Does Inequality induce more Borrowing?
Electoral Institutions and Responses to Economic Polarization

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Abstract

In several important accounts of the global financial crisis rising US income inequality plays a prominent role. Contrary to standard models of democratic political economy, these accounts claim that American politicians did not respond to growing inequality with fiscal redistribution. Instead citizens maintained relative consumption by borrowing more. Why credit-based consumption dominates redistribution is underspecified. We construct a model in which consumers care about relative income, perhaps due to positional externalities in consumption, and then show a trade-off between redistribution and willingness to borrow to fund current consumption. A key implication is that political institutions will have a strong effect on observed credit: politicians in proportional representation (PR) systems will deliver more fiscal redistribution while majoritarian countries will not, increasing the political attractiveness of credit-based consumption stimulus in the latter. We examine these expectations in 18 OECD democracies and find that majoritarian systems are significantly more likely see credit expansion as pre-fisc inequality grows while no such relationship is visible in PR systems. We trace this to PR’s propensity to generate frequent center-Left coalitions.

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

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Several high-profile accounts of the global financial crisis link the housing bubble in the United States to the extreme growth in US income inequality. The political economy foundations for these claims are underspecified and broad empirical support is lacking. In this paper we tell an institutional story that marries “expenditure cascades” (Frank, Levine and Dijk, 2005) to a model of fiscal redistribution under different electoral systems (Iversen and Soskice, 2006). We show that fiscal redistribution can blunt the credit demand generated by increasing income inequality and associated positional externalities in consumption (Hirsch, 1978). Fiscal redistribution, in turn, is greatly affected by the electoral system, with redistribution more forthcoming under proportional electoral rules (PR) and less likely in majoritarian systems (Austen-Smith, 2000; Iversen and Soskice, 2006; Kang and Powell, 2010; Persson and Tabellini, 2005).

This implication leads to an empirical strategy for identifying the relationship between inequality and credit: electoral institutions, which were largely established decades ago and change only rarely, provide a way of circumventing obvious endogeneity and measurement problems with fiscal redistribution. This allows us to look at a much wider cross-section and longer time period. We build a Bayesian hierarchical model and establish that, among 18 OECD democracies, increased inequality is linked to more rapid growth in credit, but only in countries operating under majoritarian electoral rules. Further examination shows that the greater relative frequency of center-left government induced by PR, rather than partisan disproportionality itself, appears to be the mechanism at work. Our findings have implications for financial system risk: if income polarization continues to grow then majoritarian democracies could be more prone to credit booms and financial crises than countries functioning under PR systems.

1Positional goods are those from which individuals derive utility, at least in part, from their social scarcity. Aside from rare luxury goods like unique works of art, canonical examples include desirable housing and spots at elite educational institutions, for which all may aspire but for which only a few can ever succeed, and for which supply does not grow with the productive capacity of the rest of the economy. Competition for socially scarce goods can generate inefficient positional externalities.
The paper is composed of four sections. The next section reviews current thinking around inequality, redistribution, credit and financial crises and sets out some descriptive empirics motivating the paper. In section 2 we build on existing models to describe the link between inequality, household consumption decisions, and the politics of redistribution under different electoral systems. Section 3 presents our empirical models and the final section concludes.

1 Inequality & Credit

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 2.5% of national income (including capital gains). That figure had grown to about 12% by 2007 (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, while real pre-tax income growth for an American households in the bottom fifth of the income distribution was essentially flat, 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, McCarty, Poole and Rosenthal 2013, Rajan 2010). Each emphasizes different policy levers (housing finance, financial deregulation, taxation) but suggest similar core relationship: widening income gaps produce turmoil among voters as many see themselves falling further behind while others reap spectacular fortunes. Policy makers have an incentive to respond to voters using politically “efficient” policies, i.e., those that cost the least in terms of lost votes or political conflict. Policies stimulating immediate consumption
by extending credit down the income distribution were more politically palatable than fiscal redistribution. Rajan (2010:31) states this succinctly:

[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.

These arguments have two components: first, American politicians found direct income redistribution politically unattractive. Second, a series of policies emerged, either by design or coincidence, that extended access to credit, especially for housing, further down the income distribution.

In terms of policy, new literature on government credit allocation reinforces their political attractiveness (Quinn, 2012). Credit policies are often directed at narrowly defined constituencies. Loan guarantees and interest rate caps do not require accounting in the same ways as formal tax outlays. Government sanctioned credit vehicles are generally held off the government’s “balance sheet,” frequently in quasi-governmental organizations with implicit guarantees. And while there are no comprehensive data on private debt enjoying
state subsidies or guarantees there does appear to a notable partisan angle, with Republicans generating pork in the form of “contingent liability” policies (e.g., loan guarantees) and Democrats preferring direct spending on employment-generating projects (Bickers and Stein 2000; Lazarus and Reilly 2010).

Recent work also bolsters the argument that large, rapid increases in credit are associated with major financial crises, notably the Great Depression (Eichengreen and Mitchener 2003; Jorda, Schularick and Taylor 2010; Mendoza and Terrones 2008; Schularick and Taylor forthcoming). Kumhof and Ranciere (2010) and Kumhof, Ranciere and Winant (2013) present the most formally articulated argument linking the distribution of income to financial fragility. Kumhof and Ranciere (2010) construct a model in which increased inequality leads to increased savings by the rich and hence greater credit availability, and ultimately to credit booms and crashes. Kumhof, Ranciere and Winant (2013) calibrate a version of this model using U.S. data and generate credit, borrowing, and default/crisis events that are similar to those observed in the Great Depression and the Great Recession.

The supply of capital from the enriched elite explains one part of the connection between inequality and credit. But what of demand? Why do poorer citizens borrow? In the Kumhof and Ranciere (2010) and Kumhof, Ranciere and Winant (2013) models the borrowing decision is driven by simple consumption smoothing following a loss of income; the rich lend because they directly value financial wealth. The crisis emerges as the poor rationally default on loans. But as early as Zeldes (1989) we have seen evidence that consumers lower down the asset distribution are credit constrained and therefore unable to smooth consumption to the extent they might like, implying a latent demand for borrowing. Cooper (2013)’s recent empirical work shows that rising prices for housing led to greater consumption, but mainly among those who were previously credit constrained, i.e., housing wealth induces

\footnote{An important implication of the model is that the needs of both the rich and the poor yield increased demands for financial intermediation.}
more consumption not because of a lifetime “wealth effect” but rather because those who wanted to consume more suddenly had more collateral with which to secure loans.

Other recent work has put inequality front-and-center in explaining demand for credit. In the spirit of Akerlof (1997) and other models of social position, Frank, Levine and Dijk (2005) argue for “expenditure cascades” as those further down the income distribution attempt to mimic the consumption of the rich. Such cascades can be both a cause and consequence of a ratchet effect in the prices of “positional goods” like housing and education (Hirsch 1978) for which people readily go into debt (Sullivan, Warren and Westbrook 2000, 2006). Empirically, there is mounting evidence that interpersonal comparisons in status and income matter for well-being (Daly, Wilson and Johnson 2013). In laboratory experiments positional externalities have been shown to reduce savings and increase consumption by lower-ranked individuals (Feltovich and Ejebu 2014). Bertrand and Morse (2013) build on Frank, Levine and Dijk (2005). Looking at variation in inequality across US states, they find evidence that greater expenditures by the rich (those above a state’s 80th income percentile) are associated with greater consumption by everyone else in addition to greater reported financial duress and higher rates of personal bankruptcy.

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. In this light, the Rajan Hypothesis, as we dub it, appears underspecified both in terms of explaining the preferences and behavior of individual citizens and the behavior of politicians. Consumer demand for credit in the context of fiscal redistribution is under-theorized.

