targeted tax and transfer system (e.g. a flat tax and lump sum subsidy or public good), and that (b) this demand will be increasing in inequality (the gap between mean and median incomes), producing the basic hypothesis that higher inequality will lead to higher redistribution. This simple prediction has not met great empirical success (Goodrich, unpublished; Milanovic, 2000; Perotti, 1996; Rodriguez, 1999; Saint-Paul and Verdier, 1996). Nonetheless, even if the direct connection between inequality and redistribution has ambiguous empirical support, a

series of corollaries of the MR model have proven more robust (Kenworthy and Pontusson, 2005; Milanovic, 2000).

In particular, scholars have argued that political groups or electoral institutions that better represent poorer citizens will be associated with higher levels of public spending. In the former case, this means left-wing parties, with most scholars finding a strong positive correlation between left-party government and public spending of various stripes (for example, Ansell, 2010; Bradley et al., 2003). In the latter case, this means that proportional electoral systems may have higher redistributive spending because they encourage 'log-rolling' across electoral districts and mean that poorer citizens do not find their votes 'wasted' by candidates targeting the median voter as in SMD systems (Austen-Smith, 2000; Persson and Tabellini, 2005). An important work by Iversen and Soskice (2006, 2009) connects these two hypotheses by suggesting that proportional electoral systems are in fact associated with higher spending *because* they make it more likely that center-left parties will win election than is the case in SMD systems. In general, the message we take from this literature is that proportional systems are more likely to have higher redistributive spending, whatever the precise mechanism, and that this spending can at least smooth over income differentials caused by growing inequality - even if growing redistribution is not a direct functional response to growing inequality as suggested in the MR model.

The second literature we draw on is inspired not by the MR model but by another long-standing economic model - the Stigler-Pelzman model of regulation (Peltzman, 1976; Stigler, 1971). Stigler's original insight was that government regulation often ends up protecting the very industries that it is supposed to be monitoring - a process referred to as 'capture'. Accordingly, businesses are likely to be interested in capturing regulators and where possible will push politicians for regulation that creates monopolies and the associated rents. Peltzman's generalization of Stigler noted that politicians are thus in a position of trading off support from businesses, who want high monopoly prices, and consumers who want lower

competitive prices.

Rogowski and Kayser (2002) developed a well-known extension of the Stigler-Pelzman model to argue that electoral systems fundamentally shape the 'slope' of this tradeoff. Since electoral systems make politicians more or less responsive to the median voter - with SMD systems producing very high seat-vote elasticities in tight elections - they make them more or less responsive to the preferences of consumers in general - making the assumption that the median voter and consumers in general can be analogized. Accordingly, SMD systems with more consumer-responsive politicians are predicted to have lower price levels (lower rents to industry), a finding subjected to considerable empirical testing in Rogowski, Chang and Kayser (2008) and Chang et al. (2010) as well as criticism in Iversen and Soskice (2010).

The story told by Rogowski and his co-authors, however, is one that relates to the prices of tradable goods. How can this be connected to credit provision? A simple extension, made in Rosenbluth and Schaap (2003) is to note that interest rate spreads provide the financial market equivalent of the gap between competitive and monopoly prices emphasized in Rogowski et. al's work. Where interest rate spreads are higher, banks are more profitable and the cost of borrowing is higher for consumers. According to Rosenbluth and Schaap, this gap is more pronounced in countries with proportional representation or mixed systems such as Germany and Japan (pre-1995) with lower spreads and more consumer-friendly regulation in the UK and the USA, which have SMD/majoritarian electoral systems. And while very few will argue that the American banking regulators were not "captured" by the big banks in the 1990-200s, the more dramatic difference between the USA and UK, on the one hand and continental Europe on the other is in the extent of banking de-regulation, both on the consumer and investment sides.

2.2 Our Expectations

The discussion of existing literature above suggests a series of interlinked conclusions, from which we derive our expectations over how politicians will use credit as a political solution to rising inequality but will do so only in majoritarian electoral systems. We make the argument in three stages, emphasizing demand, capacity, and responsiveness in turn.

First, countries with proportional electoral systems have long had higher public spending than their counterparts with majoritarian electoral systems. Accordingly, there is a potential *substitute* for credit smoothing policies in such countries - direct income smoothing through the fiscal tax and transfer system. Accordingly, only in countries with majoritarian systems will there remain a large and unfulfilled *demand* for policies that increase the consumption of less well-off citizens, since these needs are met by explicitly redistributive policies in proportional systems. As inequality rises, the demands increase from relatively poorer citizens (including the median voter) for a rise in their living standards, even in the face of stagnant or declining real wages. Whereas proportional electoral systems have longstanding redistributive programs that fill the gap between gross wages and net consumption by providing transfers, SMD/majoritarian systems have (a) less developed automatic stabilizers and transfer regimes, and (b) do not appear to translate growing inequality into growing popular demand for redistribution (perhaps because of the dominance of center-right parties as in Iversen and Soskice (2006) or perhaps because citizens in such countries are not habituated to highly visible tax and transfer systems). Thus over the long-run we expect higher redistribution to be the solution to inequality in proportional systems.

