Inequality & Unemployment, Redistribution & Social Insurance, and Participation: A Theoretical Model and an Empirical System of Endogenous Equations*

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I. Theoretical Models of Democratic Policy with Income, Employment, and Participation Inequality

Conflicts of interest over the generosity and structure of redistribution and social insurance (call these jointly: *social policy*) include that between the relatively poor and wealthy—which theoretically produces the familiar median-voter result that democratic demand for broad redistribution increases in the income skew—and that between the safely employed and the unemployed or precariously employed—which yields a different theoretical result, namely that inequality reduces median-voter demand for social insurance. In each case, the generosity and structure of social policy may itself affect simultaneously the efficiency of the labor market and the political participation of society's less fortunate, which latter affects the identity and so the income and job-security status of the median voter. These considerations imply endogenous relations between economic performance (employment/income level and distribution), social policy (redistribution and social insurance), and political participation. This chapter elaborates the theoretically expected nature of these endogenous relationships, suggests identification conditions that derive from the theory and substance, and offers empirical estimates of the resulting system of equations.

We begin with a reconsideration of the Moene-Wallerstein (2001) (M&W) model of unemployment, inequality, and the democratic demand for redistribution and social insurance, which offers a very useful formulation for considering jointly the redistributive and insurance motivations for social policy and the effects of inequality thereupon. First, we illustrate and discuss the implications of the M&W model for the expected relationships between inequality, unemployment, redistribution, and social insurance. Then, we extend the model discussion to consider *median-preserving* increases in income inequality,[1] continuous heterogeneity in income and unemployment risk, and correlation of the latter with former. Penultimately, we consider the effects of incomplete and heterogeneous political participation (voter abstention, weightier

[1] In earlier versions of this work, we first showed how the classical Meltzer-Richards model obtains as a special case of the M&W model with full employment (and also therefore no targeting decision to make) and then that, with unemployment but no targeting of benefits, some insurance motivation for the universal benefits arises but the equilibrium remains very similar to Meltzer-Richards. Thus, the combination of unemployment and the ability to target benefits thereto is necessary to the M&W results.

political input from some than others) that also correlates with economic status. Finally, we acknowledge and grapple with the joint endogeneity of the five outcomes of this expanded theoretical model: inequality (skew) and unemployment (risk), redistributive and social-insurance policies, and political participation.

A. The M&W Model of Redistribution & Social Insurance with Exogenous Unemployment & Inequality

The M&W model[2] includes population shares σ_0 of permanently unemployed, σ_H of high-income (w_H) earners who face no appreciable employment risk,[3] and σ_L of low-income (w_L) workers who face some risk, α, of losing their income (job). Job-losers have probability β of regaining employment, giving respective steady-state employed and unemployed population-shares of $e = \sigma_H + \frac{\beta}{\alpha+\beta}\sigma_L$ and $u \equiv 1-e = \sigma_0 + \frac{\alpha}{\alpha+\beta}\sigma_L$.[4] Governments levy a proportionate income-tax at rate *t*, which generates revenues and expenditures (i.e., all revenues are spent and no borrowing) of **[1]** $T = \tau(t)e\overline{w}$, where $\overline{w} \equiv \frac{1}{e}\left[\sigma_H w_H + \frac{\beta}{\alpha+\beta}\sigma_L w_L\right]$ are average wages and $\tau(t)$ is revenue as a share of earnings. $\tau(t)$ incorporates deadweight losses in that it is strictly concave (i.e., deadweight losses mount increasingly with tax rates) and with $\tau'(0) = 0$ and $\tau(0) = \tau(1) = 0$ (i.e., no deadweight cost if no tax, and no revenue if tax rates are 0 or 1). Finally, a share, γ, of revenues (*cum* expenditures), *T*, goes to current earners, with the remaining *(1- γ)T* going to the unemployed.

Individuals currently with and without jobs will thus have respective net incomes (*cum* consumption) of **[2]** $c_E = (1-t)w_i + \frac{\gamma T(t)}{e}$ and **[3]** $c_N = \frac{(1-\gamma)T(t)}{1-e}$. M&W (p. 862) assume utilities, *u(c)*, concave in consumption ($u'(c) > 0, u''(c) < 0$), which implies some risk aversion, and satisfying other conditions such that insurance is a normal good (namely: coefficient of relative risk aversion exceeds one: $\frac{-cu''(c)}{u'(c)} > 1$) and is demanded if risk is non-negligible ($u'(c) \to \infty \; as \; c \to 0$).[5] Given all this,[6] the lifetime utility of a currently employed low-

[2] All notation *and equation numbering* given here exactly follows M&W to facilitate comparison.
[3] As the authors note (and as illustrated below), high-income earners can face unemployment risk without qualitative (but with quantitative) change to the conclusions, provided unemployment risk remains weakly negatively correlated with income.
[4] The job-loss and job-finding rates imply a system of differential equations, which M&W solve for these steady-state equilibria and from which they derive their comparative statics. We will discuss only the steady states and so will skip explicit derivation, expressing the model instead in simpler, static terms (without further loss of content or generality).
[5] Empirical estimates generally suggest coefficients of relative risk-aversion of $\mu \geq 1$. Log utility, which has constant relative risk-aversion $\mu=1$, would not satisfy this, but other functions in the class of constant relative risk-aversion could.
[6] …and assuming infinitely-lived actors, but relaxation of this assumption adds only notational (and actuarial) complexity,

income worker—the group which is, very importantly and highly plausibly, assumed also to be the median (i.e., to contain the median voter)—is a weighted average of that type's employed and unemployed utility:

$$v = \left(\frac{\beta + r}{\alpha + \beta + r}\right)[u(c_E(w_L))] + \left(\frac{\alpha}{\alpha + \beta + r}\right)[u(c_N)] \quad \textbf{[6]}.$$

Intuitively, the weights reflect the shares of life spent employed and unemployed, with the former weighted and the latter discounted by the time discount-rate, *r*, since employment is the current state. Inserting **[2]** and **[3]** into **[6]**, and then **[1]** into that, yielding **[6']**, will facilitate discussion of the model:

$$v = \left(\frac{\beta + r}{\alpha + \beta + r}\right)\left[u\left\{(1-t)w_L + \frac{\gamma[\tau(t)e\overline{w}]}{e}\right\}\right] + \left(\frac{\alpha}{\alpha + \beta + r}\right)\left[u\left(\frac{(1-\gamma)[\tau(t)e\overline{w}]}{1-e}\right)\right] \quad \textbf{[6']}$$

M&W designed this model to analyze the democratic choice of both the generosity or size of the system, captured in *t*, and the degree of unemployment-targeting of its benefits, given by *(1-γ)*, the share of spending on those without jobs. Consider the utility effects for the median voter, a currently employed worker of type *L*, of increasing *t*. Starting with the first term in the first square brackets of **[6']**, this tax-increase costs the worker some take-home pay, as reflected in the $-tw_L$ term, but returns to her some public transfers insofar as (*i*) public spending accrues to the employed, *γ*; (*ii*) taxable income is not lost to the deadweight inefficiencies of taxation incorporated in $\tau(t)$, and (*iii*) the source of revenue, average wages, $\overline{w}$, is high, all combined as given in the $+\gamma\tau(t)\overline{w}$ term. This is the usual motivation for and tradeoff in redistribution; the more skewed is the income distribution, i.e., the higher is $\overline{w}$ relative to w_L, the more redistribution the median voter (an employed type *L*) would like by this redistributive motivation.[7] However, as reflected in the $\frac{\beta+r}{\alpha+\beta+r}$ term, these considerations matter in this model only in proportion to the share of time the worker expects to stay employed ($\frac{\beta}{\alpha+\beta}$) as augmented by her discounting the future ($\frac{\beta+r}{\alpha+\beta+r}$). To the remaining proportion, $\frac{\alpha}{\alpha+\beta+r}$, being unemployed, she will derive utility from the second half of **[6']**. The increased taxes bring higher

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requiring replacement of *r* with $\frac{r}{1-\exp^{-rH}}$, with *H* the actor's life expectancy, in the asset equation that produces **[6]** below. This would add little relevant substantive content, although it could possibly introduce a social *life*-insurance motivation.

[7] A few other implications surrounding the first, second, and cross (with $\overline{w}$) derivatives of *τ(t)* emerge as well (see Franzese 2002, ch. 2). For example, the greater the deadweight losses (the more concave is *τ(t)*), the less redistribution the median voter seeks by this redistributive motivation (or, indeed, by the insurance motivation also).

utility in those future times when she lacks a job, which she expects to be $\frac{\alpha}{\alpha+\beta}$ of the time and discounts by *r*. In these times, to the degree public transfers go to the unemployed, *1-γ*, she will receive her equal share of total revenues, $\tau(t)e\overline{w}$, as divided among the unemployed, $\frac{1}{1-e}$, yielding the $\frac{(1-\gamma)\tau(t)e\overline{w}}{1-e}$ in the second square-bracket term. This provides the insurance motivation and demand for unemployment-targeted redistribution.

For our purposes, the most important results from the M&W model are these:[8]

- With exogenous targeting (γ fixed), a mean-preserving increase in income skew (i.e., a reduction in w_L holding $\overline{w}$ fixed) increases the median voter's preferred social-policy generosity (t^*) if benefits go exclusively to the employed ($\gamma=1$) and reduces her preferred safety net if benefits go exclusively to the unemployed ($\gamma=0$). Thus, inequality increases (broad) redistribution whereas it decreases (targeted) social insurance.
- With endogenous targeting (both γ and t^* chosen democratically), a mean-preserving increase in income skew increases the median voters' preferred targeting of benefits to the employed (γ) and generally increases her preferred *sum* of insurance and redistributive spending, total social-spending, t^*. Unconstrained desired-redistribution remains increasing, and desired-insurance remains decreasing, in inequality. With desired-insurance rising and the desired-total declining with equality, however, at some point all spending is targeted to the unemployed ($\gamma=0$). At this point, denoted $w_L=w_0$, funding of the desired insurance becomes constraining. The results are:
    - A monotonic-positive relationship of equality to insurance spending, although with a kink at w_0 and a flatter positive relationship as wages-*cum*-equality rise beyond w_0;
    - A weakly monotonic-negative relationship of equality to redistribution spending, being strictly negative through w_0 but flat at greater equality.
    - A non-monotonic relationship of equality to total social-policy spending (insurance + redistribution), with the sum declining as equality increases to w_0, kinking there, and then rising as wages-*cum*-equality increase further.

For the case of $w_L<w_0$, the constraint is not binding, so $\gamma_i^*<1$ and these implications of the full model[9] are

[8] M&W consider three classes: permanently-unemployed, low-wage at-risk (*L*), and high-wage permanently-employed (*H*) workers. *L* is the median. Thus, we follow them in replacing subscript *i* with *L* in this section.

[9] Median-voter equilibria do not generally obtain in more than one dimension: here, *t* and *γ*. M&W show that if the policy choices are sequential (Shepsle's SIE) or if the party system prevents coalitions of rich and poor *v.* middle, then the middle is median in both dimensions and remains determinant. However, the single-crossing property would seem to hold, voter heterogeneity having just one dimension that identically orders voter-preferences on both policies, so direct median-voter equilibria should also exist.

seen in the following first order conditions with respect to t and to γ, respectively:[10]

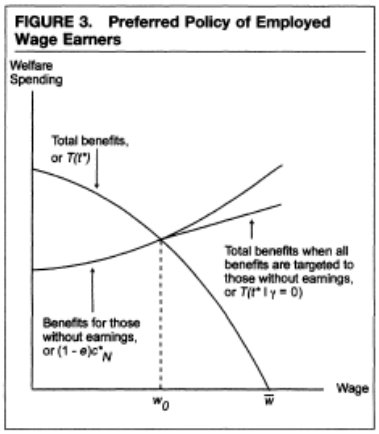
$$\tau'\left(t_L^*\right) = \frac{w_L}{\overline{w}} \quad \textbf{[14]}$$

$$\frac{u'\left(c_E^*\right)}{u'\left(c_N^*\right)} = \left(\frac{e}{1-e}\right)\left(\frac{\alpha}{\beta + r}\right) \quad \textbf{[15]}$$

The first of these simply replicates the standard Romer/Meltzer-Richard median-voter equilibrium that total social-spending increases in the income skew. The second is more complicated but implies, *inter alia*, that insurance spending and its share of the total increase in w_L over this range. With $w_L > w_0$, the constraint $\gamma \leq 1$ binds, all spending is insurance, and the second and now solely determinant first-order condition becomes:

$$\frac{u'\left(c_E^*\right)}{u'\left(c_N^*\right)} = \left(\frac{e}{1-e}\right)\left(\frac{\alpha}{\beta + r}\right)\left(\frac{\tau'(t)\,\overline{w}}{w_L}\right) \quad \textbf{[18]},$$

which establishes a similarly positive, but flatter (the new term is less than 1), relation of w_L to insurance-*cum*-total spending. M&W Figure 3 (reprinted with permission) illustrates these conclusions graphically:



The figure reads as follows. All considerations are of *mean-preserving* movements in inequality, which M&W consider as movements of w_L relative to *fixed* $\overline{w}$. As w_L increases (skew decreases), the desired, unconstrained level of benefits to the unemployed strictly increase (the smoothly upward-sloping curve) and that of total social-spending strictly declines (the downward-sloping curve). Accordingly, the unconstrained, desired share of spending targeted to the unemployed/employed also strictly increases/decreases (the ratio of the preceding two curves). However, beyond some wage-*cum*-equality level, w_0, unconstrained desired

[10] *We have rewritten these two first-order conditions slightly to isolate further the implicit optimum choices on t and γ.*

insurance exceeds unconstrained desired total social-spending, so the constraint binds. Beyond this point, all spending targets the unemployed, and this insurance-*cum*-total spending remains upward sloping in wages-*cum*-equality but with a desire to restrain total taxes dampening that slope. Thus, in equilibrium, (*i*) welfare-targeted (insurance) spending strictly rises with w_L (equality), although with a kink at w_0 and more slowly thereafter; (*ii*) total social-spending (insurance+redistribution) declines with w_L (equality), kinks at w_0, and rises (more slowly) thereafter; and (*iii*) the share of total spending targeted to the unemployed rises weakly monotonically with w_L (equality), reaching unity at w_0 and staying at 100% thereafter.

