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## DISCUSSION PAPER SERIES

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# **THE POLITICAL ECONOMY OF REDISTRIBUTION IN THE U.S. IN THE AFTERMATH OF WORLD WAR II AND THE DELAYED IMPACTS OF THE GREAT DEPRESSION - EVIDENCE AND THEORY**

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## **ABSTRACT**

### **The Political Economy of Redistribution in the U.S. in the Aftermath of World War II and the Delayed Impacts of the Great Depression - Evidence and Theory**

The paper presents evidence of an upward ratchet in transfers and taxes in the U.S. around World-War II. This finding is explained within a political-economy framework involving an executive who sets defense spending and the median voter in the population who interacts with a (richer) agenda setter in Congress in setting redistribution. While the setter managed to cap redistribution in the pre-war period, the War itself pushed up the status-quo tax burden, raising the bargaining power of the median voter as defense spending receded. This raised the equilibrium level of redistribution. The higher share of post-War transfers may thus be interpreted as a delayed fulfilment of a, not fully satisfied, popular demand for redistribution inherited from the Great Depression.

JEL Classification: E62, E65, N11 and N12

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# 1 Introduction

Major wars frequently cause an upward ratchet in the overall size of government. Although the size of government recedes when the war is over, it often does not fully go back to its pre-war level. This type of ratchet has been well known for some time. Higgs (1987) for the U.S. and Peacock and Wiseman (1961) for the U.K., among others, argue that the share of government in the economy rises permanently as a result of major wars. Less attention has been paid to, potentially permanent, effects of wars on the composition of public expenditures. This paper deals with the composition of the U.S. budget during the twentieth century with a particular focus on the period between the onset of the Great Depression (GD) and the post-WW-II era. The paper opens by documenting the existence of substantial ratchets in the relation between the share of defense in GDP on the one hand and the shares of federal transfers and taxes and revenues before, during and following WW-II on the other.<sup>1</sup> Over the war cycle, the share of transfers is negatively related to the share of defense and the share of taxes (or revenues) is positively related to the share of defense. However, the increase in the share of transfers when the share of defense goes down after the War is significantly higher than the decrease in this share when defense expenditures go up at the beginning of the War. In parallel, the increase in the share of taxes or revenues per unit increase in the share of defense at the beginning of the War is significantly higher than the decrease in those shares per unit of decrease in the share of defense when the War is over.

It is instructive to compare those war ratchets with the experience during and following the GD. At the time, the GD was widely viewed by policymakers as an emergency similar to war. One may therefore legitimately ask whether the GD led to a permanent expansion of the shares of revenues and, in particular, of transfers. The answer is that after an initial decrease over the first two years of the GD, the share of federal revenues rose from about 3.6 percent in 1929 to over 7 percent of GDP and remained in this range till the end of the thirties. The share of transfers rose from less than 1 percent in 1929 to a peak of 3.3% in 1934, but fell back to about 2% around the end of the thirties. During and around WW-II, federal revenues rose from about 7.2% of GDP in 1939 to a peak of 19.6% in 1943. Although it receded after the war, the share of revenues during this period fluctuated within a substantially higher level (between 14.5% and 18.1%) in comparison to the immediate pre-war period. Transfers fell from 2% in 1940 to less than 1% in 1943, and then stabilized around or above 5% over the several post-war years. Thus, while the decade following the onset of the GD was characterized by (roughly) a doubling in the shares of federal revenues and of transfers, there was a further doubling in those shares between the pre-war and the post-war periods.

The remainder of the paper presents a theory that explains the WW-II ratchets in transfers and revenues within a framework characterized by micro-economic labor-leisure

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<sup>1</sup>In the following, "shares" for fiscal and related aggregate variables refer to shares of GDP, unless otherwise noted. Moreover, throughout all fiscal variables refer to those of the federal government.

decisions (subject to tax distortions) and decentralized fiscal policy decisions made by an executive branch that chooses defense spending and a congress where a relatively wealthy agenda setter interacts with a poorer median voter to determine the magnitude of transfers.<sup>2</sup> Under conditions of the type experienced by the U.S. economy at the eve of WW-II the model predicts upward ratchets in both transfers and taxes in the post-war period.

The interpretation of the actual course of history in terms of the model is as follows. The outbreak and persistence of the GD substantially raised the median voter's demand for redistribution and, by implication, for the taxes required to finance it. This popular demand was accommodated under Roosevelt's presidency largely through the creation of the social security system. However, due to the opposition of the relatively wealthier agenda setters in Congress who were concerned with the consequences of excessive increases in transfers for current and future tax burdens, the accommodation of popular demand for transfers was incomplete. Thus, the Meltzer and Richard (1981) type of conflict between wealthier and poorer individuals over the burden of taxation needed to finance transfer payments limited the satisfaction of popular demand for redistribution during the thirties. By contrast, in the face of the national emergency triggered by the outbreak of WW-II hostilities a solid majority supported higher (current and future) taxes to finance the defense effort, and taxes went up dramatically. WW-II ended, therefore, with a substantially higher tax burden than the status-quo burden prior to the war.

With the victory over Germany and Japan in sight the new status quo became too high for both the agenda setter in congress as well as for the median voter. Consequently both had an interest in lowering taxes. The setter because of his traditional dislike for large government and the median because the war had pushed taxes even beyond his ideal point. Under those circumstances the setter could successfully propose a budgetary package that would cut taxes to some extent and use the remaining "peace dividend" resulting from the fall in defense spending to increase redistribution. This package benefited both the setter and the median relative to the post-war tax status quo. The upshot is that the post-WW-II ratchets in transfers and taxes constituted a, long-delayed, reaction of the political establishment to the partially unsatisfied popular demand for redistribution in the aftermath of the GD. By raising taxes WW-II provided the "supply" of taxes to satisfy this demand.<sup>3</sup> A corollary is that, if WW-II had not taken place, transfer payments would have grown at a substantially lower level.

The paper also sheds light on why the ratchets associated with WW-II were not present

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<sup>2</sup>The formal model combines a microeconomic framework from Chapter 6 of Persson and Tabellini (2000) with an agenda setter of the type employed by Romer and Rosenthal (1982) to describe the choice of school expenditures by local governments in the U.S.

<sup>3</sup>Hercowitz and Strawczynski (2004) document the existence of an expenditure ratchet in the OECD economies. As tax revenues go up due to a higher tax base during expansions some of the higher base is used to raise expenditures. However, when the tax base goes down during recessions only part of the additional appropriations are rolled back. Thus, as in our paper, but for different reasons, the existence of additional revenues generates additional expenditures.

around WW-I. First, because the "war shock" itself was smaller, the need for higher war taxes and, consequently, the potential room for a peace dividend were smaller. Second, WW-I was not preceded by an event like the GD that created a substantial unsatisfied popular demand for redistribution. Finally, between the two World Wars the U.S. witnessed a dramatic expansion of the voting franchise and of political participation of groups (women and minorities) that were relatively more in favor of redistribution.

The paper is organized as follows. Section 2 presents empirical evidence on ratchets in federal transfers and revenues over WW-II. Section 3 introduces a model of political-economic interactions under full employment and Sections 4 and 5 develop its implications for shifts in the shares of defense and of transfers during the war and its aftermath. The main results of the theory concerning the existence of ratchets are contained in Section 5. In the spirit of robustness Section 6 extends the analysis to the case of excess capacity in the pre-war period. Section 7 documents (and offers an explanation for) the absence of a ratchet in transfers around WW-I, and Section 8 concludes. The Appendix contains some of the proofs. The Additional Appendix, which is not for publication but available from our websites, provides further (technical) details.

## **2 Background data and evidence on post WW-II ratchets in transfers and taxes**

### **2.1 Background data on the period between the onset of the GD and the post-WW-II era**

Table 1 provides key background macroeconomic and budgetary figures for periods from the onset of the GD through WW-II and its aftermath. Unemployment rose dramatically during the early thirties, reaching a maximum of about 25% in 1933. During the entire decade of the thirties defense spending remained at a level of barely over 1.5% of GDP. It then took off rapidly from 1940 to reach a maximum of 43% of GDP in 1944. In the ensuing years, the share of defense spending declined rapidly, but with a minimum of 6.8% in 1948 it remained substantially above the pre-war levels.

Most important from the perspective of this paper, while the share of transfers in GDP rose during the first couple of years of the GD, this share was invariably and substantially lower than the levels it attained after the war. This contrast is even more striking in view of fact that much of the rise in the share of transfers during the thirties occurred when output was either falling or low, while the post-war increase in transfers materialized against the background of a rising level of output. This data raises the possibility that the increased popular demand for redistribution triggered by the GD did not fully materialize until after WW-II possibly creating a post-war ratchet in the share of transfers. The following subsection documents the existence of such a ratchet and quantifies it more precisely.



## 2.2 Evidence on ratchets in transfers

Figure 1 plots the shares of transfers and of defense expenditures between 1929 and 2003. The figures are from the NIPA (2009) database which starts in 1929. The negative relation between the two shares is quite apparent from the figure during and around WW-II and the Korean War, and to a lesser extent during the Vietnam War.<sup>4</sup> This is confirmed by the formal regression analysis that follows.

Table 2 presents various regressions of the change in transfers on the change in defense expenditures controlling for expansions and contractions, and for serial correlation of the residuals. The data is yearly. The regression in Column (1) presents the combined effect (that is without allowance for the possible existence of a ratchet) of changes in defense spending on changes in total transfers. This regression reveals that defense spending exerts a negative effect on transfer payments and that this effect is statistically significant. Broadly speaking, when the share of defense in GDP goes up, the share of transfers in GDP goes down, and when the share of defense goes down, the share of transfers goes up.

All remaining regressions in the table allow the impact of defense expenditures to differ depending on whether defense expenditures go up or down, in order to test for the possible existence of ratchets. To this end, two new variables are defined. One is equal to the change in the share of defense expenditures when this variable is positive and zero otherwise, and the other is equal to the change in this share when it is negative and zero otherwise.<sup>5</sup> The regressions in Columns (2) - (4) aim at testing the existence of a ratchet in the impact of defense on the share of transfers for three alternative measures of transfers. The first, in Column (2), includes all current federal transfer payments for social benefits, veteran benefits and insurance, unemployment insurance and grants-in-aid to state and local governments. In the second, Column (3), the change in transfers excluding veteran benefits is used as the dependent variable.<sup>6</sup> The reason for also examining this concept is that, following wars, veteran benefits are expected to naturally grow as an immediate consequence of the war due to increased numbers of eligible veterans and their families even if other transfer payments do not increase. Examination of the impact of changes in the share of defense on changes in the share of transfers net of veteran benefits makes it possible to determine whether wars induce a general tendency of increases in transfers beyond transfers that are a more direct lagged consequence of the war effort.