Second, following Chang et al. (2010); Rogowski, Chang and Kayser (2008); Rogowski and Kayser (2002) and Rosenbluth and Schaap (2003), because majoritarian systems are expected to be more consumer-friendly in terms of regulatory policies, credit should be generally cheaper in these countries. That is, even before the contemporary rise in income inequality, these countries had banking systems with lower interest rate spreads, fewer restrictions on

access to mortgages, and fewer regulations on refinancing and borrowing against equity (see also Schwartz (2009)). Thus the *capacity* to provide accessible credit was much greater in majoritarian countries. Reversing our long-run reasoning for redistribution, we expect greater credit supply in the majoritarian countries as the baseline solution to inequality.

Finally, and again following the Stigler-Pelzman model in Chang et al. (2010); Rogowski, Chang and Kayser (2008); Rogowski and Kayser (2002), we expect policymakers in majoritarian systems to be more immediately *responsive* to demands made by citizens than their counterparts in proportional systems, and to be particularly responsive to demands made by the median voter. That is, we expect increased inequality, in as much as it relates to the median voter feeling relatively more pinched in terms of their consumption, to have a much stronger effect on politicians in electoral systems that force them to be more immediately responsive. This responsiveness argument provides a more dynamic, or short-run, account to pressure created by inequality for consumption smoothing. Not only do majoritarian systems have the right tools to provide credit (capacity) but they also have the short-term incentive to do so (responsiveness).

3 Empirics

In this section we examine our hypotheses about inequality, credit, and electoral systems. We begin by discussing the data. We present some graphical and descriptive statistics of the relationship between income inequality and credit provision across eighteen OECD countries, showing a generally positive relationship that appears to be stronger in countries with majoritarian electoral systems. However, without further exploration we have no way of knowing whether this this covariance is a function of other covariates, unmodeled cross-country heterogeneity, or temporal dependence. Accordingly, through the remainder of the section, we examine a variety of empirical models: standard AR(1) panel regressions (both

pooled and fixed-effects), error-correction models, and, finally a Bayesian hierarchical panel time-series analysis. Across all specifications we find a substantively and statistically significant impact of inequality on credit expansions but one that is limited to countries with majoritarian electoral systems.

3.1 Data & Measurement

To measure the extent of private sector credit we follow the current standard use real credit as percent of GDP, taken from the 2012 update of the well-known dataset on the financial sector created Beck, Demirgüç-Kunt and Levine (2000). Our measure includes credit provided by both banks and non-bank financial institutions. These measures vary substantially across countries and time periods. We focus on total credit provision since policymakers may resolve demands for credit either through banking deregulation (or more consumer friendly regulation) or through policies that produce non-bank financial institutions that challenge established banking sectors. While those focusing on the United States have zeroed in on housing credit and mortgage securitization, there is no reason to believe that this is the only way government can affect domestic credit provision.

Our key covariates are pre-tax inequality, and indicators of electoral institutions. We use the Piketty-Saez top income shares database, specifically the top 1% income share, as our indicator of inequality, updated to 2008 (Piketty and Saez, 2006). In addition to being a pre-tax measure of market income inequality, the top income shares data have the virtues of better cross-country availability and comparability and better longitudinal coverage than any other alternative. The top 1% measure also resonates with the the theoretical arguments of Kumhof and Ranciere (2010).

Following Chang et al. (2010); Rogowski, Chang and Kayser (2008); Rogowski and Kayser (2002) we use an indicator for majoritarian electoral systems, taken from Golder (2005) and extended through 2008 for the OECD cases under study here.

We also include a slate of additional covariates meant to conform with other studies and account for other plausible drivers of private sector credit availability. We include log per capita GDP, growth in per capita income, logged total population, and the investment share of GDP (all from the updated Penn World Tables (Heston, Summers and Aten, 2002)), the harmonized unemployment rate, the government budget deficit (negative numbers imply deficits, positive imply surpluses) and the capital account balance. We expect growth to have a negative impact on credit/GDP since it increases the denominator. A larger budget deficit may crowd out private borrowing and a capital account surplus should be associated with greater credit availability, all else equal.

3.2 Descriptive Statistics

Tables 1 and 2 provide the basic descriptive statistics for our variables in the full 1961 to 2009 sample and in the restricted 1980 to 2008 sample, when including capital account and budget deficit information.

Table 1: Descriptive Statistics: Full Sample

	mean	sd	min	max	count
Credit / GDP	0.856	0.413	0.177	2.187	607
Top 1 pct	7.745	2.477	3.490	18.29	607
Majoritarian	0.451	0.498	0	1	607
Log GDP per cap	10.08	0.307	8.822	10.81	607
Log Population	9.881	1.343	7.797	12.63	607
Unemployment Rate	6.274	3.837	0	21.33	607
% GDP Growth	2.253	2.533	-7.868	11.61	607
Investment Share	21.63	4.734	11.50	35.46	607
Year	1988.2	11.88	1961	2009	607

In order to examine relationships among these variables, we begin by examining a series of bivariate scatter plots of inequality and credit provision for our eighteen countries under analysis. Figure 1 demonstrates these relationships for the period 1961 to 2009 (we have

Table 2: Descriptive Statistics: Restricted Sample

	mean	sd	min	max	count
Credit / GDP	0.971	0.390	0.248	2.107	360
Top 1 pct	8.203	2.840	3.490	18.29	360
Majoritarian	0.394	0.489	0	1	360
Log GDP per cap	10.20	0.239	9.548	10.81	360
Log Population	9.911	1.287	8.062	12.63	360
Unemployment Rate	7.468	3.724	1.542	21.33	360
% GDP Growth	2.087	2.062	-7.447	9.812	360
Investment Share	21.56	4.148	13.81	33.04	360
Capital Account	0.198	0.489	-2.181	2.468	360
Budget Deficit	-1.936	4.476	-12.26	18.48	360
Year	1994.5	7.507	1980	2008	360

ten countries with data for 1961, expanding to thirteen by 1963, and eighteen by 1982). Countries with proportional electoral systems are colored in pink, those with majoritarian systems in blue and those with mixed electoral systems in green.