In terms of the behavior of politicians, the Rajan Hypothesis relies on the claim that (American) politicians of both the center and right failed to provide the redistributive poli-
cies expected in a Meltzer-Richard world because these policies were too difficult. Instead a set of policies emerged that ended up enhancing consumption through easier access to credit (McCarty, Poole and Rosenthal, 2013). Bertrand and Morse (2013) show some evidence that Republican Congressional representatives whose districts were more unequal were also more likely to support policies easing housing credit; Republican state representatives in Oregon and Ohio whose districts were more unequal were also more likely to support legislation capping interest rates for short-term “pay day” loans. Gabriel, Kahn and Vaughn (2013) examine the behavior of New Century Financial, a large subprime lender in the United States. They find that New Century originated more loans at better terms in the Congressional districts of the House leadership and in districts where New Century donated to the representatives’ campaigns. The managers of at least one firm (and possibly the representatives themselves) seem to believe that more readily available credit will be viewed favorably by the constituents in these districts.

Nevertheless we are left wondering exactly why redistribution is particularly politically costly in the United States. We have seen increasing dispersion in pre-tax incomes in many countries. Why did credit-based financial crises emerge in the US and UK rather than Germany or the Netherlands? Is there less demand for credit in some places? Might this be conditioned by the prevailing levels of redistribution which differ dramatically across these countries (Kenworthy and Pontusson, 2005)?

1.1 The Institutional Story

We believe that if the Rajan Hypothesis is on the right track then there is a comparative institutional story to be told. The highly developed literature on the political economy of electoral institutions contains a possible solution to the puzzle. There is abundant empirical evidence (Kang and Powell, 2010; Persson and Tabellini, 2005) as well as elegant theoretical evidence (Gabriel, Kahn and Vaughn, 2013)
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models [Austen-Smith 2000] [Iversen and Soskice 2006] showing that fiscal redistribution is politically easier and therefore more extensive in countries with proportional representation (PR) electoral systems compared to those with plurality/single member district (SMD) institutions. There is reason to believe that prevailing levels of redistribution should affect how citizens translate changes in aggregate inequality into decisions about consumption and borrowing. Hence electoral systems, via their effects on redistributive policies, should condition households’ decisions to borrow in the context of rising inequality.

Some simple graphical displays suggest that the connection between inequality and the provision of credit is indeed substantially stronger in countries with majoritarian, as opposed to proportional electoral systems. Figure [1] shows this most starkly. There is a clear monotonic positive relationship between lagged top income share and credit in the domestic economy among countries operating under majoritarian systems.\footnote{The measure of electoral system comes from Golder (2005), extended to 2010. The measure of inequality is the top one percent’s income share from Piketty and Saez (2006), also updated to 2010. The measure of credit provision is real credit as a percentage of GDP and comes from Beck, Demirg¨uc-Kunt and Levine (2000). We have data for ten countries in 1961, thirteen by 1963, and eighteen by 1982.} Also visible in the figure is the relationship between electoral institutions and the long-run partisanship of government. Majoritarian systems tend to be biased against frequent Left government, as the lighter shading among those points indicates [Iversen and Soskice 2006] [Powell 2002].

Figure [2] looks at the same relationship only within countries. We see a striking difference when comparing majoritarian countries to the others. In most of the majoritarian countries, particularly Australia, Canada, Great Britain, and the United States, we see a strongly positive relationship between top income shares and credit. By contrast in the PR and mixed systems there is either no relationship (Spain, Denmark, Norway) or a slight negative one (Finland, Netherlands). Ireland, likely because of its close financial relationship with Great Britain, is the only non-majoritarian country where there is an obvious positive relationship between inequality and credit. Moreover in countries that switched electoral institutions...
Figure 1: Credit to the private sector and inequality by the configuration of electoral institutions with nonparametric loess curves superimposed. Points represent all available country-years from 1961-2010, shaded based on the cumulative years of left-party government since 1960 as percent of years since 1960.

during this period the relationship between inequality and credit provision also appears to shift. In New Zealand, this relationship appears attenuated after the switch to MMPR.\(^5\)

\(^5\)We attempted to examine the effects New Zealand’s change in electoral institutions using synthetic case comparison methods. The potential donor cases were unable to produce an adequate “pre-treatment” match. We also note that Italy shifted from a PR system to a mixed system using more majoritarian electoral rules. The upswing in Italy’s credit level occurs after this change.
Figure 2: Credit to the private sector and inequality by country with nonparametric loess curves superimposed.

We argue that this connection stems not from electoral systems *per se* but rather their effect on the long-run partisanship of government and thereby redistributive policy. Put simply, built in redistributive policies provide a direct fiscal response to rising inequality—as the pre-fisc gap between rich and poor rises, so too do income transfers. In the absence of redistribution, the concerns of the losers from rising inequality are not met and credit
provides an alternative mechanism to narrow the consumption gap between rich and poor. Consumers in majoritarian systems respond to rising inequality with higher use of credit because governments in these systems fail to respond with redistribution.6

2 Redistribution & “Trickle-Down Consumption”

In this section we fashion a political-economic model of inequality, redistribution, and consumption/savings. We build on the FLD model of trickle-down consumption to model the optimal private consumption choices of citizens, given fixed tax policies and the income of the rich. We then include these preferences in an Iversen-Soskice model of redistributive taxation under different electoral institutions.

We consider a continuum of agents of mass one. Each agent lives for two periods and, as in FLD, agents have Cobb-Douglas utility functions composed of current and future consumption where future consumption depends on how much of current income is saved. The play of the game is as follows: First, agents vote in an election where the winner sets the tax rate in a linear tax-and-transfer system, but elections are governed by differing electoral institutions. Agents then make consumption and savings decisions holding the tax rate fixed.

To link the consumption decisions with the model of electoral systems we follow Iversen and Soskice (2006) and Persson and Tabellini (1999), and examine an economy with three equally-sized groups $j \in \{H, M, L\}$, each with group-specific exogenous period-1 incomes, $y_j$, where $y_H > y_M > y_L$. Agents within each group are identical and decide what proportion of their incomes, net of taxes, to consume today, denoted $c_i$. We assume a linear flat income tax rate, $t$, used to fund a lump sum transfer, $g$, received by all citizens. The government budget constraint implies that $g = t\bar{y}$, where $\bar{y} = \int_0^1 y_i di$, or average income. To simplify presentation let $\nu = (1 - t)$. Utility to members of group $j$ is given by

6Interestingly, Rosenbluth and Schaap (2003) find that consumers in majoritarian countries have easier and cheaper access to financial services and credit.
\[
\begin{align*}
    u_j &= \left( (1 - t)c_jy_j + g - \pi(1 - t)(\hat{c}_Hy_H - c_jy_j) \right)^{(1 - \alpha)} \left[ (1 - t)(1 - c_j)y_j + f_j \right]^\alpha \\
    &= \left[ \nu c_jy_j + (1 - \nu)\bar{y} - \pi\nu(\hat{c}_Hy_H - c_jy_j) \right]^{(1 - \alpha)} \left[ \nu(1 - c_j)y_j + f_j \right]^\alpha
\end{align*}
\]

To capture aspirational or positional consumption we allow agents to care about consumption relative to one’s peers. There are several plausible ways to model the peer or reference group. Here we assume that agents compare their consumption to the expected consumption of the rich \(\hat{c}_Hy_H\), inline with the findings in Bertrand and Morse (2013). The parameter \(\pi\) captures the importance of positional consumption. In order to make borrowing possible \((c_j > 1)\) we assume that individuals have group-specific expected future earnings, \(f_j\), unrelated to today’s savings.

Equation 1 reflects three important simplifying assumptions. First, we assume the that government transfers must be consumed in its entirely in the current period, perhaps because it is given in kind. Second we assume that aspirational concerns are only relevant in the current period. This could be motivated by the observation that relative consumption in goods like housing and education matter early on but become increasingly irrelevant later in life. Third, we assume that future income is unrelated to current savings and is untaxed.