The regression in Column (4) additionally excludes from federal transfers grants-in-aid to state and local governments. The netting out of such grants is motivated by the observation that at least part of those grants may be used to provide local public goods that differ

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<sup>4</sup>The war years are 1942-1945 for WW-II, 1951-1953 for the Korean War and 1967-1970 for the Vietnam War.

<sup>5</sup>We also experimented with specifications in which the regression constant was allowed to vary depending on whether the share of defense goes up or down. Since the difference between the intercepts was not significant and the coefficients of the other variables remained virtually the same, we do not present those results.

<sup>6</sup>This variable is calculated by subtracting the share of veteran benefits and veteran life insurance from the share of transfers.

conceptually from income transfers to individuals. Obviously, a first-best procedure would have been to subtract only the part of such grants that is not subsequently transferred directly by state and local governments to individuals. But data limitations preclude this. The current regression partially addresses this issue by assuming that all grants-in-aid are used for the provision of local public goods implying that they too should be subtracted in their entirety from transfers. By contrast the regressions in Columns (2) and (3) assume that those grants are used only for transfers to individuals implying that they should not be subtracted.

Together, the regressions in Columns (2) - (4) thus provide a broader perspective on the robustness of the results. They uniformly support the conclusion that the negative effect of defense on transfers is strongly in evidence when the share of defense goes down and is absent when this share goes up. In particular, the impact of defense on transfers is negative and quite significant when the share of defense goes down but insignificant when it goes up. Furthermore, the F-test statistic measuring the significance of the difference between the impacts of up and down movements in the share of defense are all highly significant. Those findings support the existence of a significant ratchet in the effect of defense on transfers.<sup>7</sup>

We also reran the regression in Column (2) for two different subperiods to examine whether the existence of the ratchet depends on the presence of the GD and of WW-II. Correspondingly, in Column (5) the period of the GD (1929- 1936) is omitted, while Column (6) reports the regression with data starting in 1948, in order to exclude WW-II and its immediate aftermath. Exclusion of the GD does not change the finding that there is a significant ratchet. However, when WW-II is excluded from the sample, the ratchet disappears, supporting the conclusion that the ratchet in transfers is strongly related to this particular war. These results are preserved if we exclude veteran benefits from transfers and if we exclude both veteran benefits and grants-in-aid to state and local governments from transfers (see Additional Appendix).

It is interesting to examine whether there is a transfers' ratchet, similar to that around WW-II, also around WW-I. While the NIPA data starts only in 1929, the U.S. Census Bureau (2006) contains data over the entire 20th century. Prior to 1929 the bulk of transfers was composed of veteran benefits. Probably because of that the longer and older Census data set does not contain transfers other than veteran benefits. Using a linked time series constructed in Beetsma et al. (2005) the regression in Column (2) of Table 2 has been replicated for the entire 20th century (see Additional Appendix). This regression reveals again the existence of a ratchet. However, when the same regression is re-estimated, while counterfactually setting the movements in the share of defense spending to zero for

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<sup>7</sup>Our total transfer series also includes a component labelled "Other current transfers to the rest of the world (net)". Since the bulk of the increase in this item occurred only since 1948 it cannot be responsible for the immediate post-WWII ratchet in transfers. We have, nonetheless, redone the previous regressions, while excluding this component from our transfer series, and found that the ratchet effect remains highly significant, although its magnitude is somewhat smaller.

the years 1940-1947, the ratchet in transfers disappears, indicating that there is no ratchet effect associated with WW-I.

To get a quantitative evaluation of the impact of the WW-II ratchet on the post-war path of transfers we perform a counterfactual experiment aimed at the evaluation of the evolution of the post-war share of transfers if the war had not occurred. More precisely, we use the coefficient estimates from Column (2) of Table 2 to calculate the post-war evolution of transfers under the assumption that the increases and subsequent decreases in the share of defense expenditures associated with the war from 1940 to 1947 did not materialize. This calculation is performed by counterfactually setting to zero all changes in the share of defense spending during those years. Performing this procedure, which neutralizes the effect of the war-related ratchet on the post-1948 share of transfers, we find that under the counterfactual the share of transfers as of 1948 would have been lower by 4.0 percent of GDP. If instead we base ourselves on the estimates in Column (3) of Table 2 this number drops to 2.8 percent. Hence, to sum up, the war ratchet contributes significantly to the permanent increase in the share of transfers in the post-war period.

### 2.3 Evidence on ratchets in revenues and taxes

This subsection explores the potential presence of war-related ratchets for the shares of federal taxes and federal revenues.<sup>8</sup> This is done by regressing alternative indicators of the change in federal receipts as a fraction of GDP on the change in the share of defense in GDP, while controlling for the phase of the business cycle and for serial correlation. As before, all regressions allow the coefficient on the change in the share of defense to differ depending on whether this share goes up or down.

Since, during wars, the national debt goes up and needs to be repaid after the war, it is natural to expect that the share of taxes or revenues will not go down all the way to its pre-war level.<sup>9</sup> Thus, a ratchet in taxes or revenues may be caused solely by the need to amortize the debt that has been accumulated during the war. To examine whether wars induce a ratchet beyond this mechanism, we also estimate regressions with an adjusted share of taxes (TAXADJ) or revenues (REVADJ) as the dependent variable. Variable TAXADJ (or REVADJ) is defined as total federal taxes (or revenues) minus interest payments on the public debt, minus debt repayment, and minus defense expenditures as shares of GDP.<sup>10</sup> This adjusted share of taxes or revenues measures, in each year, the

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<sup>8</sup>In addition to taxes, federal revenues include various fees and income from assets owned by the federal government.

<sup>9</sup>A formalization of this idea is Barro's (1979) tax smoothing hypothesis. In the extreme case in which a war is a total single surprise it implies that from that point in time and on the tax rate jumps up to a new higher and constant level and remains there until new information about public spending needs becomes available.

<sup>10</sup>Debt repayment is defined as end-of-current-year nominal debt minus end-of-previous year nominal debt divided by nominal GDP. While all other variables refer to calendar years, the original debt data refers to the end of the fiscal year. The fiscal year ends on June 30 during 1929-1952, on December 31 during 1953-1985 and on September 30 between 1986 and 2003. We construct end-of-calendar-year outstanding nominal debt figures for the periods 1929-1952 and 1986-2003 in two steps. First, the rate

amount of resources left to finance transfers and civilian government expenditures, after debt service and defense expenditures have been taken care of.

Table 3 shows the impact of defense spending on federal taxes, federal revenues, and on the adjusted values of those two variables. For unadjusted taxes and revenues (Columns (1) and (2)) the impact of defense is positive and significant both in the case in which the share of defense goes up, as well as in the case in which it goes down. Strikingly, the coefficient of defense is about four times higher when the share of defense goes up than when the share of defense goes down. The last row of the table confirms that this difference is statistically significant implying that this ratchet is unlikely to be a statistical artifact.

However, as argued above, this ratchet may just reflect the debt service associated with war deficits. The regressions for adjusted taxes and revenues in Columns (3) and (4), respectively, make it possible to examine whether the ratchet survives when the needs created by debt service and defense expenditures are neutralized. The impact of the share of defense, although still positive, is no longer significant when this share goes up. Interestingly, the impact of defense is now negative and significant when the share of defense goes down implying that the share of resources available to finance the sum of transfers and civilian federal expenditures goes up when the share of defense goes down. The last row of the table shows that the difference between the “defense up” and the “defense down” coefficients is statistically significant implying that there is a ratchet in adjusted federal taxes and revenues as well. The broader meaning of this finding is that a symmetric war cycle in which the share of defense first goes up and then comes back down to the pre-war level is associated with an increase in the share of taxes or revenues available to finance non-defense spending and transfers.

We also explored whether the ratchets in (adjusted) taxes and revenues are preserved when we change the sample period. Leaving out the period of the GD (1929-1936) preserves the ratchet in each of the four regressions of Table 3. However, all ratchets disappear if we also leave out WW-II, implying that the ratchets in (both adjusted and unadjusted) taxes and revenues are due to developments in defense spending and taxation during and around WW-II.

## 2.4 Evidence on income tax rates during and around WW-II

During WW-II statutory tax burdens were raised substantially and personal filing requirements were broadened permanently. Table 4 presents evidence on the evolution of average income tax burdens at various levels of income during the period between 1939 and 1948.<sup>11</sup>

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of growth of the nominal debt between the end of the fiscal year that occurs within calendar year  $j$  and the end of the fiscal year that occurs within calendar year  $j+1$  is calculated. Second, an appropriately prorated value of this growth rate is applied to the debt figure available at the end of the fiscal year that occurs within calendar year  $j$  to calculate the debt figure at the end of this calendar year.

<sup>11</sup>The figures in the table are calculated as tax payments divided by taxable income, where taxable income is income minus deductions.

The table shows that, as the U.S. went into the war, tax burdens at all income levels increased and the tax base widened as well (for example, individuals with taxable incomes of \$1,000 who did not pay taxes during the thirties started paying taxes as of 1940). This process was reversed only marginally after the war; at all income levels average income taxes in 1948 were substantially higher than in 1939. This evidence supports the view that the post-WW-II ratchet in the share of federal taxes is largely due to a parallel ratchet in federal tax legislation.<sup>12</sup>

An additional contributing factor to the ratchet in federal taxes was the extension of filing requirements to lower taxable incomes at the end of the thirties and its gradual extension over the war period. In 1942 Roosevelt proposed and managed to enact the Revenue Act of 1942 (also known as the Victory Tax). This was the broadest and most progressive tax in American history. The number of income taxpayers increased from 4 millions in 1939 to 43 millions in 1945 (U.S. Treasury, 2009). Before the war less than 15 millions individuals filed an income tax return. After the war this number rose to about fifty millions (Higgs, 2007). The federal government was now covering more than half of its expenditures with the new income tax revenue.