A striking distinction is apparent when comparing the scatterplots for majoritarian countries to the other countries. In most of the majoritarian countries, particularly noticeably in the USA and Great Britain, we see a strongly positive relationship between the two indicators. By contrast in the proportional and mixed systems there is either no relationship (Spain, Denmark) or a negative one (Finland, Sweden). Only in Ireland, likely because of its close financial relationship with Great Britain, is there an obviously positive relationship. We now move to examining a more rigorous fashion, how robust this bivariate relationship is to a more fully modeled specification of credit provision.

3.3 Baseline Panel Analysis

Time series cross-section (TSCS) data, common in in comparative and international political economy, present thorny modeling challenges. Our data are no different, exhibiting significant cross-country heterogeneity as well as dependence over both space and time within and

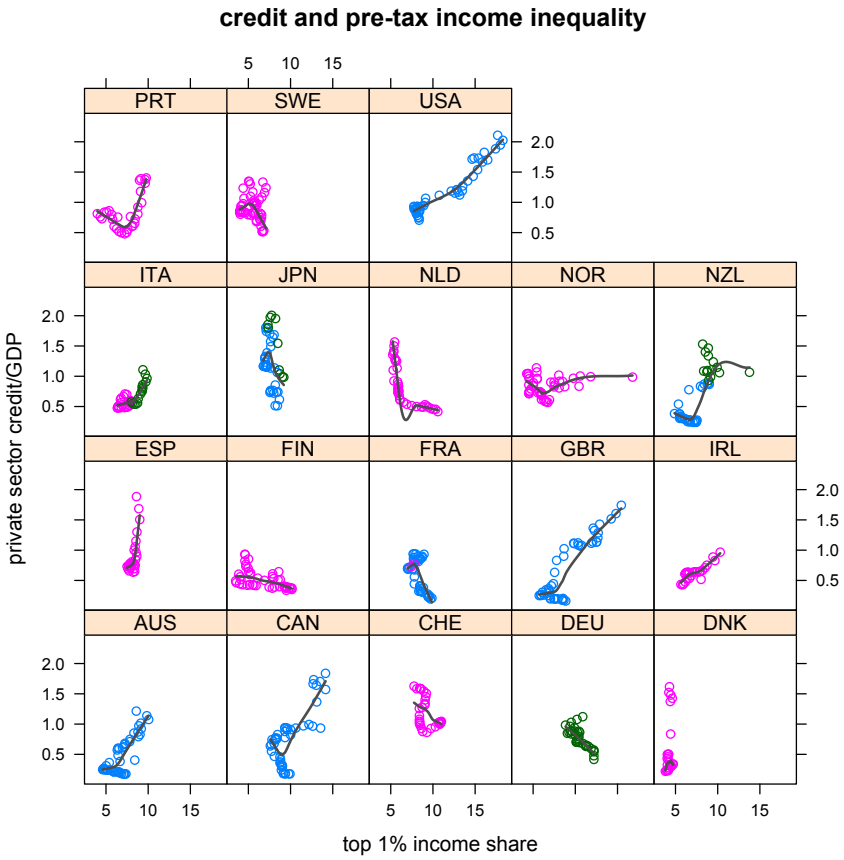

Figure 1: Credit to the Private Sector and Inequality

across countries. Rather than treat these attributes as a nuisance, as is commonly done, we choose to model them explicitly, exploring a series of modeling strategies, beginning with a simple panel model.

We begin our panel analysis with a series of pooled and fixed effects models before turning to an error-correction model. We then switch tacks and present a (preliminary) Bayesian hierarchical model. The analysis in this section can accordingly be considered a series of baseline models that examine standard Prais-Winsten cross-sectional time series estimations of the relationship between credit, inequality, and electoral systems, with subsequent analyses refining assumptions related to the dynamic process of credit provision (the error correction model) and panel heterogeneity (the Bayesian panel model). The baseline models reported

in Table 3 can be written as:

$$y_{it} = (\alpha_i) + (\gamma_t) + \alpha_0 + \beta' x_{it} + u_{it} \quad (1)$$

$$u_{it} = \rho u_{it-1} + \epsilon_{it} \quad (2)$$

Each observation is observed in country i at time t. The outcome variable - credit as a proportion of national income - is denoted y_{jt}. The x_{it} and β are $k-$ vectors of covariates and regression parameters, respectively. The observation specific error term u_{jt} is autoregressive of order one, with autocorrelation coefficient of ρ.