B. Median-Preserving Increases in Income Skew in the Moene-Wallerstein Model

M&W discuss only *mean-preserving* increases in income skew, which they equate with falling median incomes and, implicitly, upper-class incomes rising (to fix the mean). *Median-preserving* skew-increases, conversely, would have mean income rising with the median fixed, implying that upper-class incomes rise.[11] The implications of such "yachts outpacing tugboats and rowboats", which is by far the more-common case, empirically,[12] can be seen using Figure 3 and the equilibrium conditions **[14]**, **[15]**, or **[18]**. In using Figure 3, note that increases in $\overline{w}$ with w_i fixed will be shifts in the curves and not moves along them. The $T(t^*)$ curve shifts outward as the base for the median to tax while her own income stays fixed. Accordingly, she wants greater social spending at whatever w_i she has stagnated. The larger tax-base also enables the median to raise unemployment benefits, i.e., to boost her social-insurance consumption, and, insurance being a normal good, she will. Thus, both curves shift outward; i.e., median-preserving skew-increases raise insurance and total spending. To see how redistribution and the targeting ratio are affected, consider **[14]** and **[15]**. In **[14]**, as $\frac{w_i}{\overline{w}}$ falls (skew rises), τ' must fall, so t and thus total spending must rise, as just noted. In **[15]**, the right-hand side is unaffected by an increase in $\overline{w}$, so the left-hand-side ratio of marginal utilities under (un)employment must not change either. However, with w_i fixed and tax rates and base higher, c_E^* rises and so the numerator marginal-utility falls. The denominator marginal-utility must therefore decline proportionately and so c_N^*

[11] Technically, lower-class income-growth can also fix or move the mean, or contribute to doing so, or move contrarily and so require greater upper-class income-growth (all subject to remaining below median, of course).
[12] We heard and so attribute the catchy phrase from/to Tim Smeeding, whose work is among that establishing it as more common.

must rise too (i.e., insurance spending rises, as we just saw). Furthermore, since $c_N^* < c_E^*$ and utility is concave, denominator marginal-utilities exceed and decline faster than those in the numerator, so holding the ratio fixed requires a smaller increase in c_N^* than in c_E^*. Then, recall that $c_E^* = (1-t)w_i + \gamma\tau\overline{w}$ and $c_N^* = (1-\gamma)\frac{e}{1-e}\tau\overline{w}$. The $\tau\overline{w}$ term rises the same amount in each expression, of course, and the $(1-t)w_i$ term in c_E^* declines because *t* rises and w_i is fixed. Since $\frac{e}{1-e} > 1$ and is unchanged and yet c_E^* must increase more than does c_N^*, we conclude that the share of spending on the employed, γ, and so its level, must increase. Finally, with both curves shifting upward but the total-spending curve more so, the kink point, w_0, beyond which wage (equality) level all spending is insurance-targeted, must also shift outward (to a higher wage).

Thus, in the equilibrium with $\gamma^* < 1$, median-preserving skew-increases, i.e., "yachts outpacing tugboats and rowboats", raise total social-policy spending, insurance (unemployed-targeted) spending, redistribution (employed-targeted) spending, and the share of redistribution in the total; and this unconstrained equilibrium applies through greater equality-levels. In the constrained case of $\gamma^* = 1$, "top-pulled" and "bottom-dragged" increases in skew have similar effects,[13] but the constraint binds in a narrower range (of lower skew: w_i nearer $\overline{w}$) for top-pulled increases. These notable differences between the effects of top-pulled and bottom-dragged increases in skew, given the empirical prevalence of the former, imply that empirical results should differ accordingly depending on whether the average income-level is controlled. With/without such control, we would expect to find effects of mean-/median-preserving increases in skew, respectively.

C. Continuous and Correlated Income Distributions and Unemployment Risks

For our purposes, replacing M&W's three discrete classes with continuous voter heterogeneity adds little beyond enhancing intrinsic realism and changing subscripts from the decisive median-*group*, *L*, to decisive median-*voter*, *i*.[14] Rather, the move serves more to facilitate exploring correlation of unemployment-risk to

[13] I.e., in both cases, all spending is insurance and it rises with skew-increases at a lesser rate than in the unconstrained case.
[14] The three-class model facilitated M&W's proof that their party-coalitional equilibrium was the median-voter equilibria. They also showed equivalence of a structure-induced equilibrium, and we noted that the single-crossing property holds and so direct median-voter equilibria would obtain too (see note 9). We allow an additional dimension of heterogeneity here, unemployment risk, but we assume it to correlate perfectly with income, and it/they still order both policy preferences, so all three options remain.

income, which proceeds by indexing α_i and β_i and assuming their ratio negatively related to w_i. To simplify, we ignore time discounting, which added little of interest, so the hire-fire ratios simultaneously determine the (un)employment rate, the share of life each worker spends (un)employed, and the relative weight in her inter-temporal utility on consumption while (un)employed as $\frac{\beta_i}{\alpha_i+\beta_i}$ (and $\frac{\alpha_i}{\alpha_i+\beta_i}$). With these ratios positively (negatively) related to income, mean-preserving increases in wage skew, i.e., decreases in median-voter income, now also entail increases in unemployment and in the median's unemployment-risk. The main implication is a flattening of the upward-sloping curve relating w_i to insurance spending in Figure 3 because the income-effect, which alone had operated and which had induced the median's desired insurance to decline as she grew poorer, is now offset by a substitution effect as her unemployment-risk rises in tandem. Assuming $\frac{\beta_i}{\alpha_i+\beta_i} > \frac{\alpha_i}{\alpha_i+\beta_i}$ so that the median is employed the majority of her life, this flattening does not switch sign of the slope nor does it alter that this curve will cross the (essentially unchanged) downward-sloping total-spending curve at some $w_0 < \overline{w}$ and continue upward, flatter still, thereafter. Thus, the equilibria as previously described remain qualitatively accurate, but the flattening of the curve likely also implies that w_0 shifts rightward, expanding the range of income skews over which the simpler unconstrained results hold.

D. Incomplete Political Participation, Correlated with Incomes and Unemployment Risks

Next, consider that not everyone votes or, more generally, participates equally and equally effectively politically. Obviously, the relevant population with regard to democratic policy-choice is the *voting* (more generally: the *politically active*) public, and, in these models (see notes 9, 14), the median *voter* (or *effective-participant*) decides. Moreover, as is well established empirically (e.g., Verba et al. 1978, Wolfinger & Rosenstone 1980, Conway 1985, Harrop & Miller 1987), the relatively wealthy have higher propensity to vote than the relatively poor. Under rather general conditions (see Franzese 2002, ch. 2), these empirical regularities combine to imply that the median *voter* will be poorer (and closer to the median person) as voter participation increases.[15] Referring back to Figure 3, as participation declines, one should read median-*voter* preferred insurance and total spending from a wage higher than the population median; i.e., the "skew" from

[15] Indeed, Nagel (1987:117-9) shows that US voters, at least, are generally wealthier than non-voters.

median-voter to mean-person income is less than that from median- to mean-person. As participation rises, these ratios converge. Thus, both curves in Figure 3 flatten as participation decreases. With unemployment risk also declining with income, the insurance-spending curve will also shift downward as participation declines.[16] As with income-correlated unemployment-risk, declining participation also seems likely to shift w_0, and the associated kinks in the relationships of skew to redistribution/insurance spending, outward.

We considered only voting, but other modes of participation—lobbying, campaign contributions, direct contact of representatives, etc.—also convey influence. Indeed, considering the minuscule probabilities that individual votes will alter election outcomes, these other modes are likely more influential than mere voting. Considering variation in effective political-participation, however, only strengthens the empirical relevance of this discussion, for two reasons. First, as voting declines, the relative prevalence and influence of other participatory modes seems likely to increase. Second, socio-economic status correlates even more strongly with extra-electoral participation—most obviously, sizably, and notoriously: contributions—than voting: "[C]lass differences in mobilization typically aggravate rather than mitigate the effects of class differences in political resources," Rosenstone & Hansen (1993:241; see also Verba et al. 1978, 1995). Therefore, not only does electoral representation of the poor and high-unemployment-risk decline as turnout falls, but the influence of extra-electoral participation rises and these disadvantaged groups are still less-well represented there. Thus, voter turnout may adequately summarize effective political-participation for present purposes.

In sum, in the (democratic) polity, the relevant population for policymaking influence is the effectively *politically* active; in the economy, and specifically regarding average income for the median voter to tax to fund social policy, the relevant population is instead the *economically* active, i.e., employed; and regarding policy outlays, e.g., social spending, the relevant population is the *entire society* of potential beneficiaries (divided into employed and unemployed camps by targeted policy-tools if available). Society, economy, and polity together determine social-policy outcomes, and this hints at the final and thorniest consideration.

E. Endogeneity of Economy, Policy, and Politics

[16] Intuitively, in the limit, with no voters or effective political participants, i.e., in pure autocracy, both curves are flat (at zero) and policy is completely insensitive to societal interests.

Finally, we come at last to the previously ignored gorilla in the room: endogeneity. The distributional and employment outcomes that are the key explanators in these political-economic models of social policy, $skew \equiv \frac{w_i}{\bar{w}}$ and $u \equiv \frac{\alpha}{\alpha+\beta}$, are themselves affected by the redistribution and social-insurance policies aimed at ameliorating them. Regarding incomes and income-skew measured post-tax-and-transfer, obviously these social policies affect them as well as the other way around; such effects are the policies' *raisons d'etre*. Even with pre-tax-and-transfer measures, and even regarding (un)employment outcomes and risks, these social policies have important disincentive and distortionary effects. Indeed, these effects are the subject of much of welfare economics. Likewise, political participation should condition these relationships of economic outcomes to policies, yet it, too, is endogenous to the economic conditions whose effects on social policies we argue it moderates. Empirical exploration of the theoretical propositions above, therefore, must somehow confront the endogeneity of economy, policy, and politics. With five endogenous outcomes across these three spheres in the present case, we follow a simultaneous system-of-equations approach here.

II. Empirical Model: A System of Equations for Inequality & Unemployment, Redistribution & Social Insurance, and Political Participation

A. Identifying the System of Equations

The theoretically suggested system of equations involves two economic conditions, *U*=unemployment and *S*=skew; two social policies, *I*=social insurance and *R*=redistribution; and *P*=political participation. In general, to identify a system of *M* simultaneous equations—here, *M*=5:

$$\begin{gathered} S = s(U,R,I,P,\bullet,\varepsilon_s); \quad U = u(S,R,I,P,\bullet,\varepsilon_U); \\ R = r(S,U,I,P,\bullet,\varepsilon_R); \quad I = i(S,U,R,P,\bullet,\varepsilon_I); \quad P = p(S,U,R,I,\bullet,\varepsilon_P) \end{gathered} \qquad \textbf{[19]}$$

—we must "tie down" *M(M-1)* terms—here: 5*x*4=20—by sufficient restrictions on the equations given by some *extra-empirical* information (Greene 2003:378-95). We follow the most-common strategy of providing such identifying information, that of imposing exclusions, i.e., that some variables from among these five endogenous ones and/or the other regressors (represented by • in **[19]**) are excludable from some equations.[17]

[17] Other sources of information include any identities known to hold (and so unnecessary to estimate) in or across equations, other restrictions (besides exclusions) on the coefficients in or across equations (e.g., that some are equal or proportionate), knowledge of differing functional forms for the equations, restrictions upon the variance-covariance of residuals across equations, etc. This

Each excluded right-hand-side variable reduces the number of parameters to estimate by one per variable per equation. In words, exclusion assumptions/arguments are statement like: "Variable *z* affects one or some of the endogenous variables but does not affect others except in so far as it affects (causes) the first one or set." If, for example, we could find five variables, one per equation, that *enter*, in this sense, only their one equation, then each would give four restrictions (namely, that the coefficient on each variable in the other four equations is zero), yielding the minimum 5*x*4=20 needed, *just-identifying* the system. Finding more than the minimum additional outside information, i.e., *over-identifying* the system, adds efficiency ("ties down the system more firmly") and opens the possibility of testing over-identifying restrictions.[18]

B. Identification by Exclusions among the Endogenous Variables

We begin by considering which endogenous variables, *S*, *U*, *R*, *I*, and *P*, enter which others' equations, starting with the economic outcomes, *S*kew and *U*nemployment. First, **[14]** would indicate that *S*kew and not *U*nemployment enters the *R*edistribution equation, and our elaborations modified this conclusion only by extending the empirically applicable range of **[14]**. We argue that *U*nemployment does not enter our *S*kew equation either, at least not strongly directly. The unemployed have zero wages, so *U* directly affects mean wages, *S*kew's theoretical denominator. This effect is likely small though: 10% unemployment, e.g., lowers mean wages by just 0.1 times the (likely low) wages when working of the jobless. Furthermore, because percentiles like the median (50^{th}) are not directly affected by extremes above and below them, and because the jobless come mostly from the lower end of the wage/income distribution, we can evade much of even this small direct simultaneity by using percentile ratios instead of median-to-mean ratios to measure *S*kew, especially if we use higher percentiles. That is, 90-50 ratios provide stronger basis for some of the exclusion restrictions we intend to impose than the 90-10 ratios more commonly used. Since either equally effectively

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list is not exhaustive, exclusive, or disjoint. Bayesian priors on parameters, e.g., can also add information useful for identification.