Holding tax rates fixed and maximizing this equation with respect to \(c_j\) for \(j \in \{L, M\}\),

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7Note that all agents within an income tier make the same consumption choice.

8We derive similar results if the reference point it mean income or if each group refers to the next-highest income group in setting consumption aspirations. [More generally, we assume that what drives the changes in individual consumption choices is changes in the income of the rich rather than in the proportion of their income that the rich choose to consume.]

9Our interest focuses on borrowing and saving today. To analyze future choices explicitly, the model would need to be extended to include a stream of expected future consumption decisions for times \(t = 2\) through \(t = T\): that is, \(c_{jT}\) through \(c_{jT}\). This adds considerable complexity to the model without providing new insights for our purposes.

10To our knowledge no one has studied possible life cycle effects in aspirational consumption. We also ignore bequest motivations.
yields the following first order condition:

\[(1 - \alpha)\nu(1 + \pi)y_J(\nu(1 - c_J)y_J + f_J) = \alpha \nu y_J\left(\nu y_J(1 + \pi)c_J - \pi \nu (\hat{c}_H y_H) + (1 - \nu)\tilde{y}\right)\]  \(2\)

From this equation we can solve for the optimal level of consumption for group members \(c^*_J\), noting that \(\tilde{y} \propto y_H + y_M + y_L\), and replacing \(\nu\) with \((1 - t)\):

\[c^*_J = (1 - \alpha)\left(1 + \frac{f_J}{(1 - t)y_J}\right) + \alpha \left[\pi(1 - t)\hat{c}_H y_H - \left(\frac{t}{1 - t}\right)\left(\frac{y_H + y_M + y_L}{y_J}\right)\right]\]  \(3\)

This expression is revealing. Firstly, presuming no expected future earnings (i.e. \(f_J = 0\)), optimal consumption is clearly likely to vary from the case without either relative consumption motivations or taxation, where \(c^*_J = (1 - \alpha)\). However, unlike the FLD model the direction of this variation is not obvious. In the FLD model the aspirational consumption effect (coming through \(\pi(1 - t)\hat{c}_H y_H\)) will increase optimal individual consumption. However, introducing taxation produces countervailing effects. Why does this occur? Partly this is a function of the fact that we assume all government programs must be consumed immediately. But it also occurs because redistribution provides a way to reduce the relative incomes of the rich and increase one’s own relative income, thereby reducing post-tax inequality in consumption.

Finally, once we add future earnings into our analysis \((f_J > 0)\), we find that higher expected future earnings increase preferred consumption levels as they rise in comparison to net current income. Notably, with positive future earnings, citizens can sustain higher levels of consumption than their current income would otherwise be able to produce - that is we
can have $c_J^* > 1$. We can thus think of higher levels of preferred consumption as implying higher willingness to borrow in the population.

Of particular interest to us is how changes in the income of the rich, holding constant the incomes of the other two groups alter an individual’s preferred level of consumption and hence borrowing. An increase in the income of the rich under these conditions implies an increase in inequality driven by the top end of the income distribution, hence we view this as a shorthand measure for rising inequality. We now take the derivative of optimal consumption for group $J \in \{L, M\}$ with respect to $y_H$:

$$\frac{\partial c_J^*}{\partial y_H} = \alpha \left[ \pi (1 - t) \hat{c}_H - \frac{t}{1 - t} \frac{1}{y_J} \right] > 0$$  \hspace{1cm} (4)

Rising inequality - driven by the rich becoming wealthier - can increase or decrease optimal consumption. Whether it does so depends on whether the aspirational consumption effect outweighs the taxation effect. As the ‘anchor point’ consumption rate of the rich $\hat{c}_H$ rises, it is more likely that rising inequality produces higher individual consumption (through the aspirational consumption effect) and hence lower savings. This is unaffected by future expected earnings since individuals only care about comparing their relative current consumption–future earnings simply provide a means to borrow and consume now. On the other hand, rising incomes of the rich also increase the size of the redistributive transfer received by other groups (for a fixed rate of taxation). This in turn provides higher current income and thus reduces the incentive to consume private income rather than save.

We can examine these divergent effects directly by examining the cross-derivatives of $y_H$.

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$^{11}$This will be true provided that $\frac{(1 - \alpha)}{\alpha} \frac{f_J}{1 - t} y_J + \left[ \pi (1 - t) \hat{c}_H y_H - \left( \frac{t}{1 - t} \right) \left( \frac{y_H + y_M + y_L}{y_J} \right) \right] > 1$: that is, if the present is valued highly relative to the future, if expected future earnings are high relative to net current earnings, or if aspirational consumption effects are substantially larger than tax effects.
and (a) aspirational consumption \( \pi \), and (b) taxation \( t \).

\[
\frac{\partial c_J^*}{\partial y_H \partial \pi} = \alpha(1 - t)\hat{c}_H > 0 \quad (5)
\]

We find that the cross-derivative of \( y_H \) and aspirational consumption \( \pi \) is positive. This suggests that factors that raise either the motivation or capacity to engage in aspirational consumption will amplify the impact of growing inequality on consumption. One obvious example is easier access to credit–on the motivational side, advertising may have a similar effect. This supports our argument that politicians may wish to use credit availability policies as a response to changes in income inequality since we can identify a demand-side reason why individuals would wish to borrow more money in an era of rising income inequality.

What about the effect of taxation? Here we take the cross-derivative of the effect of \( y_H \) on consumption, with respect to taxation:

\[
\frac{\partial c_J^*}{\partial y_H \partial t} = -\alpha \left[ \pi\hat{c}_H + \frac{1}{y_J} \frac{1}{(1 - t)^2} \right] < 0 \quad (6)
\]

Here we see a negative cross-derivative. The implication of this key result is that higher levels of taxation reduce the impact of growing income among the wealthy on the consumption of other groups. This occurs through two mechanisms: firstly, rising taxes lead to larger redistributive transfers that therefore increase income in the first period, reducing the incentive to consume private income in that period. Second, higher taxes also reduce the net income of the rich, and therefore the absolute level of net consumption by the rich. Accordingly, higher taxes compress the difference in consumption between the rich and the rest and thereby reduce the aspirational consumption effect. Starting from a position where aspirational consumption effects dominate and inequality increases consumption, a rise in taxation could reduce this effect to zero or indeed could, given high enough rates of taxation, reverse the effect entirely. Higher levels of redistribution should reduce consumption
demands produce by rising incomes of the rich. Where redistribution is higher, we should be less likely to see demands for higher consumption and hence less demand for credit.

2.1 Electoral Institutions and Redistribution

To connect this micro-model of borrowing choices to institutional differences at the national level it remains then to discuss why levels of redistribution differ across countries. Our core argument, following Iversen and Soskice (2006), is that proportional electoral institutions systematically produce a greater preponderance of left-leaning governments and that such governments are associated with higher levels of redistribution, dampening demand for credit when inequality rises. By contrast, majoritarian electoral systems, favoring center-right parties, produce less redistributive policy inducing private citizens to respond to growing inequality with increased borrowing.

Iversen & Soskice’s argument assumes that different income groups possess distinct preferences over redistribution. Electoral institutions affect policy outcomes by systematically favoring particular types of coalitions. More concretely, as we did above, Iversen & Soskice assume three equally sized groups defined by their income: low, middle, and high. Each of these groups can be represented by a political party.

For Iversen & Soskice, the key distinction between SMD and PR systems is the timing of intergroup bargaining over policy. Under PR these parties bargain and form coalitions after the election whereas under SMD groups must bargain between themselves prior to the election. It is clear that with three relevant groups the middle-income group is necessary for any coalition sufficient to win an election and govern. Under PR each income group can guarantee itself representation in the legislature through its own political party. The middle class can always ensure itself a role in the cabinet proportional to its size relative to its coalition partners; assuming uniformly sized income groups implies the middle-class party has fifty percent of the governing cabinet in any coalition and can therefore set policy
on redistribution at or near its preferred rate.