A few words are in order about the country "fixed effects" specifications. We are fundamentally interested in whether institutions mediate how countries respond to increasing economic polarization. Institutions–electoral institutions specifically–change rarely. In our dataset the only major shift out of SMD into PR was New Zealand.[4] We also saw less drastic or more short-lived changes in France, Italy, and Japan. In all other countries electoral institutions are fixed during the period under analysis. This implies that identifying country fixed effects relies on a small number of within-country changes in four cases. This is one reason to consider the more flexible Bayesian approach below, but we report initial results here for comparison. We also attempted to construct a "synthetic control" (Abadie, Diamond and Hainmueller, 2010) for comparison with New Zealand but "pre-treatment" covariate values for the donor cases (Australia, Canada, UK, and USA) were sufficiently different to prevent the construction of a comparable synthetic New Zealand.

Table 3 reports results for a set of initial models. Models 1, 2 and 6 in includes neither the country-specific fixed effect (α_i), nor year fixed effects (γ_t) - we refer to these as fully pooled models. Models 3 and 7 include the former, Models 4 and 8 the latter, and Models 5 and 9 include both sets of fixed effects. Finally, in all the models, the estimated standard

[4] A mixed-member PR system was introduced via popular referendum in 1993; the first election under the new system was held in 1996.

errors are clustered by country.

The first five models in Table 3 include our independent variables of interest: the top one percent share, the majoritarian dummy, and their interaction (except in Model 1) - along with measures of population (logged), GDP per capita (logged), unemployment, GDP growth, and investment as a percent of GDP. The second four models further add the size of the capital account as a percent of GDP and the budget deficit, also as a percent of GDP. Adding these variables reduces the size of the sample from 607 observations to 371 observations and restrict its time coverage from 1961 to 2009 down to 1980 to 2009.

We begin by discussing Model 1, a fully-pooled model which omits the interaction of inequality and electoral system shows no statistically significant "direct effect" of either variable on credit supply. Personal income, population size, and (surprisingly) unemployment are positively correlated with increased credit supply and the growth rate is negatively correlated. Thus inequality alone does not appear directly related to credit supply. Yet we see in Models 2 through 9 that once we take into account the *conditional* effect of electoral system, pre tax income inequality has a strong association with credit supply. In comparing Models 1 and 2 alone it is notable that, even in the absence of country and year fixed effects, adding the interaction term improves model fit (using the Adjusted R^2) by over fifty percent.

Table 3: Baseline Analysis of Majoritarianism and Inequality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top 1 pct	0.007	-0.002	-0.011**	-0.004	-0.017***	-0.003	-0.011*	-0.012**	-0.017***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.007)	(0.006)	(0.006)	(0.006)
Majoritarian	-0.019	-0.291***	-0.252***	-0.293***	-0.255***	-0.370***	-0.372***	-0.176	-0.135
	(0.031)	(0.076)	(0.074)	(0.076)	(0.075)	(0.111)	(0.106)	(0.131)	(0.139)
Log GDP per cap	0.703***	0.661***	0.187	0.417***	0.152	0.802***	0.222*	0.419***	0.201
	(0.087)	(0.077)	(0.129)	(0.089)	(0.164)	(0.120)	(0.134)	(0.143)	(0.252)
Log Population	0.071**	0.064***	0.067***	1.366***	1.048***	0.040	0.050**	2.410***	2.352***
	(0.029)	(0.023)	(0.022)	(0.232)	(0.291)	(0.028)	(0.025)	(0.444)	(0.495)
Unemployment Rate	0.012***	0.012***	0.003	0.008**	0.006	0.002	-0.011*	-0.001	0.000
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.005)	(0.007)
% GDP Growth	-0.009***	-0.009***	-0.007***	-0.008***	-0.007***	-0.013***	-0.009***	-0.013***	-0.010***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Investment Share	0.003	0.004*	0.006**	0.006**	0.009***	0.012***	0.010**	0.013***	0.012***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Top 1 X Maj.		0.033***	0.029***	0.039***	0.035***	0.041***	0.043***	0.028**	0.022**
		(0.009)	(0.008)	(0.009)	(0.008)	(0.011)	(0.010)	(0.011)	(0.011)
Capital Account						-0.029*	-0.041**	-0.041***	-0.044***
						(0.016)	(0.016)	(0.016)	(0.017)
Budget Deficit						-0.010***	-0.011***	-0.007**	-0.007**
						(0.003)	(0.003)	(0.003)	(0.003)
Constant	-7.042***	-6.526***	-1.900	-17.029***	-11.389***	-7.833***	-2.109*	-27.412***	-24.603***
	(0.820)	(0.730)	(1.220)	(1.672)	(3.497)	(1.151)	(1.276)	(3.395)	(5.202)
Country Dummies	No	No	No	Yes	Yes	No	No	Yes	Yes
Year Dummies	No	No	Yes	No	Yes	No	Yes	No	Yes
Observations	607	607	607	607	607	371	371	371	371
Adjusted R Sq.	0.098	0.155	0.203	0.422	0.458	0.320	0.370	0.561	0.562

All models use country clustered AR1 standard errors: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Beginning with Models 2 through 5 we find that the interaction term is statistically significant and positive - suggestive of a complementary relationship between inequality and majoritarianism on credit supply. However, because interactive models involve three components (the two direct effects and their interaction), each with their own degree of uncertainty, it is important to examine whether the combined effects of these variables is indeed statistically significant (Berry, Golder and Milton, 2012). This can be done through simulations of quantities of interest and calculating t-tests or presented graphically. We do this for Model 2, which is easiest to interpret given the absence of fixed effects. For example, a t-test of whether estimated credit supply is different at top one percent income shares of five and fifteen percent (approximately the 5th to 95th percentiles of this variable's distribution) shows a slight decline in predicted credit supply from 90.4% to 88%, significant only at a p level of 0.68 - that is, there is no statically significant difference. However the same test for majoritarian systems shows an increase from 77% of GDP to 108%, significant at the $p < 0.0001$ level.