### 3 A political-economy model of interactive fiscal decisions about transfers and defense expenditures

#### 3.1 General structure

This section presents a model that is used in subsequent sections to identify political economy factors responsible for the WW-II ratchets documented in the previous section. The model consists of a large number of individuals, an executive branch and an agenda setter located within the legislative branch of government (Congress). Each individual decides how much to work and to consume subject to his time constraint. There is a proportional tax,  $t$ , on labor income and each individual receives a transfer,  $r$ , from the government. Government expenditures consist of total transfers,  $R$ , to individuals and of defense expenditure,  $G_d$ . The government's budget constraint is

$$R + G_d = (t_r + \frac{t_d}{f})Y, \quad 0 \leq t_r, t_d \leq 1, \quad 0 < f \leq 1. \quad (1)$$

Here  $Y$  is total income and  $t_r$  and  $t_d$  are the parts of the total tax rate,  $t = t_r + t_d$  ( $0 \leq t \leq 1$ ), required to finance respectively transfers and defense expenditures when the level of income is  $Y$ , and  $f$  is the fraction of defense expenditures financed by taxes (and the remainder through debt creation).

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<sup>12</sup>A similar picture arises if we consider statutory tax rates. Lowest and highest statutory tax rates went up from 4% and 79% in 1939 to maxima of 23% and 94%, respectively, in 1944 and 1945. After the war they came down only marginally to 16.6% and 82.13%. In addition, the thresholds for the second highest and the highest tax brackets came down in the run-up to and during the war and this too was reversed only very partially after the war.

There are three periods. The first corresponds to the pre-war period, the second to the WW-II period and the third to the first several years in the post-war period. Changes in external threats to U.S. security across these broad periods are captured by a war shock,  $w$ , whose size is inversely related to national security. Since population size is normalized to unity, total and per capita transfers are equal implying that  $r = R$ .

Within each period, the Executive chooses defense expenditures and, by implication, the associated tax rate,  $t_d$ , needed to finance those expenditures. The level of transfers and the associated tax rate,  $t_r$ , is determined by a game between voters and a relatively wealthier agenda setter in Congress. In making those decisions the Executive, the agenda setter and the public play Nash. The establishment of social security under Roosevelt in 1936 permanently provided each American with a minimal subsistence level. To capture this constraint we assume that, from the pre-war period and on,  $t_r$  was permanently bounded from below at a positive level,  $\bar{t}_r$ .

The model extends the framework of Meltzer and Richard (1981) and adapts it to economic developments prior to, during and following WW-II. The main extensions include: 1. incorporation of defense (a public good) into the analysis, 2. incorporation of endogenous changes in those expenditures across the three periods due to changing security threats, and 3. determination of transfers through a strategic interaction between an agenda setter in Congress and the median voter rather than by the latter alone. It is well known from the work of Romer and Rosenthal (1978, 1979) and others that political outcomes in the presence of an agenda setter depend on the status quo. Changes in status-quo tax rates during and after the war play an important role in our explanation of the post WW-II ratchet in transfers and taxes.

The analysis in Sections 3 - 5 assumes full employment. However, between 1939 and 1943 the rate of unemployment decreased from over 17 percent to less than 2 percent. To reflect this fact, the robustness analysis in Section 6 takes into consideration that the economy moved from excess capacity to full employment between the pre-war and the war periods.

### **3.2 Individual utility, employment, defense expenditures and the determinants of national security**

Utility of individual  $i$  is

$$c_i + v(x_i) + h(s), \tag{2}$$

where  $c_i$  is his consumption,  $x_i$  his leisure and  $s$  is national security. The functions  $v(\cdot)$ ,  $h(s)$  are (thrice, respectively twice) continuously differentiable, increasing and strictly concave. The linearity of utility in consumption is adopted for simplicity and is borrowed from Persson and Tabellini (2000, Chapter 6). Individuals may differ in their consumption and leisure, but they all experience identical utility from national security that is conceived as a pure public good. Consumption of agent  $i$  is

$$c_i = (1 - t) l_i + r, \quad (3)$$

where  $l_i$  represents effective hours worked at a real wage of 1. If the person does not work,  $l_i = 0$  and  $c_i = r$ . Agent  $i$ 's effective leisure,  $x_i$  is given by

$$x_i = 1 - q_d + e_i - l_i, \quad (4)$$

where  $e_i$  is the agent's ability. Ability is unequally distributed and its average over all agents is denoted by  $e$ . The formulation in (4) assumes that individuals with higher ability are more effective in producing utility through both market and non-market activities. Further,  $q_d$  represents the fraction of the labor force that is drafted into the army. The draft is unpaid and involuntary time spent in the army. National security is

$$s = \gamma \frac{G_d}{Y^s} + q_d - w, \quad \gamma > 0, \quad (5)$$

where  $Y^s$  is full employment output and  $w \geq 0$  is a war shock that exerts a negative impact on national security, and

$$G_d = q_d Y^s, \quad (6)$$

where  $G_d$  consists of military hardware and other goods required for the army but produced by the private sector. Equation (6) is the production function of those military goods. It states that their output is directly related to total output and to the fraction of individuals employed in this sector. (This fraction is assumed to equal the fraction of individuals in the armed forces for simplicity). Equation (5) states that national security is an increasing function of the fraction of individuals in the armed forces and of the share of defense expenditures in GDP. Although the functional form for the impact of  $G_d$  on national security is chosen mainly for convenience, it can be justified on the ground that more military goods are needed to provide a given level of national security when the economy is larger. Substituting (6) into (5) and simplifying, we obtain:

$$s = (1 + \gamma) q_d - w, \quad \gamma > 0. \quad (7)$$

### 3.3 Individual choices and full employment output

Individual  $i$  takes  $r, t, s$  and  $G_d$  as given and chooses  $l_i$  and  $x_i$  so as to maximize his utility in equation (2). This is equivalent to the maximization of

$$c_i + v(x_i), \quad (8)$$

subject to the individual budget constraints in equations (3) and (4). At an internal maximum the solution for  $l_i$  is

$$l_i = 1 - q_d + e_i - v_x^{-1}(1 - t), \quad (9)$$

where  $v_x^{-1}(1-t)$  is the inverse of the first-order condition with respect to leisure,  $v_x = 1-t$ . Aggregating equation (9) over all individuals and provided everybody works

$$\int_0^1 l_i dF(e_i) = 1 - q_d + \int_0^1 e_i dF(e_i) - v_x^{-1}(1-t) = 1 - q_d + e - v_x^{-1}(1-t) = Y^s. \quad (10)$$

The next-to-last equality follows from the fact that the marginal productivity of effective labor is constant and equal to one. Since the aggregation in equation (10) is done under the assumption that everybody works, it equals full employment output  $Y^s$ . Substituting (10) into (4) the equilibrium level of effective leisure is

$$x_i = v_x^{-1}(1-t) \equiv x, \text{ for all } i's. \quad (11)$$

Using (11) in (4) and rearranging

$$l_i = 1 - q_d + e_i - v_x^{-1}(1-t) = Y^s + e_i - e \equiv Y_i^s. \quad (12)$$

Thus, under full employment the difference between the output of individual  $i$  and average output is equal to the deviation of his ability from the average ability in the population.

### 3.4 Choices of $q_d$ and $t_d$ by the Executive under full employment

The Executive is a Benthamite. He picks  $q_d, G_d$  and  $t_d$  so as to maximize the sum of the utilities of all individuals given by

$$\int_0^1 [c_i + v(x_i) + h(s)] dF(e_i). \quad (13)$$

Substituting equations (3), (4), (6), (7) and (11), along with the identity  $t \equiv t_r + t_d$  into equation (13), the problem of the Executive is to choose  $q_d, G_d$  and  $t_d$  so as to maximize

$$(1 - t_d - t_r)Y^s + v(v_x^{-1}(1 - t_d - t_r)) + h((1 + \gamma)q_d - w) + r. \quad (14)$$

WW-II was financed by a combination of taxes and of deficits. Over the war years (1942-1945) the average shares of current tax revenues and of deficits in GDP were 17.5 percent and 22.6 percent respectively.<sup>13</sup> Under the simplifying (but largely factually correct) assumption that, during the war and the initial post-war periods, the entire deficit was used for defense purposes the financing constraint of the Executive can be formulated as

$$fG_d = t_d Y^s. \quad (15)$$

Accounting explicitly for the political-economic intertemporal considerations that led to this structure of financing during the war and the post-war periods is beyond the scope of

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<sup>13</sup>By contrast in the pre-war years, starting with Roosevelt's inauguration (1933-1941), those shares were 2.5 and 5.8 respectively.



our framework. We therefore take the values of  $f$  during the war and the initial post-war periods as exogenous. Equations (6) and (15) imply that

$$t_d = fq_d. \quad (16)$$

Using this relation in (14) the problem of the Executive reduces to choosing  $q_d$  so as to maximize (while taking as given the shock  $w$ , transfers  $r$  and the tax rate  $t_r$ )

$$W(q_d) \equiv (1 - fq_d - t_r)Y^s + r + v(v_x^{-1}(1 - fq_d - t_r)) + h((1 + \gamma)q_d - w). \quad (17)$$

The first- and second-order conditions for an internal maximum for  $q_d$  are

$$\frac{\partial W}{\partial q_d} = -fY^s - (1 - fq_d - t_r) + (1 + \gamma)h'(\cdot) = 0, \quad (18)$$

$$\frac{\partial^2 W}{\partial q_d^2} < 0 \Leftrightarrow (1 + \gamma)^2 h'' < -f \left( 2 + \frac{f}{|v_{xx}|} \right). \quad (19)$$

Fulfilment of the second-order condition requires sufficiently strong concavity in the utility of security and/or a sufficiently large effect  $\gamma$  of defense spending on national security. In the sequel we assume that the second-order condition (19) is fulfilled.

The following claim summarizes the impacts of the war shock,  $w$ , on the draft, on defense taxes and on the share of defense expenditures in GDP under full employment for a given level of  $t_r$ . All proofs are in the Appendix.

**Claim 1:** For a given level of  $t_r$ , under full employment an increase in the war shock:

- (i) raises  $q_d$  and  $t_d$ .
- (ii) reduces total output.
- (iii) raises the share of defense expenditures in GDP.

### 3.5 Political choice of $r$ and $t_r$ under full employment

Redistribution,  $r$ , and the part of the tax rate required to finance it,  $t_r$ , are determined through a political interaction between the general public and an agenda setter in Congress. The median in the general public may be thought of as being represented by the median in the full Congress floor. The real-life counterparts of the model's setter are committees such as the Appropriations and Ways and Means Committees that possess gate-keeping authority over the legislative agenda. While bargaining over transfers the setter and the median take the variables  $q_d$  and  $t_d$  chosen by the Executive as given.