By contrast, in majoritarian systems, the centripetal pull of plurality electoral districts reduces the effective number of parties to two. Under such conditions the middle class gets ‘split’ between center-left and center-right coalitions, each dominated by the extreme income groups. Should a center-left coalition win, the middle-class only has a minority position in the government. Under such an outcome the redistributive policy implemented by a center-left government will be higher than that preferred by the middle class. Under SMD the middle class faces the risk of substantial redistribution of their income to the poor under center-left control, whereas center-right control means they avoid such redistribution, albeit forgoing redistributing income to themselves from the rich. In the Iversen-Soskice model the middle-class will shy away from center-Left parties under SMD whereas they will be much more supportive of similar post-election coalitions in proportional systems. The immediate implication of this result is that center-left governments should be more common under PR than majoritarian electoral systems. Furthermore, policies associated with the preferences of the center-Left should also be more common in proportional systems. In their work this leads to higher levels of redistribution under PR systems.

To link our earlier discussion with the Iversen-Soskice model we now assume that at election time private consumption choices are fixed. We examine citizens’ preferences over taxation, fixing consumption at $c_J = \tilde{c}_J$.\footnote{The tax rate of this hypothetical center-left government under SMD will also redistribute more than under the center-left coalition under PR.} We use as our baseline utility function, Equation (1) and take its derivative with respect to taxes $t = 1 - \nu$. As with Iversen & Soskice we presume that the richest group wants zero taxes, since their income is by definition above the mean and hence their benefit from a lump sum transfer is always lower than the absolute cost of taxation with a linear tax schedule. Accordingly, we restrict our analysis to the preferred

\footnote{In other words, we assume policies are fixed for the medium term when citizens make consumption choices but that consumption choices are fixed when it comes time to express policy preferences. It is not possible to solve this model simultaneously for consumption and tax preferences.}
tax rate for voters in each group $J \in \{L, M\}$.

$$t^*_J = 1 + (1 - \alpha) \frac{f_J}{(1 - \hat{c}_J)y_J} - \frac{\alpha\bar{y}}{\bar{y} + \pi c_H y_H - (1 + \pi)\hat{c}_J y_J}$$

(7)

The derivative of this expression with respect to group income is:

$$\frac{\partial t^*_J}{\partial y_J} = - \left( \frac{(1 - \alpha)f_J}{(1 - \hat{c}_J)y_J^2} \right) - \alpha \left( \frac{\pi c_H y_H + (1 + \pi)\hat{c}_J(\bar{y} - y_J)}{(\bar{y} + \pi c_H y_H - (1 + \pi)\hat{c}_J y_J)^2} \right) \leq 0$$

(8)

Mirroring standard results from the political economy of public finance we see that the preferred tax rate declines with income under our specification once consumption is fixed. In particular this implies that the middle income group want lower taxes than the poor group, since $y_M > y_L$ and $\partial t^*_J/\partial y_J < 0$, (with the rich group preferring zero taxes by assumption). The choice facing this middle-income group with intermediate preferences is the same as under the original Iversen-Soskice model: under PR the middle group knows they can directly affect policy in their preferred direction whereas in a majoritarian system the middle income group is split with policy being set by the coalition partner. The center-right coalition is generally lower risk for the middle class voters. The implications are also the same: PR will yield more frequent center-Left government and higher levels of redistribution.

In summary, we have a model in which consumers borrow to consume more as inequality rises, but the policy environment can alter this profoundly. The relevant parameters of the policy environment–taxation/redistribution–are strongly affected by the existing electoral institutions. Only in countries with majoritarian systems will there remain a large and unfulfilled demand for policies that increase consumption, since these needs are met by explicitly redistributive policies generated in proportional systems. Majoritarian systems will thus more readily translate rising inequality into borrowing by households.
3 Empirics

Our model of consumer/voter behavior implies a tradeoff between fiscal redistribution and borrowing under conditions of widening inequality. Systematic variation in credit use and availability will be increasing in inequality, but only in places that fail to blunt the effects of rising pre-tax inequality with fiscal redistribution. More rigorous examination poses non-trivial modeling challenges. Measuring fiscal redistribution requires comparable data on both pre-tax and post-tax inequality; the availability of such data, especially on a consistent longitudinal basis, is extremely restricted. Even if such data were available any attempt to empirically estimate this relationship in a direct fashion runs in to serious endogeneity problems, with inequality plausibly affecting both credit and redistribution simultaneously.

To address both these problems we build on existing work linking electoral institutions to redistribution and displayed in the path diagram in figure 3. Fiscal redistribution is known to be less pronounced and weakly correlated with pre-tax inequality in democracies operating under majoritarian electoral institutions. Variation in electoral institutions, largely determined many years prior to the period we analyze and credibly exogenous to existing levels of inequality and credit provides a way around the endogenous inequality-redistribution relationship. To be clear: electoral institutions cannot be used as a formal instrument for redistribution here for two reasons. First, existing data on redistribution are insufficient, especially longitudinally, for a formal instrumental variables analysis. Second, as represented by the dashed line in figure 3, we are unwilling to assume that the only path through which electoral institutions affect private credit is via their effects on fiscal redistribution. For example majoritarian systems might be more likely to deregulate banking, perhaps because of greater consumer demand for credit. Rather, our strategy is to take advantage of the link between electoral institutions and redistributive policy to circumvent endogeneity problems.

\footnote{Only New Zealand made a durable change from SMD to a mixed system in our observational window.}
between inequality, credit, and redistribution.

Figure 3: Path diagram underlying the empirical model. Z are other exogenous covariates.

3.1 Data & Measurement

Our core analysis uses a panel dataset covering eighteen OECD countries from 1980-2010. The main constraint that generates this restricted time period is the availability of several covariates. Simpler models excluding these covariates are reported in the supplementary materials; these findings are potentially stronger than those reported here, but we discuss the full model since we believe it important to condition on as many potential confounders as possible, given the observational nature of the study.

To measure the extent of private sector credit we follow the current standard and use real credit as percent of GDP, taken from the 2012 update of the well-known cross-national dataset on financial sectors (Beck, Demirgüç-Kunt and Levine, 2000). This measure includes credit provided by both banks and non-bank financial institutions and displays substantial variation both across countries and over time. While scholars focusing on the financial crisis in the United States have zeroed in on housing credit and mortgage securitization as the relevant policy areas we have no reason to believe mortgage policy is the only way government can affect domestic credit conditions. We therefore look at the outcome of interest—aggregate private borrowing—rather than specific policy variables.

We include three covariates to model the relationship of theoretical interest: pre-tax
income inequality, a measure of majoritarianism, and an interaction between the two. We use the Piketty-Saez top income shares data, specifically the top 1% income share (including capital gains, when available), as our indicator of inequality, updated to 2010 (Piketty and Saez, 2006)\footnote{Results are qualitatively similar if we use inequality excluding capital gains. See the Reviewer’s Appendix.}. 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 theoretical arguments of Kumhof and Ranciere (2010) and the model outlined in above in which voters are sensitive to the income of the richest group. We interpolate missing values for intermittently reported series and lag this variable by one year to avoid immediate problems with simultaneous or reverse causation.