Furthermore, it is not the case that majoritarian systems have distinct levels of credit supply *per se*. Although the coefficient on majoritarianism is statistically significant and negative, this implies only that comparing countries with a zero percent top income share, majoritarian electoral systems would have lower credit supply - this is, of course, an impossible income share. Instead, comparing electoral systems at median levels of top income share (7.75%), we find majoritarian systems with credit supply of 86.1% of GDP and proportional / mixed systems with credit supply of 89.7% and moreover, this difference is not statistically significant at conventional levels. Hence, the basic take home is that inequality and electoral system matter *only* in conjunction - it is the combination of inequality and majoritarianism that affects credit supply.

These same patterns can be viewed graphically in Figure 2, which shows predicted credit levels as a function of inequality and electoral system, with ninety-five percent confidence

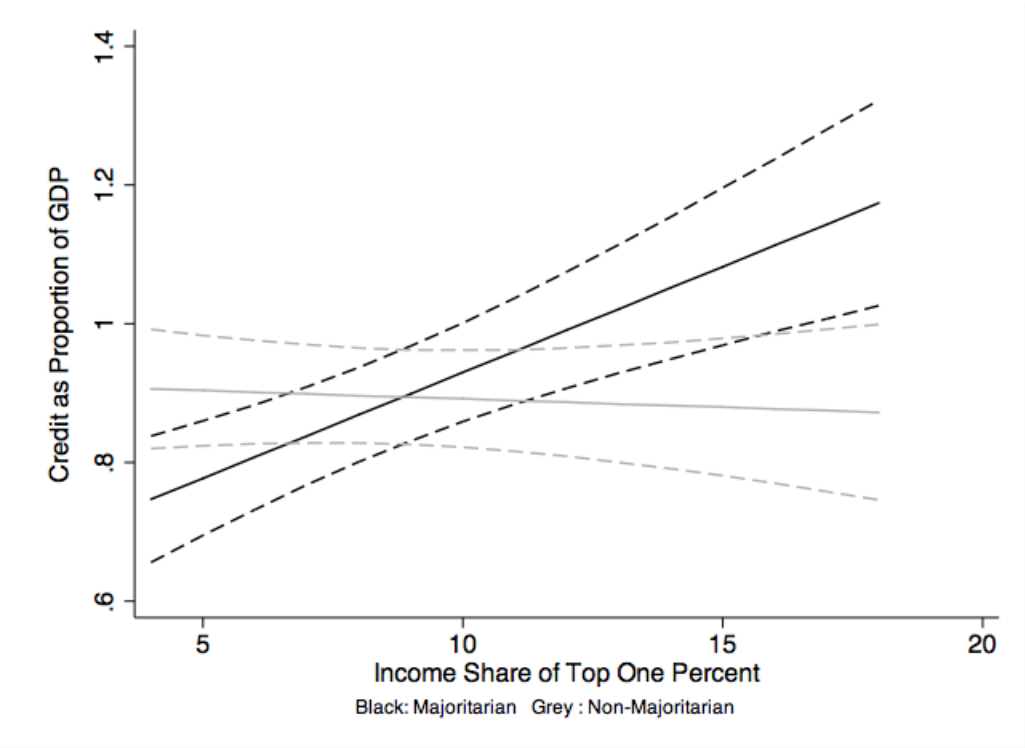

Figure 2: Comparing Credit and Inequality across Electoral Systems

intervals around the estimates.

These simulations would be somewhat suspect if we found that our results were driven by unmodeled cross-country or temporal heterogeneity. However, this does not appear to the case. Models 3 through 5 add country and year fixed effects to the specification in Model 2. We see consistent findings in the estimates for the interactive effect which sticks in a tight range of (.029 and .039) with standard errors of .008 or .009, unsurprising given the low level of within-country variation in electoral institutions.

Models 6 through 9 add two important control variables, the capital account as a percent of GDP and the budget balance, also as a percent of GDP. Both variables appear negatively related to capital supply as expected. Even though they reduce the dataset by over one third in size, they do not dramatically effect the estimates for the conditional impact of inequality and electoral system. We reiterate that this sample size reduction is purely temporal: it shrinks the time frame under consideration but does not exclude any countries that were present in the full analysis.