[18] The validity of any empirical strategy of identifying an endogenous system, and so the credibility and creditability of estimation results, ultimately rest on the strength of the theoretical/substantive arguments that produced the identifying restrictions. Therefore, identification, i.e., just-identifying assumptions, i.e., endogeneity vs. exogeneity, cannot be directly tested empirically. Over-identifying restrictions, however, can be; i.e., *given some assumptions that suffice to identify a system,* we can test whether additional restrictions, which would enhance efficiency if also true but would render estimates inconsistent if false, seem to do the one or the other, empirically. Such *tests of over-identifying restrictions*, furthermore, are only asymptotic and are usually weak in small samples, i.e., in practice. The phrasing "test for endo/exo-geneity" should be avoided, being almost oxymoronic.

summarizes the distribution, we use 90-50.[19] *U*nemployment also adds labor-supply competitors and so will affect wages at all percentiles, but this too should mostly affect lower percentiles that compete more directly with the jobless, giving further argument for the higher-percentile 90-50 ratio. *U* does enter the remaining equations though: *P*articipation because the unemployed tend to drop not only from the economically but also from politically active, and social *I*nsurance, obviously, the unemployed being its target. As obviously and centrally analytically, *S*kew enters both the *R*edistribution and *I*nsurance equations, as seen in **[14]** and **[15]**, and the *P*articipation equation too, as sections *I.D* and *I.E* discuss. Finally, we argue that the income-distribution, and so *S*kew, would not affect *U*nemployment except through its effects on policies.

Turning to the policy variables, *R*edistribution clearly enters the *S*kew equation, especially insofar as our *S* measure reflects the post- tax-and-transfer income-distribution, such impact being the policies' intent (and effect: Atkinson et al. 1995, Danziger & Gottschalk 1995, Gottschalk & Smeeding 1997, Smeeding et al. 1990). *R*edistribution indirectly affects even pre-tax-and-transfer *S*kew though, and also *U*nemployment, as it alters labor-market functioning, e.g., by raising reservation wages. The same argument places *I*nsurance in the *U*nemployment equation, but it would not enter our 90-50 *S*kew as social-insurance directly aids only the jobless, lowest (wage-zero) end of the distribution. As for the policy equations, *R*edistribution and *I*nsurance correlate in **[14]** and **[15]** only because they both relate to *S*kew,[20] yet they should enter each other's equation anyway due to policy-substitute or -complement effects. Lastly, one might argue that *R*edistribution and *I*nsurance should affect *P*articipation only as they affect recipients' socio-economic status (SES), i.e., here, only *via U* and *S*, but Hobolt & Klemmensen (2006) argue and find instead that social-spending recipients—perhaps responding to a sense that policy regards, and so politics involves, them—do have higher propensity to vote even controlling for their post-tax-and-transfer SES. (Their supportive evidence does not address the endogeneity issues raised here, however.) The expected positive feedback in equality, unemployment,

[19] Indeed, the median-to-mean ratios of the theory, which are less widely available empirically, will relate more tightly to 90-50 than 50-10 or 90-10 ratios since the 90th-percentile numerator more heavily influences the mean than the does the 50th and since the denominator is the desired measure exactly.

[20] *R* and *I* relate directly only past some critical equality-level, w_0, at which *I* exhausts revenue, binding *R* to zero. No developed democracy has ever produced such a policy mix, and not remotely in our sample, so we might safely ignore this complication, experience having proven that the degree of equality that produces it, even as refracted by unequal participation, has never arisen.

redistribution, social insurance, and participation raises the possibility of multiple political-economic equilibria, with two basins of attraction—one of high and one of low political participation, social-insurance and redistributive spending, unemployment and equality—consonant with Alesina and Angeletos' (2005ab) social-policy multiple-equilibria, but of political-participation rather than of societal-preference provenance.

Political *P*articipation, finally, only directly affects the policy variables, *R* and *W*; an effect on economic outcomes that did not work through policy is hard to imagine. The remaining system is thus the following:

$$\begin{gathered} S = s\left(R, \bullet, \varepsilon_S\right); \quad U = u\left(I, R, \bullet, \varepsilon_U\right); \quad R = r\left(S, I, P, \bullet, \varepsilon_R\right) \\ I = w\left(U, S, R, P, \bullet, \varepsilon_I\right); \quad P = p\left(U, S, R, I, \bullet, \varepsilon_P\right) \end{gathered} \qquad \textbf{[19a]}$$

C. Identification by Exclusions among the Exogenous Variables

By **[19a]**, we have reduced the 20 coefficients to identify by 6 exclusions to 14. We introduce next some potentially exogenous regressors and discuss their in- or exclusions, before proceeding to specify how the regressors enter the estimation equations and then to consider estimation methods. These other regressors are variables related to demographics: **D** (e.g., the age distribution); socio-economic institutional and interest structure: **SIS** (e.g., trade exposure and structure); domestic political institutions: **DPI** (e.g., governmental and electoral systems); and current political contexts: **CPC** (e.g., government partisanship and electoral competitiveness. Additionally, we might find further identification leverage in the international (i.e., spatial) interdependence of the economic- and policy-outcome dependent variables, i.e., in economic conditions and policies abroad, which we will write $U_{\sim i}$, $S_{\sim i}$, $R_{\sim i}$, and $I_{\sim i}$,. This further elaborates the system of equations to:

$$\begin{gathered} S = s\left(R, S_{\sim i}, \mathbf{D}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_S\right); \; U = u\left(I, R, U_{\sim i}, \mathbf{D}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_U\right) \\ R = r\left(S, I, P, R_{\sim i}, \mathbf{D}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_R\right); \; I = i\left(U, S, R, P, I_{\sim i}, \mathbf{D}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_I\right) \\ P = p\left(U, S, R, I, \mathbf{D}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_P\right) \end{gathered} \qquad \textbf{[19b]}.$$

1. Spatial Interdependence

Insofar as economic conditions diffuse across borders by trade and investment flows, and international competition more broadly, economic conditions abroad, $S_{\sim i}$ and $U_{\sim i}$, can enter as regressors for the *S*kew and *U*nemployment equations that would enter other equations only through these domestic economic outcomes. Analogously, the economic policies of a nation's competitors and partners affect the costs and benefits of its domestic policies (see, e.g., Hallerberg & Basinger 2004; Franzese & Hays 2006b, 2007b), so $R_{\sim i}$ and $I_{\sim i}$

may enter the *R*edistribution and *I*nsurance equations. (Cross-national dependence of mass participation seems rather unlikely, though; see, e.g., Kayser 2007.) As Franzese & Hays (2004, 2006a, 2007ab) explain and explore, such spatial-lag regressors entail their own endogeneity issues: if, e.g., France affects Germany and Germany affects France, then the spatial lag, a weighted average of the dependent variable in the other (~*i*) units is endogenous. This *spatial-simultaneity* bias may be small enough and/or redressed effectively enough by our time-lagging of it (an imperfect stratagem), and the identification leverage that these spatial lags offer upon the simultaneity of central interest here (outcome and regressor simultaneity *within* a spatial unit) large enough, to render usage of spatial lags as *quasi-instruments* (see Bartels 1991) advantageous.

Each quasi-instrumental spatial-lag enters one equation and so brings four exclusions, 16 more in total, two more than the 14 remaining to fulfill the *necessary* rank condition for identification of our system. The order condition, however, which is necessary and sufficient with the rank condition, and which requires that the exclusions equaling or exceeding *M(M-1)* (here: 20) are distributed across the equations such that each is *tied down* by at least one unique exogenous aspect of its specification, is not satisfied yet. The *P*articipation equation as-yet lacks such unique exogenous component, and so is unidentified, whereas the *I*nsurance equation is just-identified, basically by its quasi-instrumental spatial-lag, and the *S*kew, *U*nemployment, and *R*edistribution equations are all over-identified, having both their own unique quasi-instrumental spatial-lags and three, two, or one further exclusions, respectively, from among the endogenous variables. Furthermore, we would not want to rest identification of the system solely on quasi-instrumental variables, and we can find further leverage in some of the other exogenous regressors to which we turn now.

2. *Demographics*

Demographic variables, **D**, especially the age distribution, can provide some regressors the exogeneity of which is more certain.[21] Unfortunately, though, most demographics relevant to one of the outcome variables would also affect most or all the others. The over-65 share of the population, *Pop65*, for instance, should impinge upon *R*edistribution and/or *I*nsurance (insofar as public pensions and other age-dependent spending,

[21] Even demographics are not entirely unproblematic though, because, for example, *retirement age* insofar as it enters pensioner-targeted spending, e.g., is politically determined and may be set, e.g., in response to the amount and costs of *I*nsurance spending.

like health and child care, comprise those measures), but age-demographics like these certainly affect employment and income-distribution outcomes directly also (see, e.g., Smeeding & Sullivan 1998). Age also has among the most robust and sizable known effects on voter participation, so *Pop65* likely enters all the equations and so, while exogenous, provides no identification leverage for any of them (unless we could determine that it enters them differently, which we cannot). The under-15 population share, *Pop14*, also causally relates to economic outcomes, surely *U*nemployment and possibly *S*kew. Again, *R*edistributive and/or *I*nsurance spending clearly depend on *Pop14* too—e.g., education and related spending programs—but *P*articipation is a share of the eligible-age (i.e., over-15) population, might not. Our system is now:

$$\begin{gathered} S = s\left(\widehat{R}, \underline{\underline{S_{\sim i}}}, Pop65, \underline{Pop14}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_S\right);\ U = u\left(\widehat{I}, \widehat{R}, \underline{\underline{U_{\sim i}}}, Pop65, \underline{Pop14}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_U\right) \\ R = r\left(\widehat{S}, \widehat{I}, \widehat{P}, \underline{\underline{R_{\sim i}}}, Pop65, \underline{Pop14}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_R\right);\ I = i\left(\widehat{U}, \widehat{S}, \widehat{R}, \widehat{P}, \underline{\underline{I_{\sim i}}}, Pop65, \underline{Pop14}, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_I\right) \\ P = p\left(\widehat{U}, \widehat{S}, \widehat{R}, \widehat{I}, Pop65, \mathbf{SIS}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_P\right) \end{gathered} \quad \textbf{[19c]}.$$

Excluding *Pop14* from the *P*articipation equation provides the missing unique exogenous aspect to that equation. Our system is now identified if we credit the quasi-instrumentality of the spatial lags. In **[19c]**, we have begun to indicate our situation vis-à-vis identification by placing arcs over endogenous variables, double-underlining regressors that appear in only one equation, which suffice to identify that equation's left-hand-side variable for inclusion on the right of other equations, and single-underlining regressors that do not appear in all equations, which provide leverage on those outcome variables from which they are excluded.

3. Socio-Economic Institutional and Interest Structures

Next, consider socio-economic institutions and interest structures, like unionization and corporatism, trade exposure and structure, stock-market capitalization and outcomes, and female labor-force participation. Unions work to enhance and protect members' wages, and evidence that they affect the wage and income distributions is rife (see, e.g., Freeman 1991). Union density, *UDen*, thus enters the *S*kew equation (directly or indirectly as unionized sectors array at or near the percentiles used in the 90-50 skew-measure). Then, largely as consequence of this aim and effect, unionization exacerbates insider-outside conflicts that can spur unemployment, so *UDen* enters the *U*nemployment equation too. Strong unionization also represents likely effective political influence favoring both *R*edistribution and *I*nsurance spending, and union members, in

strongly empirically supported theory, have greater propensity to participate politically. Thus, unfortunately, *UDen* provides no identification leverage (without further information/expectations about the shape of these relationships, which we do not have). Likewise corporatism, *Corp*, or the coordination or centralization of labor organization, centrally affects wage and employment outcomes including *S*kew and *U*nemployment, and the balance of political influence on *R*edistribution and *I*nsurance. However, *Corp* seems unlikely to affect voter participation beyond the positive effect already accounted by unionization except insofar as it affects these policies and outcomes, so we may perhaps exclude *Corp* from the *P*articipation equation.

By the Stolper-Samuelson theorem and related international-trade theories, trade exposure, *TExp*, and especially exposure to trade with developing (i.e., labor-rich, capital-scarce) economies, *TExpD*, should increase some combination of *S*kew and *U*nemployment.[22] The unemployment impact arises if and insofar as some real-wage or -price inflexibility and unemployment exists (e.g., due to monopoly union or firm power) rather than the Stolper-Samuelson assumed perfect competition and full-employment.[23] By similar reasoning, openness and, especially, trade with developing countries would also shape *R*edistribution and *I*nsurance demand (e.g., Cameron 1984, Katzenstein 1985, Rodrik 1998). However, insofar as these policy effects of trade occur because of, i.e., through, the Stolper-Samuelson and related employment and wage effects, we can exclude these trade-structural variables from the policy outcomes. Likewise, trade structure may affect *P*articipation, if at all, only through these economic outcomes and policies. Most theory would cast international financial exposure, *FinExp*, in an identical role to trade exposure.

Huber & Stephens (2001) argue that historical Social-Democratic, *SDG*, Christian-Democratic, *CDG*, or Secular-Conservative, *SCG*, governance—an aspect of socio-economic structure (as opposed to incumbent-government partisanship, which is a **C**urrent **P**olitical **C**ontext—shapes the generosity and structure social policy. Accordingly, these factors enter the policy equations, but not the outcome or participation equations,

[22] Specifically, Stolper-Samuelson holds that (unskilled) labor in developed (human-and-physical-capital-rich, labor-scarce) countries, which will presumably occupy income percentiles around the denominator of most skew measures, loses by trade, more so the more that trade occurs with countries having opposite endowment-ratios to greater extents.
[23] I.e., in economic theory, insofar as quantities as well as prices adjust to clear markets, here employment and wages, the price (wage) implications of equilibria that assume market clearing solely by prices (wages) are shared between prices (wages) and quantities (employment).

wherein their effects, if any, should arise only through the policies. In particular, Huber and Stephens argue, essentially, that *SDG* and *CDG*, but not *SCG*, policy legacies involve strong social-insurance generosity. Conversely, neither the *SCG* nor the *CDG* legacies involve the generous general *R*edistribution of *SDG*. Accordingly, we can capture these hypotheses succinctly by including just *SCG* in the *I*nsurance equation, expecting a negative coefficient, and just *SDG* in the *R*edistribution equation, expecting a positive one.[24]

Next, female labor-force participation, *FLFP*, may operate analogously to demography in shaping *S*kew and *U*nemployment and also may spur both demand for and supply of *I*nsurance and *R*edistribution. Indeed, the type of spending-responce to *FLFP*[25] likely depends on whether a historical legacy of *SDG* predominates because both the *CDG* and the *SCG* legacies have supported *FLFP* far less (Huber & Stephens 2001). We suspect also that *FLFP*, or more exactly its societal and other roots, may affect *P*articipation as well—i.e., what favors female labor-force participation likely favors female electoral participation as well—but its interaction with *SDG* is unlikely to affect *P*articipation except through its effects on policy.