We construct a series of statistical models using several ways of measuring differences across electoral institutions. Our focus, however, is on long-run cabinet composition as the core mechanism connecting electoral system to redistribution (Iversen and Soskice, 2006). Our primary measure of electoral institutions is cumulative Left government, defined for country $i$ in year $t$ as the proportion of years between 1960 and $t$ for which $i$ has a Left government, as defined in\textit{Comparative Political Data Set I 1960-2010} (2012), weighted by the government’s seat share in the lower house of the legislature\footnote{Results using the unweighted version yield substantively unchanged results.}. This measure has several things to recommend it. First, it most closely matches the mechanism leading to more redistribution under PR in the Iversen-Soskice model: the long-term relative frequency center-left government. Second, the measure changes slowly for the years we analyze (1980-2010) yet still incorporates contemporary government conditions\footnote{We also fit models using lagged government partisanship, rather than cumulative Left government, as the key variable. Simple partisanship variables did not appear as meaningful predictors of credit, giving us further confidence that our cumulative partisanship variable is capturing the enduring impact of political institutions rather than a simple contemporary partisanship story.}. We also examine three other measures of electoral institutions, discussed below.
Observed credit in the economy is an equilibrium quantity, so we include a slate of additional covariates meant to conform with other studies and account for other plausible drivers of private sector credit demand and supply. We include GDP (logged) and GDP growth to capture business cycle effects and the fact that our response variable is standardized by GDP. To capture the business cycle experienced by consumers we include the one year lag of the harmonized unemployment rate, taken from the OECD. We also include the one year lag of log population and population growth. The GDP and population variables are taken from the updated Penn World Tables (Heston, Summers and Aten 2002).

There may be concerns that our use of total credit combines both credit to households as well as firms. To address this we condition on the investment share of GDP (also from the PWT) to capture firms’ investment activities and better isolate the relationship with household borrowing. Government borrowing may affect credit availability indirectly by crowding out private borrowing, so we include the lag of the government budget balance (negative numbers imply deficits).

International economic flows can affect credit availability. We include the lag current account balance to directly account for capital inflows. Several commenters on the global financial crisis, including Rajan, have also expressed concern with savings imbalances and a global “savings glut.” To address broader international savings conditions we follow Bracke et al. (2008) and, for each year, sum the absolute value of current account balances for all reporting countries in the world and divide by world GDP. We refer to this variable as world savings. Note that this variable is constant across countries within a year, so we omit year effects in the model for the mean. We expect both a local current account deficit and more money in the global system to be associated with greater credit availability, all else equal.

Finally, a word on monetary policy and central bank independence. We might imagine that less-independent central banks would provide an additional policy lever for elected governments to pull: they can directly stimulate borrowing by keeping interest rates low and
inflate away debts, both public and private. A small literature on inequality and inflation has come to mixed conclusions on this front (Albanesi 2007; Bhattacharya, Bunzel and Haslag, 2005; Desai, Olofsgard and Yousef, 2005; Dolmas, Huffman and Wynne, 2000). The inequality-credit link is highly visible in countries like the United States and New Zealand, known for the political independence of their central banks.

From a purely practical angle, existing measures of de jure bank independence are almost entirely time-invariant within the countries we are considering here, substantially complicating any attempt to tease out the relationships between credit, inequality, and electoral institutions, the latter being nearly invariant. Furthermore, as shown by Adolph (2013), CBI fails to capture the actual incentives facing central bankers. We therefore turn to a behavioral measure of monetary conditions: broad money (M3) growth. We construct our measure from three different sources. We started with the “broad money growth (annual %)” indicator in the World Bank’s World Development Indicators (World Bank, N.d.). The WDI defines broad money growth as “the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler’s checks; and other securities such as certificates of deposit and commercial paper.” This is by far the single most complete source for these data. That said, historical data for several countries are not included in the WDI’s broad money series, including France, Germany, Portugal, and Spain. For these countries, we calculate percentage growth rates from annual M3 stocks as reported in the IMF’s International Financial Statistics Database (International Monetary Fund, N.d.). After 1999, we use the “monetary aggregate M3” indicator from the European Central Bank’s Statistical Data Warehouse for all country-years in the Eurozone (European Central Bank, N.d.). The source data provide annual percentage growth rates for each month.

18Interestingly, the political economy angle in this literature entirely ignores the fact that the poor may be debtors and therefore prefer higher inflation if debts are denominated in nominal local currency.
of the year (January’s value is the annual growth rate since the previous January). We take the mean of these monthly annual growth rates as the percentage growth rate for the euro in a given year.

3.1.1 Hierarchical ECM

We are interested in the dynamic relationships among slow-moving and rarely changing variables. Whether due to common economic shocks, cross-border financial holdings, or coordinated monetary policies there is reason to believe that country-specific effects may not be independent of one another. Missing data may pose inferential challenges. Standard fixed effects (within-country) models for panel data analysis suffer significant weaknesses in such situations. We adopt a fully Bayesian hierarchical framework for the flexibility needed to address these issues. We build a hierarchical linear-Normal error correction model incorporating temporal dynamics, and non-constant variance over time and space.\textsuperscript{19} Letting $\Delta$ be the first difference operator, the model for country $i$ in year $t$ is

\textsuperscript{19}See De Boef and Keele (2008) on the use of the ECM outside of conventional analysis of cointegrated time series.
\[ \Delta \text{credit}_it \sim N(\theta_it, \sigma^2_it) \] (9)

\[ \theta_it = \alpha_i + \lambda_i \text{credit}_{it-1} + \beta'x_{it-1} + \zeta' \Delta x_{it} \] (10)

\[ = \beta_1 \text{inequality}_{it-1} + \beta_2 \text{EI}_{it} + \beta_3 \text{inequality}_{it-1} \times \text{EI}_{it-1} + \] (11)

\[ \zeta_1 \Delta \text{inequality}_{it} + \zeta_2 \Delta \text{inequality}_{it} \times \text{EI}_{it} + \]

\[ \alpha_i + \lambda_i \text{credit}_{it-1} + \tilde{\beta}'z_{it-1} + \tilde{\zeta}' \Delta z_{it} \]

\[ \alpha_i \sim N(\mu_{\alpha}, \sigma^2_{\alpha}) \] (12)

\[ \sigma^2_{it} = \exp(\gamma_{i} + \eta_t + \xi_{\text{euro}}) \] (13)

\[ \gamma_{i} \sim N(0, \sigma^2_{\gamma}) \] (14)

\[ \eta_t \sim N(0, \sigma^2_{\eta}) \] (15)

The \( x_{it} \) are vectors of time varying covariates while \( \beta \) and \( \zeta \) are a vectors of to-be-estimated regression coefficients. Equation (11) makes explicit our modeling of the most theoretically interesting components, where \( z_{it} \) represents the remaining covariates and \( \tilde{\beta}, \tilde{\zeta} \) are \( \beta \) and \( \zeta \) excluding \( \beta_1, \beta_2, \beta_3 \) and \( \zeta_1 \) and \( \zeta_2 \), respectively. \( \lambda_i \) is the error correction term, describing the rate at which the system returns to long-run equilibrium. Importantly, we allow this to vary by country. We assume independent negative Beta(1,1) priors on the \( \lambda_i \), reflecting the constraint that the error correction parameter lie in the (-1,0) interval. The \( \alpha_i \) are the country-level effects. Finally, we explicitly model error variance in lines (13) (14) and (15) using country \( (\gamma_{i}) \) and year \( (\eta_{t}) \) effects as well as a variable indicating membership in the Eurozone, under the hypothesis that credit variance should decline relative to country-specific means once in the Eurozone. We put diffuse Normal priors on \( \beta, \zeta \) and \( \xi \) while variance hyper parameters have diffuse uniform priors.
3.1.2 Estimation

We generate samples from the joint posterior distribution of the model parameters by relying on Gibbs sampling and MCMC techniques, as implemented in WinBUGS/GeoBUGS. Data were mean-centered and standardized to speed MCMC convergence. Missing values for both covariates and the response were imputed as part of the MCMC estimation process. We ran three chains for 30,000 iterations each, discarding the first 10,000 draws as burn-in and thinning the chain by saving every tenth iteration. Visual inspection of the trace plots and the Gelman-Rubin $\hat{R}$ statistics indicate that the chains in fact converged. As an example, Figure 4 displays convergence diagnostics for the regression parameter on the lag inequality $\times$ Left government interaction term; plots for other parameters displayed similar convergence properties.