3.4 Error-Correction Model

Credit availability is dynamically evolving, responding both to long-run differences in market and political conditions and to short-term opportunities. In order to capture these dynamics we revisit the initial analysis using an error-correction model to see what more we can learn. The structure of this model is captured as follows:

$$y_{it} = \alpha_0 + \gamma y_{it-1} + \beta_d' \Delta x_{it} + \beta_l' x_{it-1} + u_{it} \quad (3)$$

$$u_{it} = \rho_{(i)} u_{it-1} + \epsilon_{it} \quad (4)$$

The error-correction model assumes that credit supply follows an equilibrium process such that *transitory* shocks impact credit supply but then fade out whereas *permanent* changes

in predictors have a long-run impact on the level of credit supply. The transitory shocks are modeled as order-one differences in covariates Δx_{it}, with k coefficients represented by the vector β_d. The permanent effects of predictors come in through the lagged levels term x_{it-1} with coefficient vector β_d. Finally, the error term is modeled as autoregressive: in Models 1 and 3 of Table 4 we use the same sample-wide estimate of autocorrelation ρ, whereas Models 2 and 4 use a panel-specific measure of autocorrelation ρ_i.[5]

Table 4 displays our results, with Models 3 and 4 including the capital account and budget deficit variables (changes and lagged levels). Immediately apparent is the fact that few variables are consistently significant predictors across specifications, save for the lagged dependent variable, the budget deficit and the lagged majoritarian dummy. However, the lagged interaction of inequality and majoritarianism is significant across all four models (though variable in magnitude depending on the sample used). The substantive implications are similar to Table 3 - only in majoritarian systems is there a consistent effect of inequality on credit supply and this effect remains positive in direction.

Figure 3 displays the estimated dynamic effects of inequality in various electoral systems on credit provision over a six year period. Starting from the same average level of credit provision (95.4% of GDP), we see a striking pattern emerge. In majoritarian electoral systems (solid lines), inequality has a much larger dynamic effect on credit provision than in non-majoritiarian systems (dashed lines). At low levels of inequality (10th percentile - top one percent share of 4 percent of national income) credit provision is actually expected to decline to just over 80% of GDP after six years. Conversely in median inequality (top income share of 8 percent) and high inequality (90th percentile - top income share of 12.5 percent) countries credit provision is expected to increase, in the latter case up to nearly 140% of GDP within six years.[6]

[5]Results are largely robust to the inclusion of country and year dummies.

[6]Standard errors for the predictions are not shown, but do not overlap after two years have elapsed,

Table 4: ECM Analysis of Majoritarianism and Inequality

	(1)	(2)	(3)	(4)
Lagged DV	0.898***	0.887***	0.899***	0.875***
	(0.023)	(0.024)	(0.034)	(0.034)
L. Top 1 pct	0.002	0.001	-0.001	-0.001
	(0.004)	(0.004)	(0.005)	(0.005)
Δ Top 1 pct	-0.003	-0.003	-0.002	-0.001
	(0.004)	(0.004)	(0.004)	(0.003)
Majoritarian	-0.066*	-0.087**	-0.094*	-0.116**
	(0.040)	(0.040)	(0.052)	(0.054)
L. Top 1 X Maj.	0.009*	0.011**	0.012**	0.016**
	(0.005)	(0.005)	(0.006)	(0.007)
Δ Top 1 X Maj	0.006	0.006	0.010	0.009
	(0.007)	(0.006)	(0.009)	(0.008)
L. Log GDP per cap	0.069***	0.073***	-0.004	0.022
	(0.022)	(0.023)	(0.044)	(0.052)
Δ Log GDP per cap	-2.686	-2.728	-4.956	-5.057
	(4.569)	(4.294)	(10.978)	(10.267)
L. Log Population	0.005	0.004	0.007	-0.007
	(0.004)	(0.005)	(0.007)	(0.009)
Δ Log Population	-0.336	-1.413	0.008	-2.130
	(0.904)	(0.932)	(1.470)	(1.564)
L.Unemployment Rate	-0.001	-0.003*	-0.004*	-0.006***
	(0.001)	(0.001)	(0.002)	(0.002)
Δ Unemployment Rate	0.002	0.002	-0.004	-0.004
	(0.004)	(0.003)	(0.005)	(0.005)
L. % GDP Growth	0.024	0.023	0.045	0.046
	(0.045)	(0.042)	(0.106)	(0.099)
Δ % GDP Growth	0.023	0.023	0.045	0.045
	(0.045)	(0.042)	(0.106)	(0.099)
L. Investment Share	0.004***	0.004***	0.003	0.003
	(0.001)	(0.001)	(0.002)	(0.002)
Δ Investment Share	0.004	0.005**	0.004	0.005
	(0.002)	(0.002)	(0.004)	(0.004)
L. Capital Account			0.020	0.022
			(0.015)	(0.015)
Δ Capital Account			-0.019	-0.017
			(0.013)	(0.013)
L. Budget Deficit			0.004**	0.004*
			(0.002)	(0.002)
Δ Budget Deficit			-0.005*	-0.005**
			(0.002)	(0.002)
Constant	-0.733***	-0.721***	0.075	-0.018
	(0.211)	(0.232)	(0.412)	(0.466)
Observations	575	575	339	339
Adjusted R Sq.	0.907	0.958	0.901	0.953

By sharp contrast, in proportional systems there are almost no dynamic differences in credit provision at very different levels of inequality. Essentially, credit provision remains flat in non-proportional systems regardless of both inequality and the passing of time.