Finally, stock-market capitalization, *SMC*, stock-market returns (i.e., percentage increases in indices), *SMR*, and their interaction, *SMC·SMR*, seems likely to affect income *S*kew in a "yachts outpacing tugboats and rowboats" phenomenon. Such outpacing is likely proportionate to stock-market (and other investment) returns and should affect income-skew more the greater is capitalization (actually, ideally: domestic stock-ownership prevalence). Less directly, and more speculatively, stock-market capitalization, reflecting an emphasis on a particular form of corporate finance, may have implications for wages and employment (Hall & Soskice 2001). This likely has the obvious implications for interest and political-influence distributions as well, so we suspect stock-market capitalization to enter the policy equations too. Current returns and the interaction should be less relevant (directly) to these policy variables, though, and such financial-market terms seem unlikely to affect participation. This brings specification of the five-equation system to this state:

[24] However, due caution regarding terms involved in interactions will insert SDG in both.
[25] Policy programs in response to *FLFP* may also bolster *FLFP*, which suggests a further endogeneity not explored here.

$$
\begin{aligned}
S &= s\left(\widehat{R}, \underline{\underline{S_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, \underline{FinExp}, \underline{TExp}, \underline{TExpD}, FLFP, \underline{SMC}, \underline{SMR}, \underline{SMC \cdot SMR}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_S\right) \\
U &= u\left(\widehat{I}, \widehat{R}, \underline{\underline{U_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, \underline{FinExp}, \underline{TExp}, \underline{TExpD}, FLFP, \underline{SMC}, \underline{SMR}, \underline{SMC \cdot SMR}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_U\right) \\
R &= r\left(\widehat{S}, \widehat{I}, \widehat{P}, \underline{\underline{R_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, FLFP, \underline{\underline{SDG}}, \underline{FLFP \cdot SDG}, \underline{SMC}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_R\right) \\
I &= i\left(\widehat{U}, \widehat{S}, \widehat{R}, \widehat{P}, \underline{\underline{I_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, FLFP, \underline{\underline{SCG}}, \underline{FLFP \cdot SDG}, \underline{SMC}, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_I\right) \\
P &= p\left(\widehat{U}, \widehat{S}, \widehat{R}, \widehat{I}, Pop65, UDen, FLFP, \mathbf{DPI}, \mathbf{CPC}, \varepsilon_P\right)
\end{aligned}
\quad \textbf{[19d]}.
$$

4. Domestic Political Institutions

Two important domestic political institutions here are (the natural log of) district magnitude, *DMag*, and presidentialism, *Pres*, which a long line of political-science research and some recent, influential political-economy formalizations have connected to redistributive and distributive policies (Persson & Tabellini 2000 offer textbook exposition). These theories expect greater redistributive and less targeted spending in more proportional, i.e., larger district-magnitude, systems, and more total public-spending in parliamentary than in presidential systems. Further, district magnitude and other electoral-law features, notably the onerousness of registration requirements, *RegReq*, and mandatory voting (abstention fines), *MandVote*, play theoretically long-noted and empirically well-established large roles in determining participation. Presidentialism may also affect *P*articipation, negatively if presidential and other elections stagger, thereby diffusing relevant policymaking authority across multiple elections and reducing the importance of each, positively or with no effect otherwise. Other institutions that diffuse authority across elections, *EleDiff*, like bicameralism, federalism, or frequent referenda, should have similar effects. These institutions likely affect policy also but *U*nemployment or *S*kew solely through policy. Likewise, the degree of intra-party competition, *IPC*, which plurality, majority, and especially transferable-vote systems strengthen, may affect participation and policy is unlikely to affect economic outcomes except thereby. Specifically, *IPC* may foster participation if that competition inspires voters but, more likely, dampens turnout by weakening party-discipline, which eases voters' electoral-information burdens and because these electoral systems foster wasted votes. Regarding policy, *IPC* favors targeted (insurance) over broader (redistribution) tools, similarly to *DMag* (see, e.g., Cox & Rosenbluth 1995, Shugart & Carey 1992, and Ariga 2006). Mandatory voting and registration burdens, finally, should affect policy only by affecting participation. These **DPI**, especially the electoral-law features,

provide crucial identification leverage on *P*articipation, which had been relatively lacking heretofore:

$$
\begin{aligned}
S &= s\left(\widehat{R}, \underline{\underline{S_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, \underline{FinExp}, \underline{TExp}, \underline{TExpD}, FLFP, \underline{SMC}, \underline{SMR}, \underline{SMC \cdot SMR}, \mathbf{CPC}, \varepsilon_S\right) \\
U &= u\left(\widehat{I}, \widehat{R}, \underline{\underline{U_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, \underline{FinExp}, \underline{TExp}, \underline{TExpD}, FLFP, \underline{SMC}, \underline{SMR}, \underline{SMC \cdot SMR}, \mathbf{CPC}, \varepsilon_U\right) \\
R &= r\left(\widehat{S}, \widehat{I}, \widehat{P}, \underline{\underline{R_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, FLFP, \underline{\underline{SDG}}, \underline{FLFP \cdot SDG}, \underline{SMC}, \underline{Pres}, \underline{DMag}, \underline{IPC}, \underline{EleDiff}, \mathbf{CPC}, \varepsilon_R\right) \\
I &= i\left(\widehat{U}, \widehat{S}, \widehat{R}, \widehat{P}, \underline{\underline{I_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, FLFP, \underline{\underline{SCG}}, \underline{FLFP \cdot SDG}, \underline{SMC}, \underline{Pres}, \underline{DMag}, \underline{IPC}, \underline{EleDiff}, \mathbf{CPC}, \varepsilon_I\right) \\
P &= p\left(\widehat{U}, \widehat{S}, \widehat{R}, \widehat{I}, Pop65, UDen, FLFP, \underline{Pres}, \underline{DMag}, \underline{IPC}, \underline{EleDiff}, \underline{\underline{MandVote}}, \underline{\underline{RegReq}}, \mathbf{CPC}, \varepsilon_P\right)
\end{aligned}
\qquad \textbf{[19e]}.
$$

5. Current Political Contexts:

Lastly, under Current Political Contexts, **CPC**, we consider incumbent-government characteristics—majority status, *GMaj*, fragmentation, *GFrag*, polarization, *GPol*, and partisanship along a left-right axis, *GPart*, or by *SDG*, *CDG*, or *SCG* classifications—and current-electoral conditions, like election indicators, *E*, and competitiveness, *Comp*. We gauge current-government ideology by *CDG* and *GPart*, which allows policy to relate to ideology linearly, roughly curvilinearly, or linearly but with Christian Democracy lying off the direct line from left (*SDG*) to right (*SCG*) ideologically (see, e.g., Swank 2002). All of these **CPC** factors should affect the policy variables directly; only competitiveness should affect participation directly;[26] and none should affect the economic outcomes except through policy and participation effects.

This gives us the following (penultimate) specification of our system:

$$
\begin{aligned}
S &= s\left(\widehat{R}, \underline{\underline{S_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, \underline{FinExp}, \underline{TExp}, \underline{TExpD}, FLFP, \underline{SMC}, \underline{SMR}, \underline{SMC \cdot SMR}, \varepsilon_S\right) \\
U &= u\left(\widehat{I}, \widehat{R}, \underline{\underline{U_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, \underline{FinExp}, \underline{TExp}, \underline{TExpD}, FLFP, \underline{SMC}, \underline{SMR}, \underline{SMC \cdot SMR}, \varepsilon_U\right) \\
R &= r\left(\begin{array}{l}\widehat{S}, \widehat{I}, \widehat{P}, \underline{\underline{R_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, FLFP, \underline{\underline{SDG}}, \underline{FLFP \cdot SDG}, \underline{SMC}, \underline{Pres}, \underline{DMag}, \\ \underline{IPC}, \underline{EleDiff}, \underline{GMaj}, \underline{GFrag}, \underline{GPol}, \underline{GPart}, \underline{CDG}, \underline{E}, \underline{Comp}, \underline{E \cdot Comp}, \varepsilon_R\end{array}\right) \\
I &= i\left(\begin{array}{l}\widehat{U}, \widehat{S}, \widehat{R}, \widehat{P}, \underline{\underline{I_{\sim i}}}, Pop65, \underline{Pop14}, UDen, \underline{Corp}, FLFP, \underline{\underline{SCG}}, \underline{FLFP \cdot SDG}, \underline{SMC}, \underline{Pres}, \underline{DMag}, \\ \underline{IPC}, \underline{EleDiff}, \underline{GMaj}, \underline{GFrag}, \underline{GPol}, \underline{GPart}, \underline{CDG}, \underline{E}, \underline{Comp}, \underline{E \cdot Comp}, \varepsilon_I\end{array}\right) \\
P &= p\left(\widehat{U}, \widehat{S}, \widehat{R}, \widehat{I}, Pop65, UDen, FLFP, \underline{Pres}, \underline{DMag}, \underline{IPC}, \underline{EleDiff}, \underline{\underline{MandVote}}, \underline{\underline{RegReq}}, \underline{Comp}, \varepsilon_P\right)
\end{aligned}
\qquad \textbf{[19f]}.
$$

Notice that theory and substance allow us to offer empirical models that strongly distinguish (identify) the three outcome-types: economy, policy, and politics. *S*kew and *U*nemployment alone have the trade- and

[26] We smooth participation rates across election and non-election years, so the election date does not affect our measure.

financial-exposure and stock-return regressors, which should be strong exogenous explanators of them. The economic outcomes also exclude *P*articipation, whereas the policy ones do not. Similarly, *R*edistribution and *I*nsurance have unique exogenous regressors in the **CPC** factors (competitiveness excepted), which should strongly predict policies, and *P*articipation uniquely responds to two electoral-law features known to predict it well. However, the two economic and two policy outcomes seem less sharply distinguished from each other. The economic outcomes are distinguished by their unique spatial lags and that *I*nsurance spending affects *U*nemployment but not *S*kew. *R*edistribution and *I*nsurance policies are distinguished by their unique spatial lags, in *U*nemployment affecting *I* but not *R* spending, and that *SCG* and *CDG* legacies similarly (negatively) affect *R* whereas *CDG* and *SDG* legacies similarly (positively) affect *I*. These perhaps weaker distinctions may nonetheless offer sufficient empirical leverage though, because the spatial lags likely have strong explanatory bite for the economic outcomes while the importance of partisan historical legacy may adequately compensate for what might prove weaker interdependence among nations' social policies. Plus, further useful distinctions arise in specifying precisely how each factor enters each function (see below).[27]

III. Empirical-Model Specification, Data, Estimation, and Results

A. Empirical-Model Specification

We now describe these functions more fully. Our theories generally lack the precision to suggest specific functional forms,[28] so we assume the usual linear-additivity here, accepting "best linear approximations" to what are likely nonlinear relationships. We have, however, suggested above certain interactions (we assume them linear interactions) among some of the regressors: between stock-market capitalization and returns in the economic-outcome equations, and between *FLFP* and *SDG* and between elections and competitiveness in the policy equations. As we convert **[19]** to specific regression models, and add dynamics to those models, we will add two more interactions. As argued above (see also Franzese 2002, ch.2), participation interacts with skew to shape the effective political demand for social policies, and then government fragmentation,

[27] Future work may benefit further from using these first empirical estimations of the resulting system, which we consider yet preliminary and suggestive only, to discover refinements that would allow more exclusions or otherwise enhance the specification.
[28] We do know that district magnitude enters reciprocally (or in logs) because its effects arise through proportionate reduction in the effective threshold for entry to parliament, which is approximately $1/2DMag$.