3.1.3 Results

We first consider whether there is any evidence that the relatively complicated hierarchical structure was needed. Figure 5 displays the estimates for the higher-order variance terms in the model. In a pattern repeated in subsequent figures, the thinner bar represents the 95% Bayesian credible interval (BCI), the thicker bar represents the 68% BCI and the solid dot is the posterior median. We do, in fact recover large and significant standard deviations for the country effects ($\sigma_a$), identifying significant cross-national heterogeneity in credit levels. We also recover large standard deviations for the country ($\sigma_\gamma$) and year ($\sigma_\eta$) effects in the model for the error variance. The Eurozone dummy is negative and distinguishable from 0, as expected. Countries in the Eurozone have seen a decline in their private sector credit

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20BUGS code is included in the Reviewers’ Appendix.

21Note that this centering was variable by variable for the whole sample not country by country. Indicator variables were not altered in any way.

22Results for models using only complete cases are in the Reviewers’ Appendix. Note that estimated relationships are stronger when we do not impute. We feel that imputation is the most principled and conservative way to proceed here.
In Figure 6 we examine this cross-country heterogeneity in more detail. The left panel displays the country-level error correction parameters, $\lambda_i$, which describe the speed of re-equilibration after a shock to a covariate. The differences across countries are stark. In six of the countries, credit levels return to equilibrium relatively quickly (median $\lambda_i \leq -0.6$), but in others the process is slow to adjust, most notably in Denmark, Spain, the Netherlands, Ireland and the UK. Note, however, that the speed of equilibration appears unrelated to electoral institutions. The right panel of the figure displays the estimated country-level volatility.

Figure 4: Illustrative MCMC Convergence Diagnostics
Figure 5: Posterior medians with 68% and 95% Bayesian credible intervals for higher-order variance parameters: . \( N = 558 \), number of countries = 18.

intercepts, again reinforcing the differences displayed across cases.

Figure 7 displays the posterior estimates for the regression slope parameters. Interpretation of regression parameters in an ECM context is somewhat more complicated than in a standard regression since the effect of a covariate perturbation is distributed over future periods (De Boef and Keele, 2008). The coefficients on the first differenced terms represent the immediate (within period) impact of a shock to that variable. The long run multiplier, i.e., total effect on credit in country \( i \) generated by a permanent change in covariate \( k \) is given by \(-\frac{\beta_k}{\lambda_i}\) (recall that \( \beta \) is the vector of coefficients on the lagged covariate). In this figure we omit the coefficients for lagged GDP, GDP growth, lag population and population.
growth since these coefficients are relatively uninteresting and were large enough to make the plot difficult to read for the remaining parameters. Lagged GDP and population were both strongly distinguishable from 0 and positive (negative). The BCI for both growth variables were wide and covered 0.

Looking first at the “control” variables we see that government borrowing appears to crowd out private sector credit in the long term while capital inflows (current account deficits) are associated with substantially more credit in both the short and long term.
Once we account for local capital conditions, however, the global savings level has no noticeable relationship with domestic private credit. Monetary aggregates influence credit in the expected ways: looser monetary policy, in the form of faster growth in M3, is associated with both short- and long-term increases in credit in the economy. Unemployment has a short term effect on credit but nothing visible over the longer term. Once we account for other covariates, investment levels by firms show no discernible relationship with credit levels.

Most importantly for our argument, we find strong evidence of a relationship between inequality and credit that is conditional on long-run government partisanship. Changes in
inequality, both in the immediate period and longer term are associated with more private sector credit usage but this effect goes away in countries with electoral systems producing consistent left-wing governments. Also of note is the fact that the linear cumulative left term is not distinguishable from zero. There does not appear to be a strong independent relationship between long-run government partisanship (electoral institutions) and credit beyond the conditional relationship with inequality. In other words, the dotted pathway in figure 3 appears to be insignificant once we account for electoral institutions’ effects on redistribution.

To interpret this more substantively we calculate the long run effect on credit of a change in inequality equivalent to the move made in the USA between 1980 and 2000 under both majoritarian and PR systems. For the majoritarian system we set the value of Left government to that of the USA in 2000. For the PR system we set Left government to that of Germany in the same year. We use each country’s respective $\lambda_i$. Figure 8 displays the posterior median and 95% Bayesian credible intervals for these long run effects. In the USA, the long run effect of this increase in inequality in the USA shows up as large predicted increase in credit use in the private sector whereas the same change in Germany implies no consistent effects on credit. While the shock to the income distribution considered here is large and unlikely to occur in a single year, the magnitude of the change does reflect the accumulated change witnessed in the USA. The corresponding predicted long-run effects on credit give a window into the stark differences observed across the OECD.

To give a sense of the scale, the model (combined with priors and data) predicts that this increase in inequality in the USA would increase credit in the USA by 1.17 standard deviations or 55% of GDP. The actual change in private credit in the US economy between 1980 and 2000 was 75% of GDP, or 1.6 standard deviations, well within the 95%BCI for the long run effect.
Figure 8: Posterior predictive density medians and 95% Bayesian credible intervals for the long-run effect of a change in top 1% income share from its 1980 USA value to its 2000 USA value. The majoritarian estimate fixes cumulative Left at its 2000 USA value; the PR/mixed estimate fixes cumulative Left at its 2000 German value.

3.1.4 Model comparisons

For the sake of comparison we also fit several alternative and simpler models. The first alternative model omits the conditioning relationship of left-wing cumulative government on inequality. The second omits the model for the variance term but allows the error variance to differ by country. The third alternative relaxes the assumption that the country-level intercepts are uncorrelated while allowing us to account for possible spatial correlation in credit levels induced by, e.g., extensive cross-border financial linkages and coordinated monetary policies. In this model we put a conditionally autoregressive prior (CAR) on the $\alpha_i$ (Banerjee, Carlin and Gelfand, 2002). A CAR prior is defined as

$$
\alpha_i \mid \alpha_{j \neq i} \sim N(\bar{\alpha}_i, \sigma_{\alpha}^2 / d_i)
$$

(16)

$$
\bar{\alpha}_i = \frac{1}{d_i} \sum_{j \in \delta_i} \alpha_j
$$

(17)
Under this specification the country effects are normally distributed with mean equal to the mean of the random effects of country’s neighborhood. The δ_i defines i’s neighbors; d_i = ||δ_i||. For this application we use two difference connectivity matrices. The first (distance) defines two countries as neighbors if they have minimum distance less 501km (Gleditsch and Ward, 2001); we also define Australia and New Zealand as neighbors. Japan is the only isolate in the dataset. The second connectivity matrix (language) defines neighboring countries to be those that share at least one official language. In table 1 we report the DIC and an R^2 calculated from the posterior median residuals. The base model we focus on performs better than all the alternatives on a DIC basis. Looking at R^2, the base model performs better than the alternatives except the model with a simpler variance expression; the simpler variance model has a much higher posterior variance around the reported R^2, however. There is good evidence that the model with the interaction terms in it are preferable to the one without. We note that our central finding—that the relationship between inequality and credit is mediated by electoral institutions—holds in the simpler variance model and both the CAR models.

Table 1: In-sample model comparison diagnostics for the base model and several alternatives. R^2 is the coefficient of determination calculated from the medians of posterior residuals.

<table>
<thead>
<tr>
<th>Model</th>
<th>DIC</th>
<th>R^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>base model</td>
<td>14198</td>
<td>0.47</td>
</tr>
<tr>
<td>w/o interaction</td>
<td>14208</td>
<td>0.45</td>
</tr>
<tr>
<td>w/o variance terms</td>
<td>14317</td>
<td>0.51</td>
</tr>
<tr>
<td>w/ CAR prior (distance)</td>
<td>14240</td>
<td>0.46</td>
</tr>
<tr>
<td>w/ CAR prior (language)</td>
<td>14325</td>
<td>0.34</td>
</tr>
</tbody>
</table>

23The CAR prior uses a sum-to-zero constraint on the random effect. This necessitates the inclusion of the constant term which is assigned an improper flat prior (Besag and Kooperberg, 1995). The CAR precision, 1/σ^2, is assigned a Gamma(0.5,.0005) prior.
3.1.5 What is it about PR?