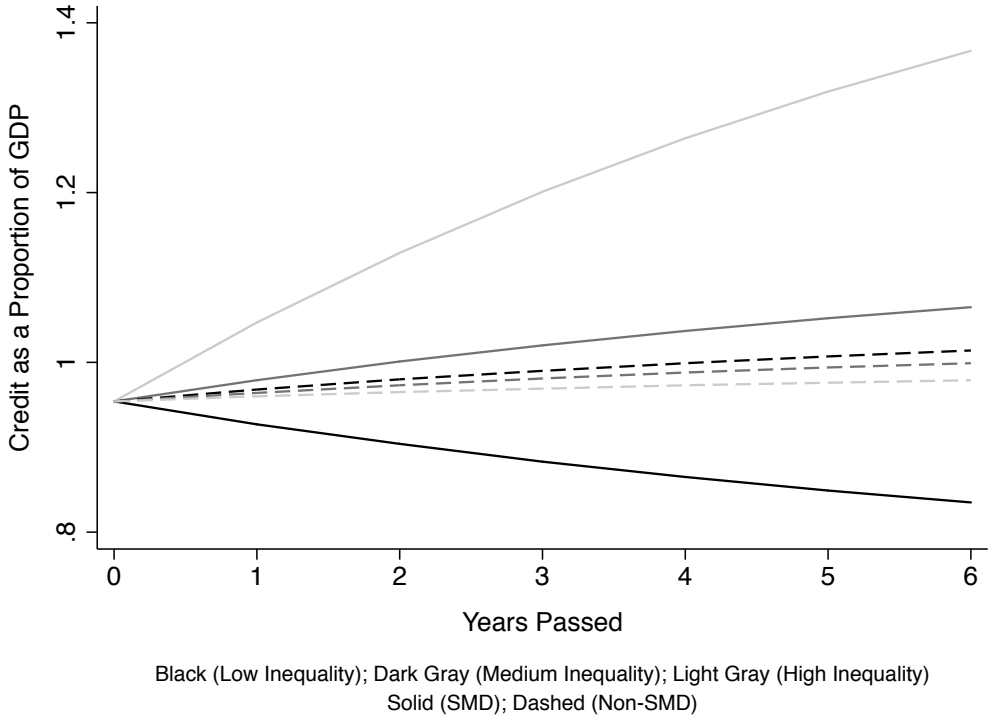

Figure 3: ECM Dynamic Estimates of the Effect of Inequality on Credit Provision

3.5 Bayesian Hierarchical Panel Time-Series Analysis

The previous specifications were consistent with the Rajan Hypothesis—that increasing pre tax inequality can lead governments to extend credit. They are also consistent with our amplification of the argument: if governments are the ones responding to increasing inequality then we should expect to see credit availability responding in SMD but not in PR countries. We do indeed see this, but the models above suffer from some weaknesses. Specifically, the

meaning that medium-run dynamic differences are statistically significant.

standard fixed effects specifications have distinct weaknesses in identifying relationships that are slow-moving or rarely changing and there is still evidence of residual dependence in the data. A fully Bayesian hierarchical framework provides a more flexible framework in which to continue to investigate these issues. Here we build a preliminary Bayesian hierarchical linear-Normal model. We include country effects and country-specific error variances to model persistent cross-country heterogeneity in domestic credit levels. Time effects account for commonly experienced shocks across countries and the 1-period within-country autoregressive error term models the possibility that these shocks may not all be experienced contemporaneously. We can formally express the model for country i in year t as

$$\begin{aligned}
y_{it} &\sim N(\theta_{it}, \sigma_i^2) \\
\theta_{it} &= \begin{cases} \mu_{it} & \text{if } \#t_i = 1 \\ \mu_{it} + \rho e_{it-1} & \text{if } \#t_i > 1 \end{cases} \\
\mu_{it} &= \beta' x_{it} + \alpha_i + \gamma_t \\
e_{it} &= \theta_{it} - y_{it} \\
\alpha_i &\sim N(0, \sigma_\alpha^2) \\
\gamma_t &\sim N(0, \sigma_\gamma^2)
\end{aligned}$$

where x_{it} is a vector of time varying covariates, $\#t_i = 1$ refers to the first observation for country i. β is a vector of to-be-estimated regression coefficients and ρ is the to-be-estimated autoregressive parameter. We put diffuse Normal priors on β and diffuse[7] uniform priors on the variance components, σ_i^2, σ_α^2, and σ_γ^2. The autoregressive parameter has a uniform prior on $(-1, 1)$.[8]

[7] (0,100]

[8] Future iterations of the paper will explore country-specific autocorrelation structures, a more complicated lag structure, the possibility of additional spatial dependence in the data, and using imputation tools to extend the time frame of the analysis. JAGS code is available from the authors.

The model was fit using MCMC techniques. We ran three chains for 10,000 iterations each, discarding the first 2,500 draws as burn-in. Visual inspection of the trace plots and the Gelman-Rubin $\hat{R}$ statistics indicate that the chains in fact converged. Data were sample-centered and standardized to speed MCMC convergence.[9] Hence the coefficient estimates are not directly comparable in magnitude to those in Tables 3 and 4.We examine two particular specifications corresponding to Models 2 through 5 and 6 through 9 of Table 3, that is, excluding and then including the capital account and budget deficit variables.