polarization, and majority status will interact with the lagged dependent-variables in the policy equations to reflect veto-actor arguments of policy-adjustment retardation (see Franzese 2002, ch. 3). These interactions and the dynamics add several further over-identifying exclusions to the system. Thus, in the end, the specific equations with which we would ideally like to begin our empirical explorations and evaluations are these:

$$S = \begin{cases} \alpha_0^i + \alpha_1 \underline{\underline{S_{t-1}}} + \alpha_2 \underline{\underline{S_{\sim i}}} + \alpha_3 \widehat{R} + \alpha_4 Pop65 + \alpha_5 \underline{Pop14} + \alpha_6 UDen + \alpha_7 \underline{Corp} + \alpha_8 \underline{FinExp} \\ + \alpha_9 \underline{TExp} + \alpha_{10} \underline{TExpD} + \alpha_{11} FLFP + \alpha_{12} \underline{SMC} + \alpha_{13} \underline{SMR} + \alpha_{14} \underline{SMC \cdot SMR} + \varepsilon_S \end{cases} \quad \textbf{[20a]}$$

$$U = \begin{cases} \beta_0^i + \beta_1 \underline{\underline{U_{t-1}}} + \beta_2 \underline{\underline{U_{\sim i}}} + \beta_3 \widehat{I} + \beta_4 \widehat{R} + \beta_5 Pop65 + \beta_6 \underline{Pop14} + \beta_7 UDen + \beta_8 \underline{Corp} \\ + \beta_9 \underline{FinExp} + \beta_{10} \underline{TExp} + \beta_{11} \underline{TExpD} + \beta_{12} FLFP + \beta_{13} \underline{SMC} + \beta_{14} \underline{SMR} + \beta_{15} \underline{SMC \cdot SMR} + \varepsilon_U \end{cases} \quad \textbf{[20b]}$$

$$R = \begin{cases} \gamma_0^i + \gamma_1 \underline{\underline{R_{t-1}}} + \gamma_2 \underline{\underline{GFrag \cdot R_{t-1}}} + \gamma_3 \underline{\underline{GPol \cdot R_{t-1}}} + \gamma_4 \underline{\underline{R_{\sim i}}} + \gamma_5 \widehat{S} + \gamma_6 \widehat{P} + \gamma_7 \widehat{S} \cdot \widehat{P} + \gamma_8 \widehat{I} \\ + \gamma_9 Pop65 + \gamma_{10} \underline{Pop14} + \gamma_{11} UDen + \gamma_{12} \underline{Corp} + \gamma_{13} FLFP + \gamma_{14} \underline{SDG} + \gamma_{15} \underline{FLFP \cdot SDG} \\ + \gamma_{16} \underline{SMC} + \gamma_{17} \underline{Pres} + \gamma_{18} \underline{DMag} + \gamma_{19} \underline{IPC} + \gamma_{20} \underline{EleDiff} + \gamma_{21} \underline{GFrag} + \gamma_{22} \underline{GPol} + \gamma_{23} \underline{GPart} \\ + \gamma_{24} \underline{CDG} + \gamma_{25} \underline{E} + \gamma_{26} \underline{Comp} + \gamma_{27} \underline{E \cdot Comp} + \varepsilon_R \end{cases} \quad \textbf{[20c]}$$

$$I = \begin{cases} \phi_0^i + \phi_1 \underline{\underline{I_{t-1}}} + \phi_2 \underline{\underline{GFrag \cdot I_{t-1}}} + \phi_3 \underline{\underline{GPol \cdot I_{t-1}}} + \phi_4 \underline{\underline{I_{\sim i}}} + \phi_5 \widehat{U} + \phi_6 \widehat{S} + \phi_7 \widehat{P} + \phi_8 \widehat{S} \cdot \widehat{P} + \phi_9 \widehat{R} \\ + \phi_{10} Pop65 + \phi_{11} \underline{Pop14} + \phi_{12} UDen + \phi_{13} \underline{Corp} + \phi_{14} FLFP + \phi_{15} \underline{SDG} + \phi_{16} \underline{FLFP \cdot SDG} \\ + \phi_{17} \underline{\underline{SCG}} + \phi_{18} \underline{SMC} + \phi_{19} \underline{Pres} + \phi_{20} \underline{DMag} + \phi_{21} \underline{IPC} + \phi_{22} \underline{EleDiff} + \phi_{23} \underline{GFrag} + \phi_{24} \underline{GPol} \\ + \phi_{25} \underline{GPart} + \phi_{26} \underline{CDG} + \phi_{27} \underline{E} + \phi_{28} \underline{Comp} + \phi_{29} \underline{E \cdot Comp} + \varepsilon_I \end{cases} \quad \textbf{[20d]}$$

$$P = \begin{cases} \omega_0 + \omega_1 \underline{\underline{P_{t-1}}} + \omega_2 \widehat{U} + \omega_3 \widehat{S} + \omega_4 \widehat{R} + \omega_5 \widehat{I} + \omega_6 Pop65 + \omega_7 UDen + \omega_8 FLFP + \omega_9 \underline{Pres} + \omega_{10} \underline{\underline{PProx}} \\ + \omega_{11} \underline{DMag} + \omega_{12} \underline{IPC} + \omega_{13} \underline{EleDiff} + \omega_{14} \underline{\underline{MandVote}} + \omega_{15} \underline{\underline{RegReq}} + \omega_{16} \underline{Comp} + \varepsilon_P \end{cases} \quad \textbf{[20e]}$$

Notice first that we gain additional identification leverage on each equation if we assume or can establish theoretically/substantively that the time-predetermined nature of the lags modeling the temporal dynamics suffices to ensure exogeneity. We do assume so, although without full confidence, especially for the very slow moving *S*kew,[29] because the set of estimated coefficients and the stationarity for the outcomes that they imply seem much more plausible with the assumption. Note next how the policy equations draw from veto-actor theory (Tsebelis 2002) to derive more specification precision and identification leverage by allowing current-government fragmentation and polarization to modify policy-adjustment rates (Franzese 2002, ch.

[29] In essence, time precedence will fail to ensure exogeneity given instantaneous (i.e., within observational-period) endogeneity and/or some failure of the empirical specification to capture the dynamics fully (such as when expectations are important and not or inadequately modeled empirically). In this case, the extremely smooth and slow time-adjustment of skew leave serious doubts whether our measurement precision suffices for the deviations of *S*kew from the modeled AR(1) to have adequate signal to noise ratios for us even to judge how well we might have met this condition.

3), with the expectation being retardation. (We also measure fragmentation and polarization to reflect how the current government's majority status relates *GFrag* and *GPol* to policy-retardation and so *GMaj* need not enter directly as a regressor.[30]) These interactions in the dynamics provide further identification leverage for the policy equations.[31] Next, notice the *i* superscripts on the constants of the economic and policy, but not the participation, equations, indicating the country fixed-effects used or omitted. Again, coefficient estimates and the implied stationarity of the outcomes seemed more empirically sensible allowing these fixed-effects. The participation equation excludes them, though, because several key explanators in that model, including some of core substantive interest on which we rely heavily for identification, like *MandVote* and *RegReq*, hardly vary over time.[32] (We do allow the country dummies as instruments in all models though: see below.) Finally, notice that regressors in **[20]** involving trade exposure to developing countries, *TExpD*, or electoral competitiveness, *Comp*, are grayed; unfortunately, this signifies that we have not yet found measures of sufficient cross-country-time coverage to include them in our current estimation models.[33]

B. Data and Measurement

For empirical estimation of the system, **[20]**, we assembled (building from the work, and thanks to the generosity, of others) a database covering 23 developed democracies[34] over 44 years, 1960-2003, although much less than that has ultimately proven usable (without extensive imputation).

*S*kew is usually the limiting reagent, as inequality data is notoriously spotty, despite the Luxembourg Income Studies (Smeeding et al. 1990, Atkinson et al. 1995) and OECD efforts having improved matters greatly. We use data on earnings by population decile, generously given to us by David Rueda and to him by the OECD Education, Employment, Labour and Social Affairs Directorate (Pontusson & Rueda 2000), to construct ratios of the 90th to the 50th deciles' incomes, as discussed above. By linear interpolation of a few

[30] We did explore the possibility, though, finding some indications, weak and not robust across specifications, that majority status may speed policy-adjustment and/or reduce welfare/insurance-spending levels beyond the role our *GFrag* and *GPol* allow it.
[31] I.e., these terms provide two more unique (and exogenous) regressors to the policy equations if we continue to assert the *poor-man's exogeneity*: time; and, even without that assumption, the *GFrag* and *GPol* modification of the simple, uniform-across-all-countries AR(1) dynamics would be unique to the policy equations and so help identify them.
[32] Plümper and Tröger (2007) offer an alternative strategy that could have been fruitfully applied here.
[33] Even to define *Comp* comparably across our heterogeneous sample of democracies is a very daunting task (but see Ariga 2006).
[34] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the U.K., and the U.S.

missing country-years (28 of the 360 total that we assemble),[35] we obtain unbroken annual series of at least some years for 19 of 23 countries.[36] S_{t-1} is the one-year time-lag; and, $S_{\sim i}$, as with all the spatial lags, is the unweighted average of that variable, that year, in the other dataset countries. Standardized unemployment rates, *U*, are from the OECD *via* Armingeon et al.'s (2005: henceforth ALMP) "Comparative Political Data Set, 1960-2003." Where possible, we expand coverage of these data (from 660 to 939 country-years) by country-specific linear-regression on the unstandardized rates. The R^2 of these fitting models always exceed .9 (implying standardized rates relate to unstandardized ones within a country by a relatively fixed factor).

Following M&W, insurance spending, *I*, is OECD Social Benefits, excluding the Health and Pension categories. (This leaves primarily unemployment and welfare benefits.) Redistributive spending, *R*, is total spending minus Social Benefits and Military spending. (*R* and *I* thus both exclude health and pensions.) We extend these data as generously provided to us by M&W, 1980-99 in 18 countries, to cover 20 countries[37] and 1960-2002 in most (from 330± to 775± observations) by regressing M&W's original data on that from the current OECD Social Benefits and Public Health datasets, plus current disbursements (total spending). This effort to recreate M&W's procedure for the current, expanded-coverage dataset yielded R^2's of the fitting models usually exceeding .9 and often approaching 1.0, indicating near-perfect replication.

We measure participation, *P*, as voters' percentage of the eligible-age population, smoothing ALMP's *vturn* series thereof, which holds participation constant at the last election's rate until the next, by averaging the current, previous, and next-two years (capturing exactly one election-cycle *per* window in most cases).

The age demographics, *Pop65* and *Pop14*, are from the OECD, *via* ALMP. Union density, *UDen*, is active (i.e., excluding unemployed and retired) members as a share of employment, taken from Jelle Visser *via* ALMP and from Golden et al. (1997), and extended by regression on gross membership and the age demographics. The corporatism index, *Corp*, is Lane Kenworthy's.[38] Trade exposure, *TExp*, is from OECD sources *via* ALMP, and international-financial exposure, *FinExp*, is the sum of current- and capital-account

[35] We gather and extend available data aggressively, merging multiple data sources on identical or related variables and, rarely, by linear-interpolation and trend auto-regression, but all this adds almost no usable data here beyond these few added to *S*kew.
[36] Greece, Iceland, and Luxembourg drop, and Spain remains with just one observation, 1995.
[37] Greece, Iceland, Luxembourg, and Spain drop.
[38] See http://www.u.arizona.edu/~lkenwor/WageCoorScores.pdf.

openness from Quinn and Inclan (1997). Female labor-force participation rates, *FLFP*, are taken from Huber & Stephens' (2004) "Comparative Welfare States Data Set." We our stock-market capitalization, *SMC*, and returns, *SMR*, measures from the Global Financial Database,[39] using all-market December 31 closing values divided by nominal GDP in domestic currency for *SMC* and its year-on-year percentage change for *SMR*.

Our government fragmentation, *GFrag*, polarization, *GPol*, and partisanship, *GPart*, indices derive from Thomas Cusack's rich, thorough, and usefully designed PGL ("Parties, Governments, and Legislatures") dataset.[40] Using *GSppt*, the percentage legislative seat-share of the governing (cabinet) parties,[41] we obtain *GFrag* for majority governments (*GSppt*>½) as the raw number of governing parties (counting non-partisans as half a party). Raw numbers are a more appropriate representation of Tsebelis' veto-actor conception of fragmentation than effective (i.e., size-weighted) numbers (see Franzese 2002, ch. 3) because, in that theory, any governing party, regardless of size, can veto policy-change since its presence in government indicates its necessity to that coalition. If *GSppt*<½ (minority government), *GFrag* is a *GSppt*-weighted count of the raw number of governing parties and the effective number of opposition parties. A minority coalition need not add all other parties to build a majority to change policy, so using raw numbers of opposition parties would exaggerate. Short of analyzing each parliamentary context at length, we construct a convenient proxy for the number of veto-acting opposition parties by weighing their counts by size (i.e., using effective numbers), reflecting the notion that larger parties are more often likely to be necessary partners in building legislative majorities. *GPol* likewise adopts a veto-actor conception of polarization, using party ideological-ranges (size-unweighted) rather than standard-deviations or variances (size-weighted). *GPol* measures leftmost to rightmost governing party if *GSppt*>½ and across the whole legislature in the case of minority government.[42] To generate *GPart*, we use Cusack's processing of the Comparative Manifestos Dataset into left-right scores

[39] http://www.globalfinancialdata.com
[40] http://www.wz-berlin.de/mp/ism/people/misc/cusack/d_sets.en.htm
[41] The president's party represents the cabinet party in all the following discussion for the U.S. case. "Legislature" here always refers to the lower (more powerful) chamber in cases of bicameralism.
[42] *GPol* exaggerates by thus implicitly assuming all legislative parties are veto actos. As with *GFrag*, *GPol* would do better to find some convenient generalization to reflect that larger opposition parties are likely more often in veto-acting positions than smaller ones. Cusack's data provide several useful indicators of governing and opposition fragmentation and key-party ideological locations that could improve our *GPol* measure, and also enhance our *GFrag* simplification, in future work.

for parties and of those into cabinet and parliament average positions. For *GSppt*>½, we use the cabinet's score directly, and for *GSppt*<½, we use the *GSppt*-weighted average of the cabinet and the legislature's.

We derive our measures of cumulative Social Democratic and Secular Conservative Government, *SDG* and *SCG*, and of current Christian Democratic Government (which sums center and right, Christian and Catholic), *CDG*, from Huber and Stephens' data on cabinet and legislative seat-shares, using Cusack's *GSppt* to enhance those measures (i.e., for minority cabinets, the parties' government-seat shares are the *GSppt*-weighted average of the cabinet and legislative shares). *Cumulative* refers to the sum from 1960.