We build on the Iversen-Soskice model of electoral institutions in which proportional representation induces post-election coalition formation more favorable to frequent center-Left government and ultimately more redistribution, dampening credit-based consumption. We can use alternative measures for electoral institutions to further examine whether the long-term frequency of Left government is the mechanism at work or whether electoral institutions have other independent effects on credit provision. We re-fit our model, substituting three different indicators of electoral institutions for our cumulative Left government variable. First, we use the simple indicator for majoritarian electoral systems we used in figure 1 which is taken from Golder (2005) and extended through 2010 for the OECD cases under study here. Second, based on Rogowski et al.’ arguments (Chang et al., 2010; Rogowski, Chang and Kayser, 2008; Rogowski and Kayser, 2002) about “seats-votes elasticity,” we use a direct measure of the disproportionality of the electoral system (Gahallager Index) taken from Comparativem Political Data Set I 1960-2010 (2012). Third, a series of well-known formal models of electoral systems and redistribution argue that higher taxes and more distributive spending are the result of attempts to buy off and hold together governing coalitions (Austen-Smith, 2000; Lizzeri and Persico, 2001; Persson and Tabellini, 1999). Lijphart (2012) shows that PR induces a more fragmented party systems inducing more frequent coalition government. To examine this mechanism we refit models using the the effective number of legislative parties (ENLP), taken from Comparative Political Data Set I 1960-2010 (2012). For space considerations we omit full descriptions of all model parameters, instead focusing on the coefficient estimates and 95% BCI for lagged and differenced inequality, the institutional variable and their interactions.  

Based on the DIC all these alternative models present an inferior fit to the data when

24Correlations among the various indicators are presented in the Appendix
Figure 9: Posterior medians with 68% and 95% Bayesian credible intervals for selected regression slope parameters using alternative indicators for electoral institutions. All other covariates are as in the base model above. $N = 558$, number of countries = 18.

compared to our base model using left-wing cabinet dominance. The majoritarian dummy model has coefficients on the “right” side of zero, but there is considerable uncertainty about this relationship, especially for the long-term effect. The Gallagher index model is similarly weak. Looking at ENLP, however, we again find results consistent with what we found in our base model: countries with less-fragmented party systems show a stronger relationship
between inequality and private credit. In this model we do find a direct effect of ENLP on credit beyond the conditional relationship through inequality.

These findings are noteworthy for several reasons. First, they lead us to conclude that PR’s effect on party systems is what matters here. Although this is not a direct demonstration, the finding is consistent with the claim that the partisan differences induced by PR, with the long-term persistence of redistributive policies as a result of left wing government, is the mechanism mediating the relationship between inequality and credit. Second, the majoritarian dummy variable is essentially coterminous with so-called “Liberal Market Economies” (Hall and Soskice [2001]). The lack of evidence linking this dummy variable with credit, especially compared to the partisan finding, further strengthens our conclusion that the differences here relates to the level of fiscal redistribution rather than the constellation of policies and institutions purporting to define LMEs.  

4 Conclusion

Rising income inequality and the Global Financial Crisis 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, greater levels of borrowing appear closely related to changes in income inequality but only in those countries where Left-wing government is less frequent. We claim that this finding reflects systematic difference in electoral institutions: PR systems generate a more fragmented party system that is more conducive to center-Left governing coalitions, which in turn implement more aggressive levels of fiscal redistribution. Redistribution, in turn, dampens the positional consumption incentives produced stagnant real wages at the bottom of the distribution and by rising pre-tax inequality.

The finding that the relationship between top income shares and credit availability is

\footnote{Also, see Ahlquist and Breunig (2012) on the weakness of asserting the existence of an LME cluster.}
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 under conditions of rising inequality. In the rich world, countries that redistribute less would be more prone to instability in the finance sector as households resort to credit-based consumption (Kumhof, Ranciere and Winant 2013). Past experiences with banking crises (which appear to occur at roughly equal rates in PR and SMD countries) may not be a good predictor of the future risk insofar as past experience does not cover periods of such rapidly increasing pre-tax income inequality at the very top. 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 fail to address rising consumption demands or— even worse—pursue the myopic policies of enabling borrowing, 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.

Finally, arguments around positional goods and positional consumption are usually re-
stricted to economies where basic subsistence needs are largely met. Similarly, the dynamic underpinning the Rajan Hypothesis presupposes a well-developed consumer-facing financial system. Both of these restrictions would seem to imply that the developing world may not yet face the problems outlined here, but that may be premature. Rapidly increasing income inequality in China appears to have coincided with a large credit boom and relatively modest attempts at redistribution. Brazil, long one of the most unequal countries in the world, has succeeded in reducing economic polarization—using fiscal transfers in the context of a mixed PR system under the center-Left PT government—while enjoying an unprecedented period of rapid and stable growth.

References


REFERENCES


Eichengreen, Barry and Kris Mitchener. 2003. The Great Depression as a Credit Boom Gone Wrong. Technical Report 137 BIS.


### Appendix

**Correlation between different indicators of electoral institutions**

Table 2: Correlation matrix for 18 OECD countries, 1980-2010. “Left gov’t” is an indicator for whether a country had a Left government in that year as defined in [Comparative Political Data Set I 1960-2010](2012)

<table>
<thead>
<tr>
<th></th>
<th>ENLP</th>
<th>Gahallager</th>
<th>Majoritarian</th>
<th>Cum. Left</th>
<th>Left gov’t</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENLP</td>
<td>1.00</td>
<td>-0.54</td>
<td>-0.60</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Gahallager</td>
<td>-0.54</td>
<td>1.00</td>
<td>0.70</td>
<td>-0.08</td>
<td>-0.06</td>
</tr>
<tr>
<td>Majoritarian</td>
<td>-0.60</td>
<td>0.70</td>
<td>1.00</td>
<td>-0.11</td>
<td>-0.12</td>
</tr>
<tr>
<td>Cum. Left</td>
<td>0.02</td>
<td>-0.08</td>
<td>-0.11</td>
<td>1.00</td>
<td>0.40</td>
</tr>
<tr>
<td>Left gov’t</td>
<td>0.05</td>
<td>-0.06</td>
<td>-0.12</td>
<td>0.40</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Appendix for reviewers

These printed results are presented for reviewer inspection. We will publicly post all data and replication code upon publication.

Alternative model specifications

Top 1% excluding capital gains

Using top 1% income share excluding capital gains does not alter inference in any way (fig. 10). The base model in the main text has slightly lower DIC/higher \( R^2 \).

![Posterior median with 68% & 95% BCI](image)

Figure 10: *Alternate measure of inequality*: posterior medians and 95% Bayesian credible intervals for regression slope parameters using top 1% income share excluding capital gains. \( N = 558 \), number of countries = 18, DIC = 14198.

Including labor compensation in FIRE sector as percent of total labor compensation

It may be argued that greater financialization of the economy will result in more credit in the economy, especially if the financial sector is better able to win policy favors due to its size.
We refit the base model including including the lag and first difference of compensation costs in the Finance, Insurance, and Real Estate (FIRE) sector as percent to total employment compensation (fig 4). Results are qualitatively similar to those reported in the main text with the base model, although the magnitude of the relationship between inequality and credit, conditional on electoral institutions is somewhat smaller. We stick with the base model because including FIRE requires us to drop Switzerland from the analysis and because the size of the financial sector may itself be a function of inequality [Kumhof and Ranciere 2010].

Figure 11: Adding an additional covariate: posterior medians with 68% and 95% Bayesian credible intervals for regression slope parameters from a model \( N = 510 \), number of countries \( = 17 \).