We display the resulting parameters and 95% credible intervals in Figures 4 and 5. As in the models in Table 3 we find strong evidence of a positive conditional effect of inequality and majoritarian electoral systems. We also find substantial evidence of cross-country heterogeneity, with a sizable country variance term, and of autocorrelation of over 0.8.

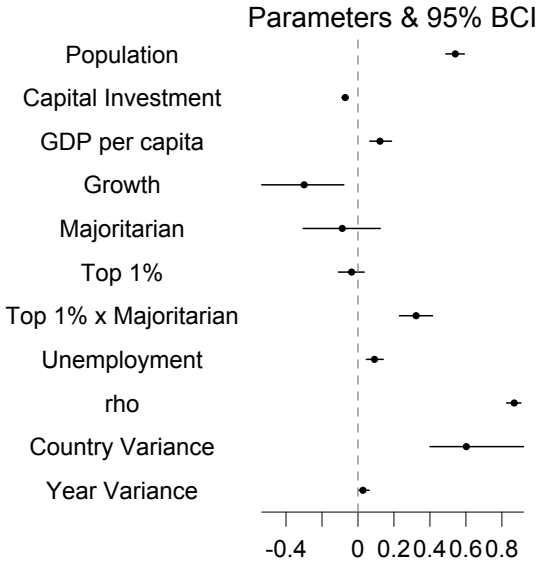

Figure 4: Parameter posterior means with 95% Bayesian credible intervals. $N = 607$, number of countries = 18, DIC = 46. Excludes capital account and budget deficits.

[9]Note that this centering was variable by variable for the whole sample *not* country by country, which would be equivalent to a "within country" model.

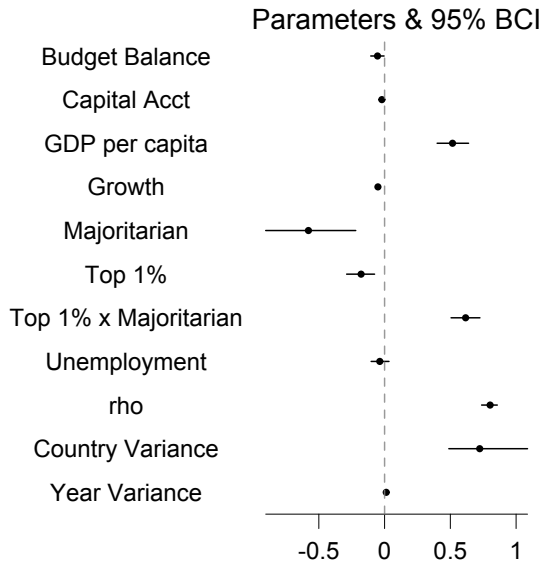

Figure 5: Parameter posterior means with 95% Bayesian credible intervals. $N = 371$, number of countries = 18, DIC = 46. Includes capital account and budget deficits.

4 Conclusion

Rising income inequality and the credit boom and bust were perhaps the two key economic stories of the first decade of the 21st Century. We build on existing arguments that their joint emergence was not a coincidence. In fact, policies that expand credit appear closely related to changes in income inequality but only in those countries with majoritarian electoral systems. We claim that such policies performed an important role in tamping down the concerns of median voters experiencing stagnant or declining wages over the past few decades even as inequality rose, by providing credit as a salve that allowed citizens to maintain consumption growth even as their incomes failed to rise.

The finding that the relationship between top income shares and credit availability is conditional on electoral institutions is important for two main reasons. First, it makes it quite difficult to sustain the argument that the increased availability of credit is simply the result of increased credit demand as poorer citizens attempted to maintain consumption in the face of stagnant real wages. Indeed, if credit availability were purely a demand-driven occurrence then we should see *higher* prices for credit and financial services as wages and incomes diverge as the demand curve shifts outward, something not seen. There is little reason to think that consumer demand for credit correlates with electoral institutions, except insofar as countries with PR systems also generate policies that generate growing real wages for more people and/or reduce consumption gaps through other policies, namely redistribution. Thus we can more confidently construe our findings as evidence for government policy reacting to economic polarization in distinctly different ways that are conditioned by the incentives facing politicians in different institutional environments. Second, the finding has implications for future financial stability, both in the developed and developing world. As gaps between rich and poor continue to grow (or at least not shrink) in the largest economies in the world, how governments respond has implications for global financial stability. If governments in

the largest economies continue to pursue the myopic policies of stimulating consumption via the provision of credit, whether through housing and equity borrowing policies, bankruptcy laws, and (de)regulation of the financial sector, the prospects for more frequent and dangerous financial crises increase. And we have all learned that spillover can be rapid and deep. Large developing countries are now implicated as well, as we see inequality increasing in China. Interestingly, Brazil, long one of the most unequal countries in the world, has succeeding in actually decreasing its economic polarization in recent years while also enjoying an unprecedented period of rapid and stable growth.[10]

The paper as it stands has several shortcomings we hope to address in future iterations. The most glaring are in refining the empirical models to better account for remaining temporal dependencies. We will also endeavor to better model the dependence across countries in credit provision, especially among the Eurozone countries. Finally, a case study of the New Zealand experience seems warranted.

[10] using fiscal transfers in the context of a mixed PR system.

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