Pres equals 1 in presidential (Switzerland and U.S.), 0.5 in semi-presidential (Finland, France, Iceland, and Portugal), and 0 in parliamentary systems and is from Golder's (2005) "Democratic Electoral Systems around the World, 1946-2000." Unfortunately, *Pres* does not vary over time within country in our sample. The natural log of (average) district magnitude (i.e., the number of representatives divided by the number of districts), *DMag*, is from Golder too, and it varies a little within country. Our intra-party competition index, *IPC*, is crude, as it merely sums indicators for plurality, majority, and transferable-vote electoral systems, again from Golder (2005). We code the German mixed system, and the similar new ones in Italy, Japan, and New Zealand as 0.5, reflecting their part-plurality nature (although in Japan, the other part is transferable-vote, so *IPC* is 1). Our measure of authority diffusion across elections, *EleDiff*, adds 'effective federalism' and 'provincial-election importance' measures from the World Bank "Database of Political Institutions" (Beck et al. 2001) to Lijphart's prevalent-referenda (i.e., Switzerland) and effective-bicameralism indicators. *EleDiff* varies only slightly within countries. Our pre-election-year indicator, *E*, allocates sums of 1 to the 365 days before lower-house elections[43] (from ALMP). The participation model also includes a measure of proximity of presidential to parliamentary elections, *Prox1* (from Golder 2005). Finally, *MandVote* and *RegReq*, our measures of compulsory voting and registration-requirement burdens derive from our own analysis of electoral-system data from the International Institute for Democracy and Electoral Assistance.[44]

[43] *E* sums these unit allocations in the rare cases of multiple elections within one year. The US case is an exception, allocating 7/9 over the 365 days before an on-year election (reflecting the President, the House, and 1/3 of the Senate being elected) and 4/9 to the 365 days before off-year elections (House plus 1/3 the Senate).

[44] http://www.idea.int

MandVote varies 0-1, according to the degree of enforcement indicated (none=0, weak=.5, strong=1) times the severity of punishments (none=0, nominal fine or other weak sanction=.5, 'appreciable fine'=1) times the share of the country's provinces in which the law is in force. *RegReq* simply indicates (0,1) whether a national voter-registry exists or voters must self-register.[45] Neither index varies over time within country.[46]

B. Estimation Strategies

Estimation strategies for systems of equations are numerous and variegated, as are those for time-series cross-sections (TSCS), so the number and variety of combinations potentially appropriate to estimate our system (of five equations, from data in 18 countries over, on average, 17-18 years) are multiplicatively great. We must consider whether to allow unexplained cross-country differences in conditional means as fixed (or random) effects, recognizing that failing to do so when heterogeneity (conditional on the rest of the model) exists can bias estimation (if these omitted conditional-mean differences correlate with included regressors) and will induce inefficiency. Conversely, regardless of whether heterogeneity exists, fixed effects prevent the direct recovery of the effects of any time-invariant explanators and can severely compromise estimation and complicate or obfuscate interpretation of the effects of slowly or rarely moving regressors (see Plümper & Tröger 2007), and random effects rely on questionable assumptions in aggregate TSCS contexts. We must consider also whether to add any other variables from among the regressors to our list of endogenous variables. Failing to acknowledge the endogeneity of some regressors will bias results, but treating variables as endogenous that are not (or that are not too importantly so) adds to the empirical identification burden of the remaining exogenous variables and to the researcher's difficulties finding viable instruments. Then we should consider also whether the TSCS data-structure might add other exogenous factors beyond the current set to the instruments, thereby gaining further crucial identification and estimation leverage if the additional conditions are true but inducing otherwise avoidable bias if they are not. Lastly, we should consider whether and how to use information in the data about cross-equation relations (like error covariances) or instead to

[45] Information on the site may allow finer granularity measures of registration ease based on assistance provided.
[46] As noted above, we do not have *TExpD* and *Comp* at this time. *Pres*, which has no within-country variation, is also omitted from the equations with fixed effects. All other variables have at least some within-country variance, but several (as mentioned) have little or very little. Accordingly, their coefficients' estimates should be interpreted with extra caution (see note 32).

estimate the equations separately. Estimating jointly can enhance efficiency notably; estimating separately forsakes these gains but isolates each equation's estimation from any specification or other problems in the other equations. All these considerations are in addition to alternative plausible theoretical specifications.

The range of options we have explored so far are:

- Joint (3SLS), separate (2SLS), or exogenous (SUR) estimation of the system's equations;
- the inclusion or exclusion of fixed effects, deciding to include country dummies for the first four but not for the fifth equation (i.e., for policies and outcomes but not participation, which contains several substantively interesting regressors that move very slowly or rarely);
- the inclusion or exclusion among the system's instruments of these country dummies, a full set of year dummies or both, choosing to include both country and year dummies as instruments;
- which regressors besides our five outcomes to consider endogenous, settling upon the interaction of *S*kew and *P*articipation as the only one, its endogeneity being most crucial substantively;[47]
- and also explored/reconsidered are several theory-derived specification choices discussed above:
    - adding *I*nsurance spending to *S*kew equation;
    - adding to the policy equations interactions of participation times unemployment,
    - and/or of *GMaj* or *GSppt* times the lagged dependent variable;
    - whether to treat the temporal and spatial lags as exogenous; and
    - whether to add a control for real GDP growth and, if so, whether to treat it endogenous.[48]

With one major exception, coefficient estimates were remarkably consistent across all combinations of these considerations and options. Without the country dummies, the coefficients on *S*kew, *P*articipation, and their product in the policy equations reverse signs to negative, negative, positive. (Wilson & Butler 2007 noted a similar reversal of M&W results with fixed effects.) Either pattern only partially supports the M&W model, regardless of whether skew increases are *bottom-dragged* or top led; the extension regarding varying participation likewise receives mixed support. None of the other estimation-strategy options affect any of the coefficient estimates nearly so much. Accordingly, since systems estimation with heterogeneous intercepts

[47] That then raised whether we should expand the instrument set to some or all products of some or all exogenous regressors in those equations. Fearing over-fitting in the instrumentation stage and thereby reintroducing endogeneity (especially since we already risk such sufficiently using full sets of year and country dummies and time-lags as instruments), we chose not to do so.
[48] Some counter-intuitive results regarding the effects of stock-market capitalization led us to wonder if it was proxying GDP growth. Adding GDP growth as an endogenous or exogenous regressor altered these and other results only marginally, however.

and more instruments is far more efficient, we report the model estimated by (iterated) 3SLS, with country dummies on the right-hand side of **[20a]**-**[20d]**, and both country and year dummies in the instrument list.

C. Estimation Results

Table 1 presents these estimated coefficients (in bold) and standard errors (beneath them), with entries significant or nearly so in italics. We omit the country fixed-effect estimates to conserve space (but they are available upon request as are all replication code and data). The results contain strong support for some aspects of previous theory, our own additions, and/or conventional wisdom, but also many notable surprises. We will first briefly survey the estimated relationships of the exogenous explanators to the outcomes of our system before turning to our central interest in the estimated endogenous relationships among the outcomes.

< Table 1 about here >

In confirmatory results, we find slow temporal adjustment-rates for all five outcomes, and strong spatial interdependence for economic policies and outcomes. We find corporatism reduces income-skew, and union density may do so too while it also, more clearly, supports turnout. Smaller youth and pensioner, i.e., larger working-age, populations boost unemployment and inequality, while *Pop65* also reduces turnout. Financial (but not trade) exposure seems to increase inequality, and trade (but perhaps not financial) exposure to raise unemployment, and greater stock-market capitalizations induce less redistribution and social insurance. We find historical social-democratic-government interacts positively with female labor-force participation to expand both social policies, and strong, intuitive, effects of current-government partisanship thereupon, with little sign that Christian Democrats lie somewhere off that left-right line. Most impressive, though, is how well political-science theories can explain turnout variation. Authority diffusion across elections, electoral systems that foster intra-party competition (SMD and Limited Vote), non-concurrent presidential elections, and onerous registration requirements all depress turnout, and, of course, mandatory-voting laws increase it.

In more-mixed results, we find support for veto-actor retardation of social-insurance policy-adjustment rates *via* government fragmentation, but our polarization measure does less well, and redistribution policy-adjustment rates seem impervious to either. The relations of corporatism and union density to unemployment have their expected signs, but significance is marginal or lacking. The negative relation of district magnitude

to both social-insurance and redistributive spending is unexpected given the emerging consensus that these electoral systems favor broadly targeted over narrowly targeted public-spending, but these results likely also imply positive association with the excluded health and pension spending and so could be read to refine and confirm that consensus. Finally, just as policy under Christian Democratic Governments is not significantly distinguishable from that of secular parties similarly positioned on the left-right axis; likewise, cumulative Secular Conservative Government is not strongly distinct from historical *CDG* in social-insurance policies.

Then, we find several null or contradictory findings also. Stock-market capitalization seems not to affect 90-50 skew and even to reduce unemployment, and market returns fail to register at all with unemployment or skew. We suspect, however, that the signal-to-noise ratio in our returns measure, being a closing price for a single day (and an odd one: December 31), may be low, and that capitalization is proxying for GDP here. That age demographics and *UDen* fail to affect social policies, and that corporatism associates marginally significantly negatively with it, are surprising findings, but perhaps best seen as plain null results. Similar null findings emerge for *FLFP* and *DMag* in the participation equation (but note that *IPC* already draws the PR/SMD distinction) and electoral cycles in the social-policy equations. Electoral diffusion and intra-party competition have very little and almost zero within-country variation, respectively, so their failure to register strongly in fixed-effect policy regressions is unsurprising. Finally, the insignificant positive relation of *FLFP* to skew is surprising, and its highly significant negative relation to unemployment quite so, given the intuitive relationships of the working-age population-share with *S* and *U*. However, we might best credit chance for this one variable of the 76 just discussed being significantly opposite of expectations.

< Figure 1 about here >

Our central interests surround the causal relationships among the endogenous variables of our system. Figure 1 summarizes the statistically significant of these effects. To assist comparisons, it gives standardized (beta) coefficients, with one (two, zero) asterisk(s) indicating significance at the .10 (.05, .15) level. We start with the determinants of income skew and unemployment. In specifying the system, we stressed that these social policies could affect these economic outcomes, redistribution the former and both the latter. Empirically, we find causal effects of both social policies on unemployment. As critics allege, social-policy

generosity does seem to undermine labor-market performance, raising unemployment. Sensibly, the size and statistical significance of the effect from social insurance to unemployment are much greater than those of redistribution; benefits targeted to those lacking income affect one's decision to work more strongly than do benefits not contingent on employment status. We find scant evidence that redistribution affects *pre-tax-and-transfer* 90/50 ratios. Recall, however, that we intentionally avoided the direct effects on post-tax-and-transfer skew by using pre-tax measures and the indirect effects on pre-tax income for individuals at the lower end of the distribution by using the 50th percentile denominator.

We turn next to the policy variables. The policy effects of income skew and participation are conditional, as expected, but the nature of that interaction is unexpected. We find that higher participation *attenuates* the relationship between skew and policy generosity, and concomitantly that the relationship of participation to social-policy generosity flattens with greater skew.[49] Nonetheless, at low political-participation and income-skew, either variable affects social-policy generosity significantly positively, consistent with our theoretical expectations for median-preserving increases in income skew. The standardized coefficients of Figure 1, which assume low participation (39.4%) and skew (1.44), suggest that participation "matters" more for social insurance than for broad redistribution, whereas a standard-deviation increase in skew explains a greater proportion of the sample variance in redistribution than in welfare/insurance policy. We also find some evidence of policy substitution from social insurance to redistribution but not in the other direction. This suggests that increases in insurance are funded to some extent by cuts in redistribution, but increases in redistribution do not induce the converse reductions in social insurance, implying funding by cuts elsewhere or revenue increases to greater extent. We also find that increases in unemployment may *decrease* social-insurance spending, which is quite surprising, the substantive and statistical significance is only marginal.

Finally, we consider the determinants of political participation. With respect to economic conditions, we find no evidence negative relationships from unemployment or skew to participation, but we do find income skew to have a small, *positive*, and marginally significant effect on participation. This might reflect the high

[49] Note that these results, which account for endogeneity, use much new data, apply several different theories, and apply different methodologies and specifications, strongly discord with Franzese (2002), ch. 2.

returns from redistribution for those at the lower end of the income distribution, but, again, these effects are only of marginal substantive and statistical significance. The evidence for direct policy effects on political participation are stronger, supporting Hobolt & Klemmensen (2006) in that both redistribution and insurance spending bolster participation, although the insurance-spending effect is not significant.

To calculate and present the implications of the estimated system in terms of the outcomes' responses to substantively interesting counterfactuals is difficult,[50] but can offer two sorts of counterfactuals. In the first, we set the levels of *S*, *U*, *R*, *I*, and *P*, and of the explanatory variable of interest, *FinExp* in our example, to hypothetical starting values (their 1967 sample-averages in our case), and then compute the response of *S*, *U*, *R*, *I*, and *P* to those values based on the estimated coefficients from Table 1.[51] Then we repeat the calculation except with a different value for the variable of interest. The difference between these two calculations (each a vector of five outcomes) is approximately[52] the effect on those five outcomes of the hypothetical. We then approximate the long-run impact of a permanent change simply by multiplying the result for each outcome by its long-run multiplier, $1/(1-\rho)$, with ρ being time-lag coefficient. We calculate thusly the response of

[50] If we had just the five endogenous variables, $\mathbf{y}_i(5\times1)$, with coefficients $\mathbf{\Theta}$ (5×5) in each others' equations (θ_{pq} is variable *q*'s coefficient in *i*'s equation and $\theta_{pp}=0$) and the matrix of exogenous variables with associated coefficients, $\mathbf{X\beta}$ $(5\times k)(k\times1)$, then $\mathbf{y}=\mathbf{\Theta y}+\mathbf{X\beta}+\boldsymbol{\varepsilon}$, which solves for $\mathbf{y}$ in terms of $\mathbf{X}$ and the coefficients as $\mathbf{y}=(\mathbf{I}-\mathbf{\Theta})^{-1}(\mathbf{X\beta}+\boldsymbol{\varepsilon})$. With this expression, we could interpret responses in all five outcomes to whatever counterfactual shocks in $\boldsymbol{\varepsilon}$ or $\mathbf{X}$ interested us. However, two of the endogenous variables, participation and skew, interact in determining two of the outcomes, redistribution and insurance, so the $\mathbf{\Theta}$ here are actually conditional coefficients that depend on $\mathbf{y}$. That is, the coefficients on skew and participation in the insurance and redistribution equations depend, respectively, on the level of participation and skew; thus, the responses of the outcomes depend on the level of the outcomes from which our counterfactual begins. However, finally, for any given set of coefficients, only one or some set of outcome values will be consistent with themselves; i.e., only one or some set(s) of outcome values will generate policy and other outcome-responses to skew and participation consistent with those outcome values. Such sets are called steady-state or equilibrium values. No guarantee exists, though, that these steady-state values would lie within substantively plausible ranges because no assurance exists that the sample ever came to or near the steady state(s). In sum, stable estimates of substantive effects require consideration of changes from steady states, yet the steady states implied by the coefficient-estimates may lie at substantive implausible values of $\mathbf{y}$ and thus give conditional coefficients for the interactive terms that are implausibly, or even illogically, large or small. Such is our case, at least for the counterfactuals we considered. We eliminated from consideration the spatial interdependence, the country fixed-effects, and all exogenous variables except the one which we perturb counterfactually. This meant we did not have to enter the entirety of all five equations—just $\mathbf{\Theta}$, the time lag, and the *x* and β in question—but this also virtually assured that our equilibrium values from which we would calculate changes in response to hypotheticals would be substantively meaningless. To some extent, this is unimportant though if we only report changes from that steady state, wherever it may be, as the effect—only to some extent, though, because the aforementioned conditional coefficients would not be entirely valid—and this finally is why we adopt the compromise expedients described in the text.