Longer time series

The key variables in the analysis are available back to 1962 for some countries, though many of the covariates only become available much later, usually around 1980. If we fit a simple version of the base model in which lagged GDP (log), GDP growth, lagged population (log) and population growth are the only covariates model beyond top income shares and electoral institutions we get the results displayed in figure [12]. Note that we use the majoritarian
dummy variable here since the cumulative Left government variable is dated from 1960 and is therefore very volatile in the early part of the series (it stabilizes dramatically by 1980). Even using this weaker predictor we find a large and strongly significant long term effect of inequality on credit. The figure omits the parameter estimates for the population and GDP variables for scale reasons.

Figure 12: Simpler model, longer series: posterior medians with 68% and 95% Bayesian credible intervals for regression slope parameters for a simpler model fit to a longer unbalanced time series (1962-2010). There are no missing values imputed here, save interpolated top income shares. Even using a weaker predictor (majoritarian dummy variable) we find that the link between credit and inequality is strongly conditioned by electoral institutions. \( N = 717 \), number of countries = 18, DIC = 1401.

No imputation

We refit the base model without imputing missing values, i.e., using listwise deletion (fig. 13). This causes us to lose 132 country-years of data, or about 24% of our sample. In this case the

\[^{26}\text{which was not a good predictor in the 1980-2010 period (Fig. 9)}\]
results are substantively consistent with what we reported based on the analysis of imputed data.

Figure 13: *No imputation*: posterior medians with 68% and 95% Bayesian credible intervals for regression slope parameters for the base model fit without imputing missing values, save interpolated top income shares. \( N = 426 \), number of countries = 18, DIC = 602.

**BUGS code for base model**

```r
model{
for(i in 1:n.obs){
d.credit[i] ~ dnorm(mu[i], tau.y[i]) #likelihood
mu[i] <- a.unit[country[i]] +
  b.1.credit[country[i]]*lag.credit[i] +
  b.1.top1*lag.ineq[i] + b.d.top1*d.ineq[i] +
  b.cl*cum.left[i] + b.1.top1cl*lag.ineq[i]*cum.left[i] +
  b.d.top1cl*d.ineq[i]*cum.left[i] +
  b.1.unemp*lag.unemp[i] + b.d.unemp*d.unemp[i] +
  b.1.pop*lag.pop[i] + b.d.pop*d.pop[i] +
  b.1.gdp*lag.gdp[i] + b.d.gdp*d.gdp[i] +
}
}
```
\begin{verbatim}

b.l.k*lag.k[i] + b.d.k*d.k[i] +
b.l.cab*lag.cab[i] + b.d.cab*d.cab[i] +
b.l.budg*lag.budg[i] + b.d.budg*d.budg[i] +
b.l.world.save*lag.world.save[i] + b.d.world.save*d.world.save[i] +
b.l.bm*lag.bm.growth[i] + b.d.bm*d.bm.growth[i]

lag.credit[i] ~ dnorm(mu.l.credit, tau.l.credit)  #imputing missing covariates
lag.ineq[i] ~ dnorm(mu.l.top1, tau.l.top1)
d.ineq[i] ~ dnorm(mu.d.top1, tau.d.top1)
lag.budg[i] ~ dnorm(mu.l.budg, tau.l.budg)
d.budg[i] ~ dnorm(mu.d.budg, tau.d.budg)
lag.unemp[i] ~ dnorm(mu.l.unemp, tau.l.unemp)
d.unemp[i] ~ dnorm(mu.d.unemp, tau.d.unemp)
lag.budg[i] ~ dnorm(mu.l.budg, tau.l.budg)
d.budg[i] ~ dnorm(mu.d.budg, tau.d.budg)
lag.unemp[i] ~ dnorm(mu.l.unemp, tau.l.unemp)
d.unemp[i] ~ dnorm(mu.d.unemp, tau.d.unemp)
lag.budg[i] ~ dnorm(mu.l.budg, tau.l.budg)
d.budg[i] ~ dnorm(mu.d.budg, tau.d.budg)

logsigma2.y[i] <- g.unit[country[i]] + g.year[years.d[i]] +
g.euro*eurozone[i]  #model for the variance

tau.y[i] <- 1/exp(logsigma2.y[i])

res[i]<-d.credit[i] - mu[i]  #residuals
y.pred[i] ~ dnorm(mu[i], tau.y[i])  #repredicting y

for(j in 1:(n.countries)){#country effects
g.unit[j] ~ dnorm(0, tau.vc)
a.unit[j] ~ dnorm(mu.c, tau.country)  #country RE
b.l.credit[j] <- -1*temp[j]  #neg Beta prior
temp[j] ~ dbeta(1,1)
}

for(j in 1:n.years){ #year effects
g.year[j] ~ dnorm(0, tau.vy)
}

# priors
mu.c ~ dnorm(0,0.00001)  #country RE

##imputation means
mu.l.credit ~ dnorm(0,0.00001)
mu.l.top1 ~ dnorm(0,0.00001)
mu.d.top1 ~ dnorm(0,0.00001)
mu.l.budg ~ dnorm(0,0.00001)
mu.d.budg ~ dnorm(0,0.00001)
mu.l.unemp ~ dnorm(0,0.00001)
mu.d.unemp ~ dnorm(0,0.00001)
mu.l.bm.growth ~ dnorm(0,0.00001)
mu.d.bm.growth ~ dnorm(0,0.00001)

# regression parameters
b.l.top1 ~ dnorm(0,0.00001)
\end{verbatim}
b.d.top1 ~ dnorm(0, 0.0001)
b.cl ~ dnorm(0, 0.0001)
b.l.top1cl ~ dnorm(0, 0.0001)
b.d.top1cl ~ dnorm(0, 0.0001)
b.l.unemp ~ dnorm(0, 0.0001)
b.d.unemp ~ dnorm(0, 0.0001)
b.l.pop ~ dnorm(0, 0.0001)
b.d.pop ~ dnorm(0, 0.0001)
b.l.gdp ~ dnorm(0, 0.0001)
b.d.gdp ~ dnorm(0, 0.0001)
b.l.k ~ dnorm(0, 0.0001)
b.d.k ~ dnorm(0, 0.0001)
b.l.cab ~ dnorm(0, 0.0001)
b.d.cab ~ dnorm(0, 0.0001)
b.l.budg ~ dnorm(0, 0.0001)
b.d.budg ~ dnorm(0, 0.0001)
b.l.world.save ~ dnorm(0, 0.0001)
b.d.world.save ~ dnorm(0, 0.0001)
b.l.bm ~ dnorm(0, 0.0001)
b.d.bm ~ dnorm(0, 0.0001)
g.euro ~ dnorm(0, 0.0001)

## variances/precisions
sigma.country ~ dunif(0, 50)
tau.country <- pow(sigma.country, -2)
sigma.vc ~ dunif(0, 10) # variance for country RE in variance term
sigma.vy ~ dunif(0, 10) # variance for year RE in variance term
sigma.l.credit ~ dunif(0, 50)
tau.l.credit <- pow(sigma.l.credit, -2)
sigma.d.top1 ~ dunif(0, 50)
sigma.l.top1 ~ dunif(0, 50)
sigma.d.top1 ~ dunif(0, 50)
sigma.l.unemp ~ dunif(0, 50)
sigma.d.unemp ~ dunif(0, 50)
sigma.l.bm.growth ~ dunif(0, 50)
sigma.d.bm.growth ~ dunif(0, 50)
tau.vc <- pow(sigma.vc, -2)
tau.vy <- pow(sigma.vy, -2)
tau.l.top1 <- pow(sigma.l.top1, -2)
tau.d.top1 <- pow(sigma.d.top1, -2)
tau.l.budg <- pow(sigma.l.budg, -2)
tau.d.budg <- pow(sigma.d.budg, -2)
tau.l.unemp <- pow(sigma.l.unemp, -2)
tau.d.unemp <- pow(sigma.d.unemp, -2)
tau.l.bm.growth <- pow(sigma.l.bm.growth, -2)
tau.d bm.growth<- pow(sigma.d bm.growth,-2)
}