#### 3.5.1 Choice of $r$ and $t_r$ when the individual with median ability is decisive

In the absence of a setter  $r$  and  $t_r$  are determined by majority voting. We investigate this particular case first and subsequently use the emerging equilibrium as an input into the

construction of the political equilibrium in the presence of an agenda setter. The indirect utility function (IUF) of voter  $i$  is given by

$$(1 - t_d - t_r) l_i^* + r + v(1 - q_d + e_i - l_i^*) + h((1 + \gamma) q_d - w), \quad (20)$$

where  $l_i^*$  is the individually-optimal level of effective labor. Hence, as a voter, the problem of individual  $i$  is to choose  $r$  and  $t_r$  so as to maximize equation (20), subject to the budget constraint

$$r = t_r Y^s. \quad (21)$$

Substituting this constraint along with equations (11) and (12) into (20), the problem of individual  $i$  is to pick  $t_r$  so as to maximize

$$(1 - t_d) Y^s + [1 - (t_d + t_r)] (e_i - e) + v(v_x^{-1} (1 - t_d - t_r)), \quad (22)$$

where we have omitted the term in  $h(\cdot)$  since it does not depend on  $t_r$ . Using  $dv_x^{-1} (1 - t_d - t_r) / dt_r = -1/v_{xx}$ , the first- and second-order conditions for an internal maximum are

$$\frac{1 - t_d - v_x}{v_{xx}} + (e - e_i) = \frac{t_r}{v_{xx}} + (e - e_i) = 0, \quad (23)$$

$$\frac{v_{xx}^2 + (1 - t_d - v_x)v_{xxx}}{v_{xx}^3} = \frac{v_{xx}^2 + t_r v_{xxx}}{v_{xx}^3} < 0, \quad (24)$$

where the second equalities in those conditions are obtained by using each individual's optimality condition at the micro level,  $v_x = 1 - t_d - t_r$ . We assume that the condition in equation (24) is satisfied in the entire range of  $t_r$ .<sup>14</sup> This implies that the indirect utility function in equation (22) is globally concave and therefore single-peaked in  $t_r$ . Hence, the voter at the median  $e_m$  of the distribution of abilities is decisive and the political equilibrium converges on his ideal tax rate for  $t_r$ . We refer to this individual as the median voter (MV). Rearranging equation (23) the MV's ideal point in the  $t_r$  space is

$$t_r^{Im} = -v_{xx} \cdot (e - e_m). \quad (25)$$

**Assumption 1:** The mean-median spread of abilities is positive or

$$e - e_m > 0. \quad (26)$$

In particular, we shall focus only on cases such that  $\frac{t_r}{v_{xx}} + (e - e_m) > 0$ , where  $t_r \geq 0$ .<sup>15</sup>

Claim 2 presents comparative statics results concerning the impact of this spread and of  $t_d$  on the ideal point of the MV.

**Claim 2:** Given Assumption 1 and provided  $v_{xxx} \geq 0$ <sup>16</sup>

<sup>14</sup>An overly restrictive sufficient condition for this is that  $v_{xxx} \geq 0$ .

<sup>15</sup>This condition requires that inequality be sufficiently large to dominate the negative contribution of  $\frac{t_r}{v_{xx}}$ . It is needed only for the proof of Proposition 2.

<sup>16</sup>This condition is trivially satisfied for a quadratic function  $v$ . In any case, it is sufficient but not strictly necessary for the statements in the claim.

- (i) Holding  $t_d$  constant,  $t_r^{Im}$  is an increasing function of the mean-median spread.
- (ii)  $t_r^{Im}$  is a non-increasing function of  $t_d$ . It is strictly decreasing in  $t_d$  when  $v_{xxx} > 0$  and independent of  $t_d$  when  $v_{xxx} = 0$ .
- (iii) The impact of  $t_d$  on  $t_r^{Im}$ ,  $dt_r^{Im}/dt_d$ , is smaller than one in absolute value.

### 3.5.2 Choice of $r$ and of $t_r$ in the presence of an agenda setter.

Shepsle and Weingast (1981) and others have emphasized the fact that various political institutions moderate some of the inherent instabilities associated with direct democracy. In particular, specialized committees in the U.S. Congress typically possess the power to set legislative agendas in their respective areas. In the area of appropriations the role of the Ways and Means and the Appropriations Committees are central. Detailed accounts of the operation and power of those committees appear in Fenno (1966, 1973). We model this state of affairs here by assuming that an agenda setter in Congress possesses gate keeping authority over the legislative agenda concerning  $t_r$  and that he is typically more conservative than the median in the full house. We think of the latter as representing the preferences of the MV in the population whereas the agenda setter represents the views and/or interests of more fiscally responsible and possibly wealthier individuals. This is formalized in the following assumption:

**Assumption 2:**  $e_s > e_m$  where  $e_s$  is the ability of the agenda setter in Congress.

**Claim 3:** Given Assumption 2 jointly sufficient conditions for the ideal point of the agenda setter in the  $t_r$  space (denoted  $t_r^{Is}$ ) to be lower than that of the MV ( $t_r^{Im}$ ) are  $v_{xxx} \geq 0$ , if  $e - e_s \geq 0$ , and  $\frac{v_{xxx}}{v_{xx}}(e - \tilde{e}) < 1$  for all  $\tilde{e} \in [e_m, e_s]$ , if  $e - e_s < 0$ .

The legislative interaction between the agenda setter (S) and the MV operates as follows. In any given period there is a status-quo redistributive tax rate,  $t_r^{sq}$ , determined by past fiscal decisions. The S has gate keeping authority over proposals concerning alternative redistributive tax rates. If he does not make a proposal the existing status quo prevails. If he does, the MV in the population as proxied by the full assembly of Congress votes for or against the new tax rate. If the median votes yes the new proposal replaces the existing status quo. Otherwise, the existing status quo prevails. When

$$t_r^{Is} < t_r^{sq} < t_r^{Im}, \quad (27)$$

the existing status quo is a stable equilibrium for the following reasons. The median desires to raise transfers above the status quo. Since preferences are single peaked he votes against any proposal to reduce status-quo transfers. Although he would like to reduce transfers below the status quo, the S abstains from bringing such a proposal up for vote since he realizes the proposal will be knocked down by the median. It obviously is not in the interest of the setter to propose a tax  $t_r$  higher than  $t_r^{sq}$  – so he refrains from that too. In the absence of any proposed alternative the status-quo tax rate prevails.

## 4 Shifts in political equilibrium between the pre-war and war periods

Following the first five years of the GD there was a change in approach to the role of government in providing a minimal level of well-being under hard economic circumstances. This change of approach led Roosevelt to establish the social security system as a permanent program in 1936, putting a lower bound on the institutionally feasible level of redistribution and, in parallel, on the redistribution tax rate required to finance it. We denote this tax rate by  $\bar{t}_r$ . During the late thirties parts of Congress and Roosevelt became concerned with excessive deficits and the size of government (Fishback, 2007). But popular demand for redistribution remained high and might have even increased as the ramification of the GD extended into the latter part of the thirties. It is therefore likely that the minimal level,  $\bar{t}_r$ , although higher than before the creation of social security, was nonetheless lower than the tax rate required to finance the demand for transfers by a majority of voters during the immediate pre-war years. We capture this state of affairs by postulating that in period 1, the redistribution tax rate was equal to its lower bound and that this was a politically stable equilibrium because the ideal point of the wealthier (and more fiscally responsible) agenda setter was below it, while the ideal point of the population's median was above it. More formally:

**Assumption 3a:**

$$t_{r1}^{Is} < \bar{t}_r < t_{r1}^{Im}. \quad (28)$$

By the argument at the end of the preceding section Assumption 3a implies that  $t_{r1} = \bar{t}_r$ . Between the pre-war period and the war (period 2)  $w$  went up from  $w_1$  to  $w_2$  implying by Claim 1-(i) that, for a given redistribution tax rate  $t_r$ ,  $t_{d2} > t_{d1}$ . In conjunction with the second part of Claim 2 this implies that, relative to period 1, the ideal point of the MV in the  $t_r$  space went down or did not change. We assume further that

**Assumption 3b:** The differences  $\bar{t}_r - t_{r1}^{Is}$  and  $t_{r1}^{Im} - \bar{t}_r$  are large enough to imply that, even after the increase in defense expenditures between periods 1 and 2 and the consequent changes in ideal points,  $\bar{t}_r$  remains bounded between the ideal points of the median and the setter. Formally,

$$t_{r2}^{Is} < \bar{t}_r < t_{r2}^{Im}.$$

To the extent that  $t_r^{Im}$  moves down this assumption puts a restriction on the magnitude of this downward movement. To the extent that  $t_r^{Is}$  moves up the assumption also restricts the upward movement in the ideal point of the setter.<sup>17</sup> Although this is assumed mainly for simplicity in the analysis of the next section, it appears reasonable in view of the

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<sup>17</sup>It is shown in the proof of Claim 5 below that in response to an increase in  $t_d$  the ideal point of the setter moves up or down between periods 1 and 2 depending on whether  $e - e_s$  is smaller or larger than zero, implying that the left-hand inequality of the assumption is binding only in the first case.

circumstances during the immediate pre-war and war periods. The argument at the end of the preceding section and Assumption 3b imply

**Claim 4:** The increase in war-related expenditures between periods 1 and 2 does not affect the redistribution tax rate. Formally,

$$t_{r1} = t_{r2} = \bar{t}_r. \quad (29)$$

Combined, Claim 4 and Claim 1, which applies when  $\bar{t}_r$  is held constant, imply that the increase in the war shock ( $w_2 > w_1$ ) raises defense spending between periods 1 and 2.