[51] We omit all aspects of the equations except those involving *S*, *U*, *R*, *I*, *P*, their time lags, or the exogenous variable of the hypothetical (see note 50).

[52] This only approximates because some *proportion* of each calculation's update is its *proportionate* step from the initial values toward the steady state and only the remainder is the desired response. By subtracting the two calculations, we largely eliminate the steps toward the steady state but some will remain as the difference in these *proportionate* steps. Since the steady states are very far from the initial values relative to the response to the hypothetical, the proportionate steps will be of almost identical size.

*S*kew, *U*nemployment, *R*edistribution, Social *I*nsurance, and *P*articipation to an increase in *FinExp* of 4.5 points, its sample-average trend from 1960 to 2000, with starting values corresponding to sample averages in 1967 (the near available to that starting point) of $S \approx 1.77$, $U \approx 5.15$, $R \approx 11.2$, $I \approx 7.64$, $P \approx 79.5$. Table 2 reports these estimates. In the long run, this increase in financial exposure would directly and indirectly cause both inequality and unemployment to rise, the 90th percentile outpacing the 50th by an appreciable nearly 7% (which is also about 7% of the sample range of about 1.5-2.5) and unemployment by a noticeable nearly half a point (+.4, although this is far less of its sample range of about 18.6). The +.4% of GDP in redistribution induced indirectly by *FinExp*'s effect on these economic outcomes is non-negligible (and about the same proportion of its sample range of about 25). The -.04% of GDP induced change in *I*nsurance spending is negligible absolutely and proportionately, as is the +.25% indirect effect on voter participation.

Table 2: Empirical System of Skew, Unemployment, Redistribution, Social-Insurance, and Participation—Estimation Results

	***S*kew**	***U*nemployment**	***R*edistribution**	***I*nsurance**	***P*articipation**
Δ (*FinExp*)=4.5	0.06739	0.39580	0.38477	-0.03988	0.27571

Our other sort of hypothetical begins similarly by choosing starting values for *S*, *U*, *R*, *I*, and *P,* and the explanator of interest, in this case selecting government partisanship, *GPart*. We then allow *S*, *U*, *R*, *I*, and *P* to respond to these starting values according to their estimated mutual endogeneity and temporal dynamics, ignoring as complicating the spatial dynamics as orthogonal to our central interests here, until converging to a steady state. From those steady state values, we then perturb the variable of interest, here *GPart*, by some hypothetical series of values the response to which we wish to estimate. In this case, we take three well-known empirical cases, Germany, Sweden, and the U.K., and set as starting values their actual *S*, *U*, *R*, *I*, *P* values in the first year we have all five variables. We then let the estimated system converge from these and the 1960 value of *GPart* before tracking the innovations from the steady state as the estimated responses of *S*, *U*, *R*, *I*, *P* to the actual historical path of *GPart*, as seen in Figures 2-4.[53]

In Figure 2, we see last two years of center-right (CDP-FDP) government in 1960-1, followed by the 21 of center-left (SDP-FDP) 1962-82, and then the cycle and rightward drift of the next 18 years, all plotted

[53] These, too, are only approximations because the steady-state conditional coefficients described in note 50 are not realistic, implausibly large in this case, as explained there.

against the right axis. The estimated responses to this are, from the top, the (mostly direct) effect on social policies in the rather steady upward trend of redistribution, to +3.55% of GDP at maximum and then some oscillation with slight downward, and the similarly patterned rise and then cycling drift in social-insurance to +1.72% of GDP, down to +1.24%, and back again. The responses this will have induced in pre-tax-and-transfer inequality are negligible, as we estimated almost no feedback from policies thereto, but the impact on unemployment is quite appreciable, due to the sizable distortionary effects of social policy we estimated, following that now familiar pattern, trending to +2.22% before falling back to +1.81%, and then almost back again before declining anew. The feedback from social policies to participation, meanwhile, induces a steady trend once more, this time to +3.5% and with only slight oscillation visible before finally abating.

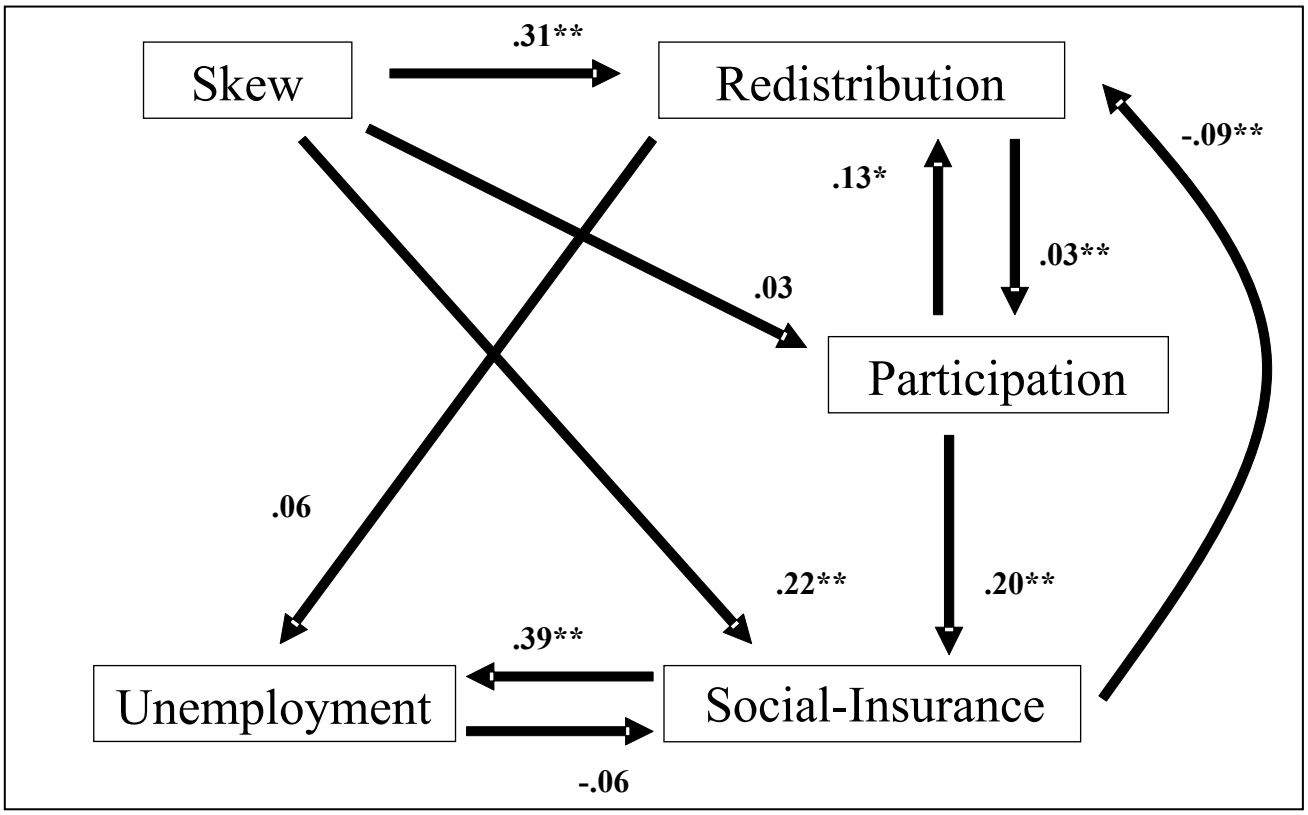
Figure 3 plots the analogous consideration for Sweden, which started with center-left government in 1960 and then experienced first left-government, then center-left, then center-right through 1998. The responses in redistribution are again most dramatic, rising +1.41% of GDP in the early seventies before declining hyperbolically to +.44% of GDP at the start of the nineties, and then plummeting to -.91% by the end of that decade. The patterns in social-insurance spending and in unemployment are similar, but flatter, to +.68% and +.85%, +.26% and +.33%, and -.45% and -.41%, respectively. Participation follows a smoother response-path again, in Sweden vaguely sloping-hill-shaped, to almost +1% and between +.9% and +.7% over the plateau. Finally, Figure 4 shows the analogous for the U.K. There, the brief return to the left in the early seventies against a background of otherwise strongly rightward trending government places a hiccup in the otherwise steadily and sharply declining response-paths. And, of course, in neither the U.K. nor Sweden is any response in Skew noticeable because, again, little feedback was found (in good part, by construction) from policy or outcomes to the (pretax, 90-50-ratio) measure.

IV. Conclusions

Conflicts of interest over the generosity and structure of social policy include that between the relatively poor and wealthy and that between the unemployed or precariously employed and the safely employed. The former conflict underlies the famous median-voter result that democratic demand for broad redistribution increases in the income skew, and the latter yields a different theoretical conclusion: that inequality reduces

median-voter demand for social insurance. In each case, the generosity and structure of social policy may affect simultaneously the efficiency of the labor market and the political participation of the less fortunate, thus shifting the income and job-security status of the median voter. These considerations imply endogenous relationships between economic performance (employment/income level and distribution), social policy (redistribution and social insurance), and politics (political participation). They also raise the theoretical possibility of multiple political-economic equilibria, with two basins of attraction: one with high equality and unemployment, redistributive and social-insurance spending, and high political participation and another with the opposite pattern. This chapter elaborated the theoretical expectations regarding these endogenous relationships, suggested identification conditions that derive from the theory and substance, and offered empirical estimates of the resulting system of equations. Our empirical analysis thus improves upon extant studies that ignore the endogenous relationships among these political, economic, and policy variables. Substantively, our results suggest that income inequality and political participation *are* important causes of social-policy generosity in the developed democracies. However, our empirical results also revealed some puzzling surprises. Clearly, much work remains to refine the empirical specification and analysis and perhaps, also, to reconsider and advance our current theoretical understandings of this endogenous system of employment-risk and income inequality, redistribution and insurance policies, and effective citizen input.

Figure 1: Causal Relationships among the Endogenous Variables



NOTES: The numbers are standardized coefficients. The conditional coefficients for skew and participation are calculated assuming low participation (39.4%) and low skew (1.44) respectively. *p-value < .10, **p-value < .05. Coefficients without asterisks are marginally significant at p-value < .15.

Figure 2: Estimated Response of Income Skew, Unemployment, Redistribution, Social Insurance, and Political Participation to the Actual Historical Path in Germany of Government Partisanship

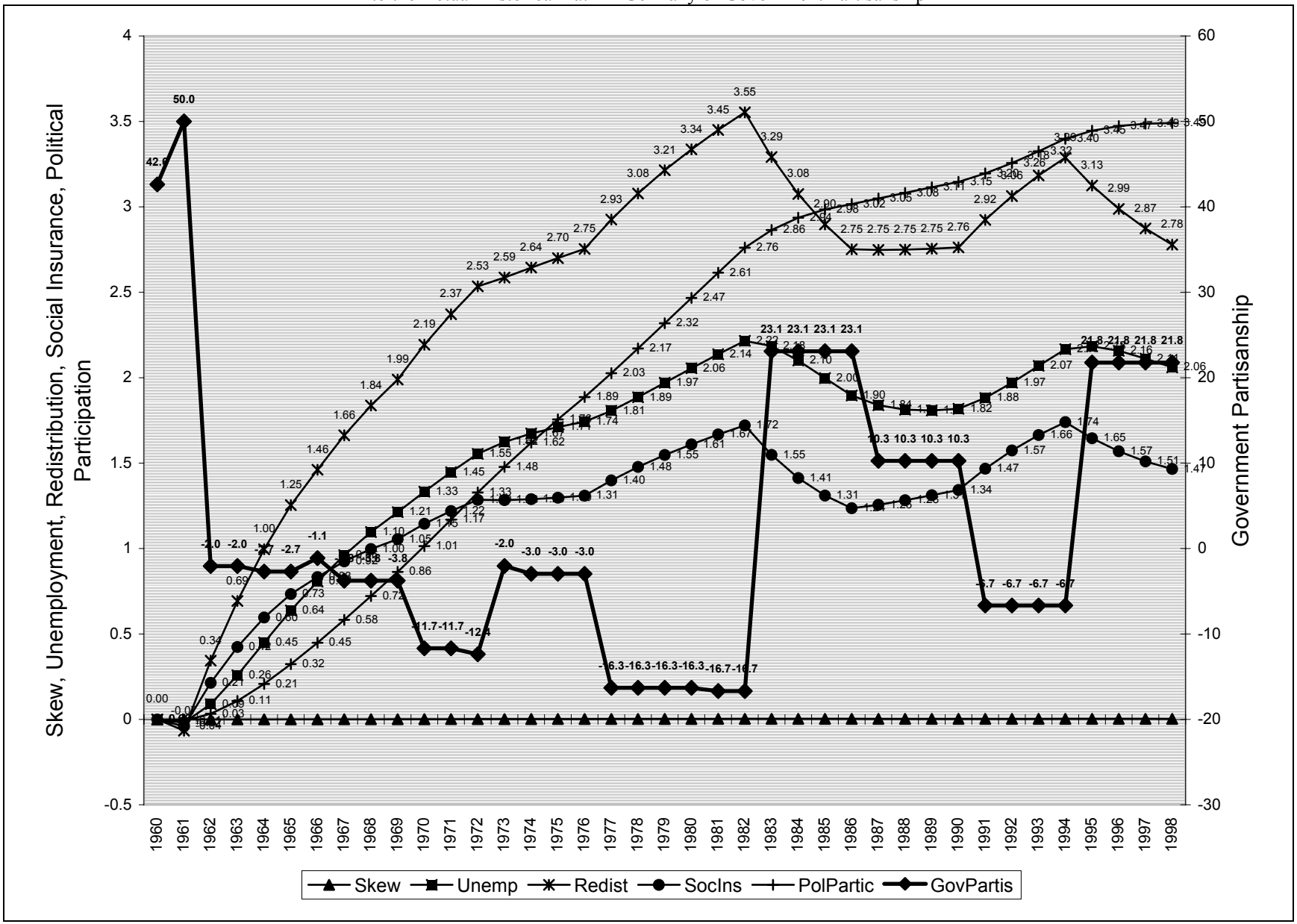


Figure 3: Estimated Response of Income Skew, Unemployment, Redistribution, Social Insurance, and Political Participation to the Actual Historical Path in Sweden of Government Partisanship