## 5 Ratchet in transfers due to shift in status-quo tax rate between war and post-war periods

With the victory over Germany and Japan external threats to U.S. security receded substantially. In terms of the model this means that the war shock,  $w$ , was lower in the post-war period than during the war. Formally,

$$w_3 < w_2. \quad (30)$$

However, due to the Cold War,  $w$  did not go all the way back to its pre-war level ( $w_3 > w_1$ ). To understand how (30) affects the evolution of tax rates between the war and post-war periods it is necessary to examine the political interactions between the MV, the S and the Executive. The interaction between the MV and the S depends on the status-quo redistribution tax rate in period 3, which is given by

$$t_{r3}^{sq} = t_2 - t_{d3} = t_{r2} + t_{d2} - t_{d3} = \bar{t}_r + t_{d2} - t_{d3}, \quad (31)$$

where we have made use of the relationship for total taxes  $t = t_r + t_d$  in periods 2 and 3. The motivation underlying this specification is as follows. The redistribution tax rate for period 3 is chosen through a political interaction between the S and the MV. When setting  $t_{r3}$ , the S and the MV take the total tax rate,  $t_2$ , inherited from the previous period, as well as the defense tax rate,  $t_{d3}$ , currently set by the Executive as given. Consequently, the transfer status-quo tax rate is equal to the difference between those two tax rates.

A complication is that, depending on the ultimate relative positions of  $t_{r3}^{Is}$ ,  $t_{r3}^{sq}$  and  $t_{r3}^{Im}$ , the political equilibrium that emerges from the strategic interaction between the S and the MV may produce several qualitatively different equilibria.

**Proposition 1:** There are, in principle, four possible configurations for the relative positions of  $t_{r3}^{Is}$ ,  $t_{r3}^{sq}$ ,  $t_{r3}^{Im}$  and  $t_{r3}^{em}$  in the  $t_{r3}$  space:

- Case 1:  $t_{r3}^{Is} < t_{r3}^{sq} < t_{r3}^{Im}$ ,
- Case 2:  $t_{r3}^{Is} < t_{r3}^{em} < t_{r3}^{Im} < t_{r3}^{sq}$ ,
- Case 3:  $t_{r3}^{em} < t_{r3}^{Is} < t_{r3}^{Im} < t_{r3}^{sq}$ ,

Case 4:  $t_{r3}^{sq} < t_{r3}^{Is} < t_{r3}^{Im}$ ,

where  $t_{r3}^{em}$  is the value of  $t_{r3}$  that provides the same utility as  $t_{r3}^{sq}$  to the MV given  $t_{d3}$ .<sup>18</sup>

**Proof:** When the war shock,  $w$ , recedes between the war and the post-war period,  $t_{r3}^{Is}$ ,  $t_{r3}^{sq}$ ,  $t_{r3}^{Im}$  and  $t_{r3}^{em}$  generally change their positions in the  $t_{r3}$  space. The four cases above exhaust all possible relative positions between the various redistribution tax rates subject to the facts that, by Claim 3,  $t_r^{Is} < t_r^{Im}$  in all periods including in particular the post-war period and that due to single-peakedness either  $t_{r3}^{em} < t_{r3}^{Im} < t_{r3}^{sq}$  or  $t_{r3}^{sq} < t_{r3}^{Im} < t_{r3}^{em}$  (see Additional Appendix). QED.

It turns out that the configuration in Case 4 does not arise in our framework. The following claim summarizes the result.

**Claim 5:** Under the conditions of Claim 3 it is always the case that  $t_{r3}^{sq} > t_{r3}^{Is}$ . Consequently Case 4 is excluded.

## 5.1 Characterization of political equilibrium in the post-war period

We turn next to a characterization of the political equilibria that arise in each the first three remaining cases of Proposition 1. We postulate

**Assumption 4:**

$$\bar{t}_r < t_{r3}^{em}.$$

This condition is likely to be satisfied when the indirect utility function of the MV is not too flat.

**5.1.1 Case 1:**  $t_{r3}^{Is} < t_{r3}^{sq} < t_{r3}^{Im}$

In this case, if  $t_{r3}^{sq} > \bar{t}_r$  (an inequality that we confirm below in Proposition 2), then period's 3 status quo  $t_{r3}^{sq}$  becomes the equilibrium redistribution tax rate in the post-war period. This follows immediately from the argument following equation (27).

**5.1.2 Case 2:**  $t_{r3}^{Is} < t_{r3}^{em} < t_{r3}^{Im} < t_{r3}^{sq}$

In this case, the MV and the S have a common interest in reducing the post-war redistribution tax rate below its status-quo (SQ) level as long as the MV is no worse off than under the SQ. Since preferences are single peaked there exists now a tax rate,  $t_{r3}^{em}$ , below the MV's ideal point that provides to the MV the same welfare as under the SQ. In general,  $t_{r3}$  may assume any value in the bargaining set defined by the open interval  $(t_{r3}^{em}, t_{r3}^{sq})$ . But, since he possesses a monopoly over the agenda, the setter appropriates all the surplus.<sup>19</sup> Given Assumption 4 period's 3 equilibrium redistribution tax rate is therefore  $t_{r3} = t_{r3}^{em}$ .

<sup>18</sup>The superscript "em" stands for "utility equivalent for the median voter". Further, here and in the sequel we ignore border configurations that demarcate the various cases.

<sup>19</sup>This assumption is commonly used in the political-economy literature.

### 5.1.3 Case 3: $t_{r3}^{em} < t_{r3}^{Is} < t_{r3}^{Im} < t_{r3}^{sq}$

In this case too both the S and the MV have a common interest in reducing the post-war transfer tax rate below its SQ level. However, it is not in the setter's interest to reduce it below his ideal point  $t_{r3}^{Is}$  (even though this would be in the interest of the MV). Since he controls the agenda, the S enforces an equilibrium at his ideal point so that  $t_{r3} = t_{r3}^{Is}$ .

It would appear from Claim 1 that, as the war shock recedes from  $w_2$  to  $w_3$ , the defense tax rate,  $t_d$ , goes down making the "peace bonanza",  $t_{d2} - t_{d3}$ , positive and implying that

$$t_{r3}^{sq} > \bar{t}_r = t_{r2} = t_{r1}. \quad (32)$$

However, Claim 1 has been derived for a constant level of  $t_r$ . As argued in the previous section this was indeed the case between the pre-war and the war periods. But, once  $t_{r3}^{sq}$  and  $t_{r2}$  differ from each other, the equilibrium value of  $t_r$  in period 3 is no longer equal to its period 2 equilibrium value and cannot be taken as given. Essentially, the problem is that the change in  $t_r$  triggered by the change in the SQ has a feedback effect on the choice of  $t_d$  by the Executive. As can be seen from equation (31) this affects  $t_{r3}^{sq}$  in turn. Thus  $t_{r3}$ ,  $t_{r3}^{sq}$  and  $t_{d3}$  are all determined simultaneously. This raises a question about whether  $t_{r3}^{sq}$  is higher than  $\bar{t}_r$  when the total impact of the decrease in the war shock is taken into consideration. It is convenient to conduct the analysis in terms of  $q_d$  rather than in terms of  $t_d$  since there is a simple positive relation between them. The *total* impact of  $w$  on  $q_d$  is given by

$$\frac{dq_d^T}{dw} = \frac{dq_d}{dw} + \frac{dq_d}{dt_r} \frac{dt_r}{dq_d} \frac{dq_d^T}{dw}, \quad (33)$$

where  $\frac{dq_d}{dw}$  is the direct effect of  $w$  on  $q_d$  and  $\frac{dq_d}{dt_r}$  is the partial effect of  $t_r$  on  $q_d$  (both obtained from the first-order condition for  $q_d$ ), while  $\frac{dt_r}{dq_d}$  is the partial effect of  $q_d$  on  $t_r$  (obtained from the first-order condition for  $t_r$ ). The second term on the right-hand side of equation (33) captures the indirect change in  $q_d$  triggered by the ultimate change in  $t_r$ . Since by Claim 1,  $\frac{dq_d}{dw} > 0$ , the total impact of  $w$  on  $q_d$  is positive if and only if

$$B \equiv 1 - \frac{dq_d}{dt_r} \frac{dt_r}{dq_d} > 0, \quad (34)$$

where  $\frac{dt_r}{dq_d}$  thus depends on which equilibrium materializes in period 3. Using (34) we can present the following proposition which makes precise the (mild) conditions under which defense spending increases as the war shock increases. For convenience we define  $\Delta Y^s \equiv Y_3^s - Y_2^s$  as the difference between output in periods 3 and 2.

**Proposition 2:** Let  $v_{xxx} \geq 0$ . Then,  $\frac{dq_{d3}^T}{dw_3} > 0$  and  $t_{r3}^{sq} > t_{r2}$  when either of the following cases occurs

- (i)  $t_{r3} = t_{r3}^{sq}$ ,
- (ii)  $t_{r3} = t_{r3}^{em}$  and

$$\left[ \frac{t_{r3}}{v_{xx}} + (e - e_m) \right] > [\Delta Y^s + (1 - t_{d3}) / f], \quad (35)$$

(iii.a)  $t_{r3} = t_{r3}^{Is}$  and  $e - e_s \geq 0$ ,

(iii.b)  $t_{r3} = t_{r3}^{Is}$  and  $e - e_s < 0$ , while  $\rho \equiv \frac{v_{xxx}}{v_{xx}} \leq 0$  is not too large in absolute value.

Inequality (35) is likely to be satisfied when inequality as characterized by the mean-median spread,  $e - e_m$ , is sufficiently high. In the sequel we assume this to be the case. The upshot is that there are three possible distinct equilibrium outcomes for the redistribution tax rate in the post-war period. They are

$$\begin{aligned} t_{r3} &= t_{r3}^{sq}, \\ t_{r3} &= t_{r3}^{em}, \\ t_{r3} &= t_{r3}^{Is}. \end{aligned} \quad (36)$$

Which of these three possible outcomes arises depends mainly on the magnitude of the decrease in external threats (characterized by the size of the decrease in the war shock,  $w$ ) between the war and the post-war period as well as on the shape of the median voter's indirect utility function. If the decrease in  $w$  from  $w_2$  is not too large the first equilibrium is more likely to arise than the other two. The reason is that (by Claim 2-(iii)) when defense expenditures decrease, the SQ transfer-tax rate moves up by more than the ideal point of the MV does. Since during the war the SQ transfer-tax rate is below the ideal point of the MV it will remain below it if the decrease in  $w$  (and therefore in defense expenditures) is moderate. But if the decrease in defense expenditures is sufficiently large the larger upward movement in the SQ will overcome the smaller upward movement in the MV ideal point so that the post-war SQ will end up being larger than the ideal point of the MV. In this case either one of the last two equilibria will arise.

What determines whether the second or the third equilibrium arises? This depends, *inter alia*, on how quickly the indirect utility function of the MV decreases when the redistribution tax rate deviates downward from the MV ideal point. If the MV indirect utility function is relatively steep in this range the second equilibrium is more likely. If it is relatively flat the third equilibrium may arise. In addition, the likelihood that the third type of equilibrium rather than the second occurs is higher, when the decrease in  $w$  between the war and the post-war periods is huge. The reason is that (given the steepness of the MV indirect utility function) the larger the decrease in defense expenditures the more  $t_{r3}^{sq}$  moves above the ideal point of the MV making the difference  $t_{r3}^{sq} - t_{r3}^{Im}$  "huge". As can be seen by inspecting the figure, the larger the difference  $t_{r3}^{sq} - t_{r3}^{Im}$ , the larger the difference  $t_{r3}^{Im} - t_{r3}^{em}$ , making it more likely that  $t_{r3}^{em}$  is below  $t_{r3}^{Is}$  so that the third type of equilibrium arises.

Since between the war and the post-war period defense expenditures went down by a lot we feel that one of the last two equilibria is nearer to the post-war reality. When asked about post-war prospects in the Fall of 1945 more than 75% of individuals backed up the



extension of social security to cover everybody that had a job (Public Opinion Quarterly, Fall 1945). This supports the view that popular demand for redistribution was strong in the immediate post-war period and makes it more likely that the MV indirect utility function declined rather steeply at the time. Both observations support the view that of the three possible equilibria above the second one in which  $t_{r3} = t_{r3}^{em}$  is the most likely.<sup>20</sup> This equilibrium is displayed in Figure 2.

The following proposition provides a condition under which Case 3 of Proposition 1 can be disregarded.

**Proposition 3:** If  $e - e_s < 0$ , then the equilibrium with  $t_{r3} = t_{r3}^{Is}$  is excluded.

**Intuitive proof** (full details appear in the Additional Appendix): The main idea is to continuously track the changes in the equilibrium value of  $t_{r3}$  as  $w_3$  (starting from  $w_2$ ), and thus also  $t_{d3}$  (by Proposition 2), continuously goes down. As  $t_{d3}$  (or, equivalently,  $q_{d3}$ ) goes down,  $t_{r3}^{sq}$  and  $t_{r3}^{Im}$  go up, but the former goes up by more (Claim 2). The system will go through various cases listed in Proposition 1. For a moderate drop in  $q_{d3}$  the equilibrium  $t_{r3}$  remains at  $t_{r3}^{sq}$  and Case 1 obtains. When  $q_{d3}$  drops further,  $t_{r3}^{sq}$  eventually becomes larger than  $t_{r3}^{Im}$  producing the Case 2 equilibrium. Once this configuration has been reached, it cannot be escaped, because when  $w_3$ , and thus  $t_{d3}$ , are falling further, the differences  $t_{r3}^{sq} - t_{r3}^{Im}$  and  $t_{r3}^{Im} - t_{r3}^{Is}$  keep on increasing. Moreover, under  $e - e_s < 0$ ,  $t_{r3}^{Is}$  will be decreasing, while, because of (35),  $t_{r3}^{em}$  will be increasing. QED

Given that the setter originates from the part of the population with relatively higher earning capacity, the restriction  $e - e_s < 0$  appears realistic. For brevity we shall use this assumption in the sequel. But the major results concerning the existence of ratchets in transfers and taxes developed in the following subsection hold for all three equilibrium configurations, including the case  $e - e_s \geq 0$  (proof not shown).

## 5.2 The political economy of the post-war ratchet in transfers

We are now in a position to shed light on a central (from the vantage point of this paper) political-economy mechanism responsible for the substantial increase in the share of transfers in GDP between the pre-war and the post-war periods. In the immediate post-war years this share took a quantum jump to more than double its value over the pre-war Depression years under Roosevelt (Table 1). This is somewhat surprising, because due to the GD the popular demand for transfers was, most likely, already high by historical standards during the pre-war years. So why was the demand for transfers not already satisfied before WW-II? As will become clear at the end of this subsection the theory also provides an explanation for this apparent puzzle.

<sup>20</sup>The large decrease in defense expenditures also raises the difference  $t_{r3}^{Im} - t_{r3}^{em}$  and (as explained in the text) this might operate in the opposite direction. The statement in the text is based on the joint presumptions that the MV indirect utility function is sufficiently steep and that the decrease in defense expenditures, although large, is not "huge".

Within the framework of the model a ratchet in transfers payments means that the post-war share of transfers is larger than the pre-war share. Since  $t_r$  also represents the share of transfers in GDP, it therefore suffices to show that  $t_{r3} > t_{r1}$ . The main result is summarized in the following proposition:

**Proposition 4:** There is a ratchet in the share of transfers between the pre-war and the post-war period (i.e.  $t_{r3} > t_{r1} = \bar{t}_r$ ) whenever either one of the following possible equilibrium outcomes arises:

- (i)  $t_{r3} = t_{r3}^{sq}$ ,
- (ii)  $t_{r3} = t_{r3}^{em}$ .

**Proof:**

(i) From part (i) of Proposition 2, the equilibrium outcome in this case is  $t_{r3}^{sq}$ . Since equilibrium defense expenditures go down between periods 2 and 3 (and using equation (31)),  $t_{r3}^{sq} > t_{r2} = t_{r1} = \bar{t}_r$ .

(ii) This equilibrium arises only under the configuration  $t_{r3}^{Is} < t_{r3}^{em} < t_{r3}^{Im} < t_{r3}^{sq}$ . Since, by Assumption 4,  $\bar{t}_r < t_{r3}^{em}$ , we have  $t_{r3} = t_{r3}^{em} > \bar{t}_r = t_{r1}$ .

Following is an intuitive summary of the main ideas embedded in the above propositions. The highly depressed state of the U.S. economy during the decade of the thirties caused a large increase in popular long-term demand for redistribution and, in parallel, for the higher redistributive taxes required to finance it. These demands were partially satisfied through the creation of social security in 1936. The creation of social security established a minimum long-term floor to redistributive taxes ( $\bar{t}_r$  in the model). But popular demand for redistribution, as reflected in the model through the preferences of the MV, was higher than this minimum. On the other hand, the level of redistributive taxes of the agenda setter in Congress was lower than the minimum tax rate mandated by social security. As a consequence  $\bar{t}_r$  became a stable equilibrium in the game between the S and the MV in the immediate pre-war years. Given that the war did not alter the ranking of the ideal points of the S and the MV and of  $\bar{t}_r$ , the pre-war level of redistributive taxation persisted throughout the war years as well.

The end of the war brought with it a substantial reduction in defense expenditures, and with it, the level of taxes needed to finance national security. As a consequence the status-quo redistributive tax rate went up by the peace dividend,  $t_{d2} - t_{d3}$ , making it larger than  $\bar{t}_r$ . The decrease in defense taxes also raised (or did not change) the ideal points of both the S and the MV. Those changes altered the relations between the ideal points of the S and the MV on one hand, and the status-quo redistributive tax rate on the other, and created new legislative bargaining opportunities between them. Our analysis has shown that, although the post-war increase in the status-quo redistributive tax rate may lead to different equilibria, these are always associated with a post-war ratchet in the share of transfers.

The intuition underlying these equilibria is as follows. In the first equilibrium, the new

SQ is larger than the ideal point of the S and lower than that of the MV. Consequently, the S and the MV want to move away from the SQ, but in opposite directions. The SQ therefore becomes the new equilibrium redistributive tax rate in the post-war period. Since, due to the peace dividend, the new SQ is higher than  $\bar{t}_r$  this leads to a post-war ratchet in the share of transfers. In the second case the new SQ is higher than the ideal point of the MV which is higher than the ideal point of the S. Now both the MV and the S have a common incentive to reduce the tax rate somewhat below the SQ as long as the MV remains at least at the same level of welfare as under the SQ. Under reasonable conditions this leads to a ratchet again, as is illustrated in Figure 2.

The upshot is that the post-WW-II ratchet in transfers constituted a long-delayed reaction of the political establishment to the increased popular demand for redistribution in the aftermath of the GD. A corollary is that, if the war had not taken place, transfer payments would have grown at a substantially lower level. First, popular demand for transfers was higher than actual transfers already in the pre-war period since agenda setters in Congress used their gate keeping authority in conjunction with existing SQ tax rates to maintain a lid on pre-war transfers. By changing the SQ regarding available taxes WW-II created a higher post-war SQ tax burden. This raised the bargaining power of the MV in the population which was used to belatedly satisfy some of the unfulfilled popular demand for transfers in the pre-war period.

### 5.3 The model also predicts a post-war ratchet in taxes

We turn now to the implications of the theory for the behavior of (total) taxes in the post-war period. We saw in the empirical section that, in parallel to the ratchet in transfers, there also was a post-war ratchet in the share of taxes (Table 3). This is consistent with the fact that the share of federal revenues in the first five post-war years was about twice their size in the five years immediately preceding the war (Table 1). Interestingly, in comparison to the war years, the share of revenues did not decrease appreciably. It turns out that for the possible equilibria the model predicts that there should be a post-war ratchet in the share of taxes. The following proposition summarizes the main result:

**Proposition 5:**

- (i) There always is a ratchet in total taxes,
- (ii) The share of total taxes in the post-war period is bounded from above by their share during the war period. Formally,

$$t_2 \geq t_3 > t_1. \tag{37}$$

**Proof:** The proposition is proved by showing that (37) holds for each of the possible equilibrium outcomes for  $t_{r3}$  and the associated levels of  $t_{d3}$ . We make repeated use of the fact that  $t_3 = t_{d3} + t_{r3}$ .

(i) When  $t_{r3} = t_{r3}^{sq}$ , using  $t_{r3}^{sq} = \bar{t}_r + t_{d2} - t_{d3}$  we have  $t_3 = t_{d3} + t_{r3}^{sq} = \bar{t}_r + t_{d2} = t_2 > t_1 = \bar{t}_r + t_{d1}$ . The last inequality follows directly from Claim 1 in conjunction with the fact that  $t_r$  does not change between periods 1 and 2.