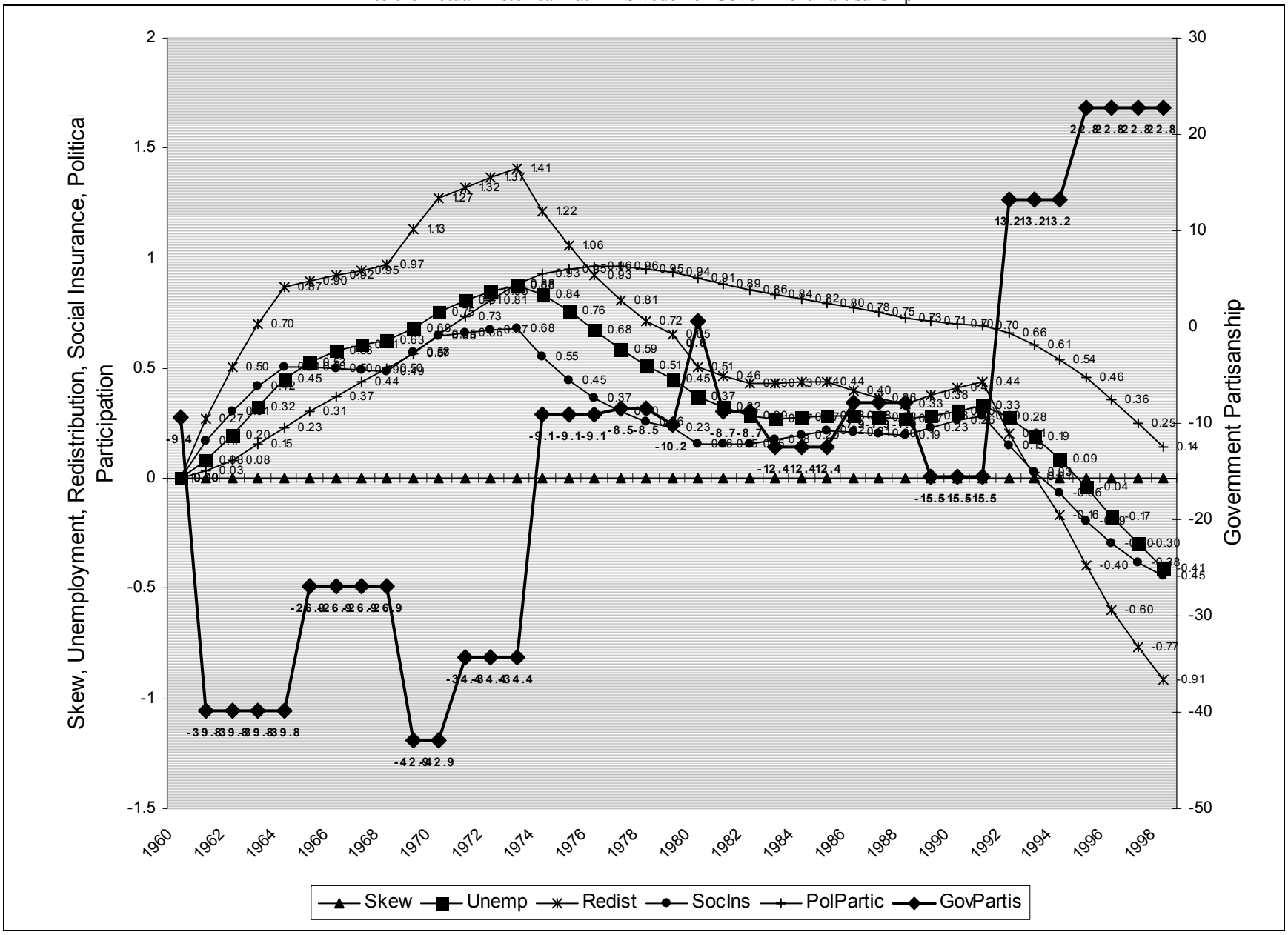


Figure 4: Estimated Response of Income Skew, Unemployment, Redistribution, Social Insurance, and Political Participation to the Actual Historical Path in the United Kingdom of Government Partisanship

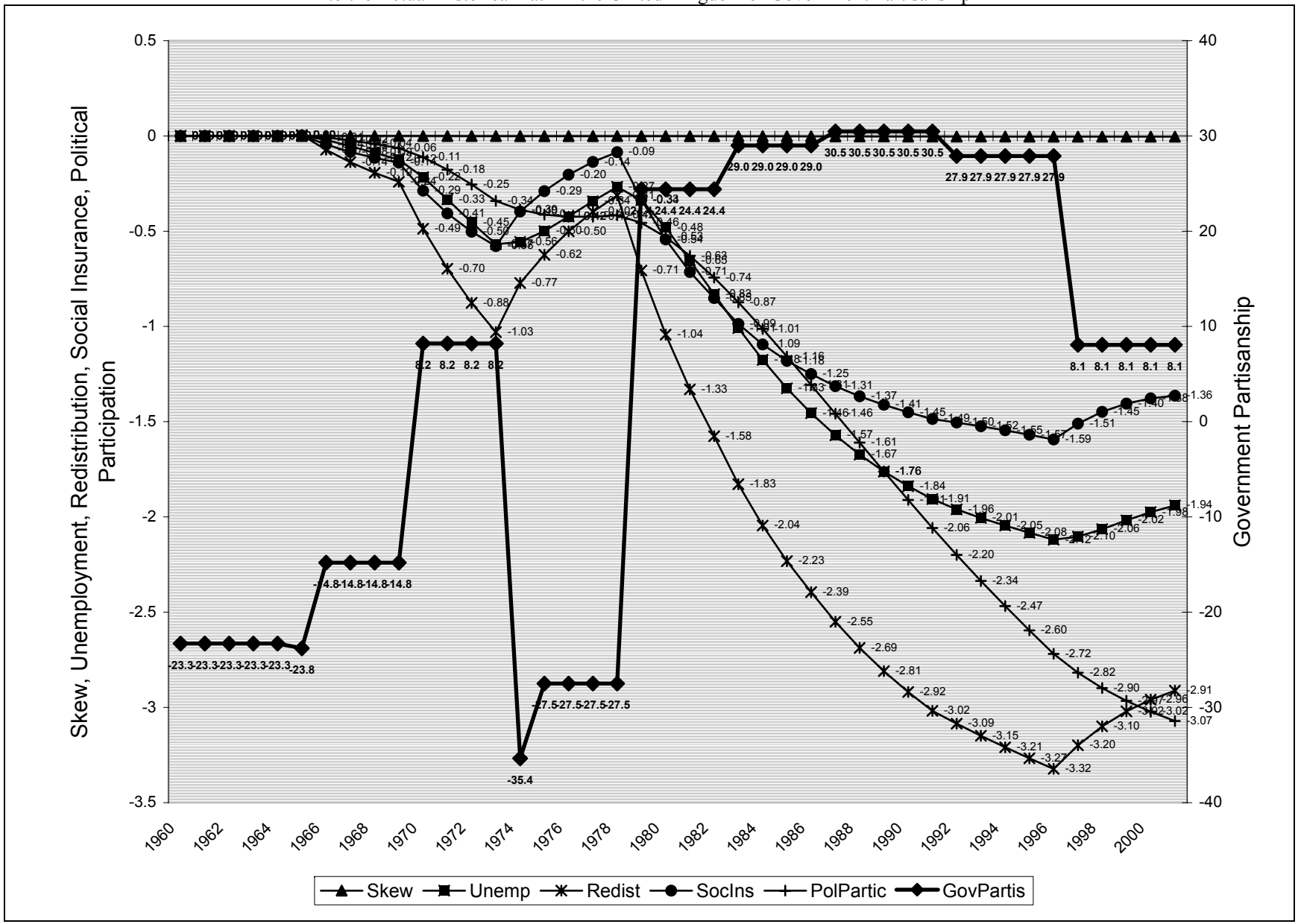


Table 1: Empirical System of Skew, Unemployment, Redistribution, Social-Insurance, & Participation—Estimation Results

	Skew	Unemp.	Redist.	Social Insurance	Political Participation
Time-Lag	***0.8196*** *0.0361*	***0.6364*** *0.0318*	***0.9151*** *0.0322*	***0.8062*** *0.0484*	***0.9269*** *0.0208*
GFrag×Time-Lag	—	—	**0.0031** 0.0119	***0.0212*** *0.0110*	—
GPol×Time-Lag	—	—	**-0.0002** 0.0005	**-0.0002** 0.0006	—
Spatial-Lag	***0.0809*** *0.0308*	***0.2069*** *0.0450*	***0.1275*** *0.0575*	***0.2232*** *0.0595*	—
U	—	—	—	***-0.0577*** *0.0377*	**-0.0421** 0.0562
S	—	—	***12.1539*** *3.3458*	***8.4677*** *3.2131*	***1.9459*** *1.2057*
P	—	—	***0.2145*** *0.0871*	***0.2080*** *0.0842*	—
S×P	—	—	***-0.1201*** *0.0461*	***-0.1069*** *0.0433*	—
R	**0.0002** 0.0012	***0.0495*** *0.0331*	—	**0.0143** 0.0230	***0.0918*** *0.0468*
I	—	***0.3950*** *0.0470*	***-0.1077*** *0.0469*	—	**0.0571** 0.0796
Pop65	***-0.0048*** *0.0032*	**-0.1111** 0.0835	**0.0060** 0.0706	**-0.0022** 0.0685	***-0.1585*** *0.0747*
Pop14	***-0.0039*** *0.0020*	***-0.0907*** *0.0551*	**0.0078** 0.0470	**-0.0340** 0.0395	—
UDen	**-0.0005** 0.0005	**0.0025** 0.0131	**0.0049** 0.0133	**0.0074** 0.0115	***0.0301*** *0.0108*
Corp	***-0.0040*** *0.0019*	**-0.0371** 0.0502	***-0.0774*** *0.0441*	***-0.0508*** *0.0347*	—
FinExp	***0.0027*** *0.0016*	**0.0323** 0.0409	—	—	—
TExp	**-0.0003** 0.0003	***0.0381*** *0.0094*	—	—	—
SMC	**0.0000** 0.0001	***-0.0152*** *0.0025*	***-0.0092*** *0.0019*	***-0.0084*** *0.0017*	—
SMR	**-0.0001** 0.0001	**0.0007** 0.0026	—	—	—
SMC×SMR	**0.0000** 0.0000	**0.0001** 0.0001	—	—	—
FLFP	**0.0002** 0.0005	***-0.1001*** *0.0166*	**0.0011** 0.0153	***-0.0320*** *0.0133*	**-0.0147** 0.0133
CumSDG	—	—	***-0.1348*** *0.0888*	***-0.1172*** *0.0761*	—
CumSDG×FLFP	—	—	***0.0026*** *0.0013*	***0.0026*** *0.0011*	—
CumSCG	—	—	—	**0.0115** 0.0171	—
ln(DMag)	—	—	***-0.0676*** *0.0438*	***-0.1092*** *0.0328*	**-0.0072** 0.0763
IPC	—	—	**-0.1801** 0.3157	**-0.1561** 0.2442	***-1.1866*** *0.5831*
EleDiff	—	—	**-0.0037** 0.0998	**-0.0471** 0.0863	***-0.1322*** *0.0575*
GFrag	—	—	**0.0643** 0.1746	**-0.1366** 0.1059	—
GPol	—	—	**0.0012** 0.0069	**0.0014** 0.0049	—
GPart	—	—	***-0.0096*** *0.0028*	***-0.0056*** *0.0024*	—
CurrCDG	—	—	**0.2439** 0.4105	**0.0084** 0.3122	—
E	—	—	**-0.0016** 0.0821	**0.0255** 0.0620	—
Pres	—	—	—	—	***-1.5602*** *0.6080*
PresProx	—	—	—	—	***2.3025*** *0.4866*
MandVote	—	—	—	—	***1.8808*** *0.5580*
RegReq	—	—	—	—	***-1.3230*** *0.6651*
Summary Statistics for Equations					
# Obs. - # Coeffs. = ° Free	311 – 29 = 282	311 – 30 = 281	311 – 40 = 271	311 – 42 = 269	311 – 15 = 296
R^2	.9797	.9508	.9835	.9860	.9891

NOTES: Equations estimated with country fixed-effects (omitted) simultaneously by iterated 3SLS, with S×P in addition to the five dependent variables treated as endogenous, and with year and country fixed effects in addition to all other regressors treated as instruments.

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