(ii) The only configuration in which the equilibrium  $t_{r3} = t_{r3}^{em}$  arises is when  $t_{r3}^{Is} < t_{r3}^{em} < t_{r3}^{Im} < t_{r3}^{sq}$ . Hence, we have  $t_3 = t_{d3} + t_{r3}^{em} < t_{d3} + t_{r3}^{sq} = t_2$ . Also,  $t_3 = t_{d3} + t_{r3}^{em} > t_{d3} + \bar{t}_r > t_1 = \bar{t}_r + t_{d1}$ , where the penultimate inequality follows from Assumption 4. The last inequality is written as  $t_{d3} > t_{d1}$ . To prove this inequality, we differentiate the first-order condition of the Executive to give  $dt_d = k_r dt_r + k_w dw$ , where  $k_r$  and  $k_w$  are some positive coefficients. For a given value of  $t_r$ ,  $w_3 > w_1$  implies that  $t_{d3} > t_{d1}$ . Further, for a given value of  $w$ , an increase in  $t_r$  raises  $t_d$ . Hence, because  $t_{r3} = t_{r3}^{em} > t_{r1} = \bar{t}_r$ , it follows that  $t_{d3} > t_{d1}$ . (For a more detailed proof of  $t_{d3} > t_{d1}$ , see Additional Appendix). QED

## 6 Robustness: incorporation of excess capacity in the pre-war period

The years preceding World War II were characterized by high unemployment. In 1938 unemployment was 19%. In 1941, on the eve of the War, unemployment was still at 10%, while one and two years later it had shrunk to a bit less than 5% and 2%, respectively. This is consistent with the view that the draft and the additional defense expenditures triggered by the war lifted the economy out of its pre-war state of unemployment into one of full employment during periods 2 and 3.<sup>21</sup> Hence, period 1 of our model may preferably be characterized as one of Keynesian unemployment. For robustness purposes this section relaxes the full employment assumption for this period and derives conditions under which the main qualitative conclusions of the previous sections stand.

Equilibrium output is below potential when aggregate consumption demand plus government defense spending is lower than aggregate supply,  $Y^s$ , or formally

$$Y^d = \bar{C} + \beta Y^d + G_d < Y^s, \quad 0 < \beta < 1, \quad (38)$$

where  $Y^d$ ,  $\bar{C}$  and  $\beta$  are total aggregate demand, an autonomous component in consumption demand and the marginal propensity to consume out of income, respectively. When aggregate demand and supply are not equal, the actual level of output is determined by the short end of the market. We assume that under excess capacity a fraction  $\frac{Y^d}{Y^s}$  of the labor force manages to work at its individually-optimal level, while the remaining fraction,  $1 - \frac{Y^d}{Y^s}$ , is involuntarily unemployed. For simplicity, we assume that an individual's chance of becoming unemployed is independent of his ability. Hence, the average ability of the employed remains  $e$ . Since the unemployed do not work, they have no market income and

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<sup>21</sup>Barro and Redlick (2009) estimate the multiplier associated with defense spending for the U.S. over periods extending back to before WW-II. Their estimates are in the range of 0.6-0.7, but increase with the amount of slack in the economy.

consume, therefore, only the transfer,  $r$ . Equation (4) implies that the effective level of leisure of an unemployed worker is

$$x_{ui} = 1 - q_d + e_i. \quad (39)$$

Using equation (6) in equation (38) the latter can be rewritten as

$$Y^d = C^d + mG_d = C^d + mq_d Y^s < Y^s, \quad (40)$$

where  $C^d \equiv m\bar{C}$  and  $m \equiv \frac{1}{1-\beta}$  is the simple Keynesian multiplier. Note that when defense expenditures go up,  $Y^d/Y^s$  increases. Hence, the gap between aggregate supply and aggregate demand shrinks.

## 6.1 The Executive

The Executive now sets the draft and the associated defense expenditures at levels that maximize a weighted average of the welfare of the employed and of the unemployed where the (non-negative) weights are  $\eta$  and  $1 - \eta$  respectively, taking  $r$  and  $t_r$  as given. As a consequence the problem of the defense authority in equation (17) is replaced by

$$W(q_d) \equiv \eta [(1 - t_d - t_r)Y^s + v(v_x^{-1}(1 - t_d - t_r))] + (1 - \eta) \left[ \int_0^1 v(1 - q_d + e_i) dF(e_i) \right] + r + h((1 + \gamma)q_d - w), \quad (41)$$

where the bracketed term in the first line represents the component of the IUF specific to employed workers and the bracketed term in the second line represents the component specific to unemployed workers. A fully Benthamite executive may be expected to choose the weights  $\eta$  and  $1 - \eta$  in proportion to the fractions of employed and unemployed individuals in the economy. Here we deviate from this paradigm by assuming that:

**Assumption 5:** When choosing defense expenditures, the Executive cares relatively little about the utility of unemployed workers from leisure so that  $1 - \eta$  is close to zero and  $\eta$  is close to one.

Since defense executives are mostly concerned with the provision of security to the entire population, while maintaining a reasonable level of economic activity and well being this assumption does not appear as grossly unrealistic.<sup>22</sup> Given Assumption 5 the Executive's objective function in equation (41) is approximately given by the objective function of the Executive under full employment in equation (17). Consequently, the solution to the Executive's problem is the same as under full employment and Claim 1 applies independently of whether the economy is fully employed or not.

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<sup>22</sup>Note that Assumption 5 still allows the executive to weigh the security levels enjoyed by the two groups in proportion to their relative sizes in the population. In any case, we also worked out the case in which the Executive is fully Benthamite and derived sufficient conditions for the results under full employment to continue to hold. But a detailed discussion of this more elaborate case requires a substantial amount of space and is therefore omitted.

## 6.2 Choices of $r$ and $t_r$ in period 1 under direct democracy

Unemployed individuals pay no taxes. Hence their best tax rate (denoted  $t_r^{Iu}$ ) is the one that maximizes the per-capita transfer. Since he does not work this tax rate does not depend on the ability level of any particular individual within the group of the unemployed. Due to the existence of a Laffer curve trade-off the optimal redistribution tax of unemployed individuals is smaller than one. The existence of unemployed workers who do not internalize the costs of taxation eliminates the correspondence between the voter at the median of the ability distribution and the median of the ideal points in the  $t_r$  space. Consequently the former is no longer generally decisive in the presence of unemployment. But, provided all indirect utility functions (IUF) are single peaked, the voter at the median of ideal points is still decisive under direct democracy. A sufficient condition for the existence of a decisive voter is that the IUF's of all individuals are single peaked. The following claim establishes single peakedness for unemployed workers and characterizes their ideal point.

**Claim 6:** A sufficient condition for single peakedness of the IUF of unemployed voters is  $v_{xxx} \geq 0$ . Further, their common ideal point occurs at the peak of the Laffer curve. It is given by

$$t_r^{Iu} = -\frac{v_{xx}Y^d}{mq_d} > 0. \quad (42)$$

We turn next to employed individuals. The IUF of employed individual  $i$  is

$$(1 - t_d - t_r)(e_i - e) + (1 - t_d)Y^s + t_r [C^d - (1 - mq_d)Y^s] + v(v_x^{-1}(1 - t_d - t_r)),$$

and its first-order derivative (*FOD*) with respect to  $t_r$  (after using the condition  $v_x = 1 - t$  from the individual's micro problem) is given by

$$FOD(t_r) \equiv \frac{mq_d t_r}{v_{xx}} + C^d - (1 - mq_d)Y^s + e - e_i = 0, \quad (43)$$

Rearranging equation (43) the ideal redistribution tax rate of voter  $i$  is

$$t_r^I = \frac{1}{mq_d} \{ -v_{xx} \cdot [(e - e_i) - (Y^s - Y^d)] \}. \quad (44)$$

The second-order condition for an internal maximum for  $t_r$  is given by

$$\frac{1}{v_{xx}} \frac{v_{xxx}}{v_{xx}} > \frac{1 - 2mq_d}{mq_d t_r}. \quad (45)$$

Provided  $v_{xxx} > 0$  a sufficient condition for the fulfilment of this condition is that the marginal utility from leisure decreases slowly and/or that the coefficient of absolute prudence in leisure,  $\left| \frac{v_{xxx}}{v_{xx}} \right|$ , is relatively high.

However the ideal points of employed voters are not all internal. The reason is that in the case of voters with sufficiently high productivities ( $e_i$  is large)  $FOD(0)$  may be zero or negative. Since  $\frac{mq_d}{v_{xx}} < 0$  (and exploiting (47) below), for such voters  $FOD(t_r) < 0$  for

all  $t_r$  above zero. It follows that, for such voters, the IUF has a single peak at  $t_r^{Ii} = 0$ . Rearranging equation (43) the range of abilities,  $e_i$ , for which this is the case is given by

$$e_i \geq C^d - (1 - mq_d)Y^s + e \equiv e_c. \quad (46)$$

On the other hand, employed voters for whom  $e_i < e_c$  will possess internal ideal points in the  $t_r$  space. For those individuals we make the following assumption:

**Assumption 6:** For individuals with abilities in the range  $e_i < e_c$

(i) The condition in equation (45) holds for all  $t_r$  in the range  $(0, t_r^{Iu}]$ .

(ii) Let  $e^{\min}$  be the ability of the lowest ability individual in the population. This individual's optimal labor supply at  $t_r^{Iu}$  may be small but is still positive. From the individual's micro problem the formal condition for this restriction is

$$e^{\min} > v_x^{-1} (1 - t_r^{Iu}) - (1 - q_d). \quad (47)$$

Note that the peak of the Laffer curve at  $t_r^{Iu}$  represents an upper bound for the range of ideal points of employed individuals. The reason is that all individuals benefit from higher transfers but only employed individuals foot the bill. This tends to reduce their ideal tax rates below the peak of the Laffer curve. By contrast, since they do not pay taxes, this moderating effect is absent in the case of the unemployed. Hence, the ideal points of all employed workers satisfy<sup>23</sup>

$$t_r < t_r^{Iu}. \quad (48)$$

**Claim 7:** The IUF of any employed voter with ability below  $e_c$  has a single internal peak,  $t_r^{Ii}$ , whose explicit form is given by equation (44). This ideal tax rate satisfies

$$0 < t_r^{Ii} < t_r^{Iu}. \quad (49)$$

**Proof:** Since by Assumption 6-(ii) the lowest ability individual works at  $t_r^{Iu}$  so do, a fortiori, individuals with higher abilities. Hence the ideal points of all individuals in this group are given by equation (44). By the first part of Assumption 6 the IUFs of all those individuals are concave in the range  $(0, t_r^{Iu}]$ , while the IUF is decreasing at  $t_r^{Iu}$ . Hence, the IUF of individual  $i$  has a single peak at  $t_r^{Ii}$  for all individuals in this group. QED

The main consequence of the discussion above is summarized in the following proposition:

**Proposition 6:** Under excess capacity and given Assumption 6 the IUF of all voters are single peaked implying the existence of a decisive voter under direct democracy. The ideal transfer tax rate of the decisive voter is given by the median,  $t_r^{Id}$ , of ideal points in the space of ideal points.

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<sup>23</sup>At the peak of the Laffer curve,  $\frac{mq_d t_r}{v_{xx}} + C^d + mq_d Y^s = 0$ , hence  $FOD(t_r) = -Y^s + e - e_i = -Y_i^s < 0$ . Further, it is easy to see that for  $t_r > t_r^{Iu}$ , the IUF is decreasing in  $t_r$ .

Since, even at the peak of the Great Depression unemployment did not exceed 25 percent, we assume that the decisive voter under excess capacity is employed and that, as under full employment, it is still the case that  $e - e_d > 0$ . Since the decisive voter is employed the equilibrium transfer tax rate under excess capacity and direct democracy is given by equation (44) with  $e_i = e_d$ .

### 6.3 Choices of $r$ and $t_r$ in periods 1 and 2 with an agenda setter and the existence of ratchets in the post-war period

Analogous to Assumptions 3a and 3b for the case of full employment, we assume for the case of excess capacity (label "u" stands for "unemployment"):

**Assumption 3u:**  $t_{r1}^{Is} < \bar{t}_r < t_{r1}^{Id}$  and  $t_{r2}^{Is} < \bar{t}_r < t_{r2}^{Id}$ .

An argument similar to that made immediately following equation (27) in conjunction with Assumption 3u implies that  $t_{r1} = t_{r2} = \bar{t}_r$  so that  $t_r$  remains at  $\bar{t}_r$  over periods 1 and 2. Hence, Claim 1 applies and the increase in  $w$  raises defense  $t_d$  between the pre-war and the war periods.

Since both the war and the post-war periods are characterized by full employment the analysis of ratchets in transfers and taxes from the previous sections remains unaltered. The upshot is that the central implication of the model concerning the existence of these ratchets is robust to the incorporation of unemployment in the pre-war period.

## 7 Why was there no ratchet in transfers after WWI?

Evidence presented in Beetsma et al. (2005), as well as in the Additional Appendix, shows that there was no ratchet in transfers following WW-I. This raises an important question about why political-economy considerations of the type developed in the theory sections operated after WW-II but did not operate after WW-I as well. The answer suggested here relies on the implications of the theory in conjunction with the presumption that, following the GD and prior to the war, there was an unsatisfied popular demand for transfer payments since agenda setters in Congress only allowed partial accommodation of the MV demand for redistribution. By contrast, since there was no event of similar proportions prior to WW-I, popular demand for transfers was comparatively low.

The force of this explanation is reinforced by the observation that between the two World Wars the voting franchise roughly doubled and so did political participation.<sup>24</sup> Figure 3 shows the evolutions of the voting franchise and of political participation between 1900 and 2003 (see Additional Appendix for the construction details). The franchise

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<sup>24</sup>While the development of the franchise is taken as given in this paper, recent contributions have explored the sources of democratization. For example, Acemoglu and Robinson (2000, 2001) argue that the extension of the franchise in 19th century Europe was introduced as a precommitment device to future redistribution in order to prevent social unrest and revolutions. Related work by Ticchi and Vindigni (2007) explores the impact of international conflicts on domestic political institutions.



measure is based on the “voting eligible population” (VEP) as a share of the population that is at or above the minimum voting age. The big jump around 1920 is the result of the 19th Amendment to the Constitution in 1920, which extended female suffrage to the entire nation. However, already before the Amendment, female suffrage was rising as some states were granting voting rights to women in the preceding years.

The effective magnitude of the franchise is difficult to measure, because only registered voters are allowed to cast their vote. Registration is done at the state level and records are held at the state level. Registration requirements differ across states, although over time they have become more uniform. In the past, a variety of measures have been used to effectively limit registration.<sup>25</sup> Even if complete data on registered voters had been available, it might provide only an upper bound for actual participation in the political process, because many citizens who could register, if they had made the effort, chose not to do so. Since the franchise measure based on the VEP may be on the high side, particularly around 1920, Figure 3 also shows as an alternative proxy for political participation the actual number of voters in presidential elections as a share of the population of voting age. One may argue that this measure is even more appropriate for political-economy theories of redistribution of the type presented in the theory sections since it takes into account the lag between legal extension of the franchise and active political participation. Although it is generally lower than its franchise counterpart, the conclusion that active policy participation about doubled between the two World Wars is robust.

There is little doubt that the gradual lifting of restrictions on the franchise and of registration requirements between the two World Wars operated to raise the active political participation of lower income groups like women and blacks.<sup>26</sup> As a consequence, the income of the median voter in the post-WW-II period was further below mean income than in the post-WW-I period. By Claim 2-(i) the partial effect of this development was to raise the ideal point of the median voter in the  $t_r$  space. The upshot is that the increase in political participation of lower-income groups reinforced the impact of the increased demand for transfers due to the experience of the GD. In this context, it is worth to recall the public opinion poll (Public Opinion Quarterly, Fall 1945) in which over three quarters of the respondents were in favor of extending social security to cover everyone that has a job. In the same survey a bit over two thirds of the respondents also expressed a preference for reduction of taxes on personal income. As documented in Subsection 2.4 this desire was accommodated by legislators. The accommodation of both higher transfers and lower taxes was made possible (in line with our theory) by the post-war peace dividend that raised the status-quo transfer tax rate – thereby raising the bargaining power of the median voter.

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<sup>25</sup>These included restrictions on gender, race, poll taxes, literacy tests and minimum duration of residence.

<sup>26</sup>Lott and Kenney (1999) discuss consequences of these developments for the size of government. They argue that even women that share a household’s budget with their husband tend to be more in favor of redistribution than their husbands, because of the risk of divorce or becoming a widow.

Another difference between the two World Wars was the establishment of income tax withholding during WW-II, but not during WW-I. This eased the collection of taxes for both taxpayers and the IRS during WW-II. It also reduced taxpayers' awareness of the amount of taxes being collected, which made it easier to maintain higher taxes in the post-war period (US Treasury, 2009). It is likely that the persistence of withholding after WW-II was largely driven by the political developments discussed in this and the previous sections.

## 8 Concluding remarks

This paper documents empirically the existence of substantial ratchets in the shares of transfers and of revenues in the U.S. around WW-II. The paper explains these findings in the context of a political-economy model with an executive setting defense spending and a congress where a relatively wealthy agenda setter interacts with a poorer median voter to determine the amount of transfers. Our reading of the historical developments is that the outbreak and persistence of the GD substantially raised the median voter's demand for redistribution, but that agenda setters in Congress managed to partially prevent this demand from materializing. However, WW-II raised the status-quo tax burden and, as defense spending receded after the war, part of the resulting peace dividend could be channelled by the median voter towards redistribution. In other words, the post-WW-II ratchets in transfers and taxes constituted a, long-delayed, reaction to an increased popular demand for redistribution following the GD.

In conjunction with the fact that political participation about doubled between the two World Wars the model also explains the absence of a ratchet in transfers after WW-I. The paper argues that, although the increase in the franchise between the wars ultimately raised redistribution (as originally proposed by Meltzer and Richard, 1981) this process took place with extremely long lags due to two reasons. First, the existence of relatively wealthy agenda setters in Congress delayed a substantial part of the process until after status-quo tax rates were drastically altered by WW-II. Second there were substantial lags between extension of the franchise and political participation.<sup>27</sup>

Alesina and Angelotos (2005) argue that, when a majority of individuals in a country believe that income inequality is largely due to differences in talent, effort and entrepreneurship, redistribution is low. The U.S. is taken as a representative of this case. Conversely, if a majority attributes a larger role to factors like luck, corruption and connections that are largely independent of effort and talent, redistribution tends to be large. They produce cross-country evidence supporting the view that redistribution is higher in countries where beliefs are of the second kind.

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<sup>27</sup>This may also explain why the econometric evidence on the relation between the franchise and redistribution is mixed (Meltzer and Richard, 1983, and Perotti, 1996). However, using a panel of U.S. states Husted and Kenny (1997) provide evidence that an expansion of the franchise through the elimination of poll taxes and literacy tests led to higher welfare spending.

During wars individual fortunes depend less on private effort and talent and more on luck and social action than in peace time. Hence, by the same broad logic, one could expect that attitudes to government intervention and redistribution will be more favorable, even within the same country, during wars and their immediate aftermaths than during normal times. We have shown that, although the post-WW-II behavior of transfers in the U.S. is consistent with this view, their behavior in the post-WW-I period is not. This does not necessarily mean that the extension of the Alesina and Angelotos argument to the case of war versus peace is irrelevant for three reasons. First, U.S. involvement in WW-II was more disruptive and longer than in WW-I. Second, the memories of the GD, during which a large part of unemployment was involuntary, led (mostly the poorer) majority to develop a relatively more positive attitude towards redistribution after WW-II. Last but not least, since political participation of lower income groups was substantially lower in the aftermath of WW-I than after WW-II, the post-WW-I demand for redistribution, even if it had existed at the grassroots level, could not have been translated into effective political action.

Various instructive extensions of the current analysis are possible. One would be to extend the modelling framework to simultaneously account for both the absence of ratchets around WW-I and for their presence around WW-II. The increase in the franchise and in political participation would be natural components of such a model. An extended model may also account for other stylized features of the data such as movements in civilian public expenditures during and around the World Wars (see Beetsma et al., 2007). Finally, it would be interesting to explore the existence of ratchets in budgetary composition, including in particular transfers around major wars, also for other countries. Potential cross-country variations in suffrage and in the severity of the economic crisis of the 1930s may shed further light on the role of these factors in the generation of ratchets in the composition of budgetary expenditures.

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## Appendix

### Proof of Claim 1

(i) Applying the implicit function theorem to the first-order condition in equation (18)

$$\frac{dq_d}{dw} = -\frac{\frac{\partial}{\partial w} \left( \frac{\partial W}{\partial q_d} \right)}{\frac{\partial^2 W}{\partial^2 q_d}} = -\frac{-(1+\gamma)h''}{\frac{\partial^2 W}{\partial^2 q_d}} = (1+\gamma) \frac{h''}{\frac{\partial^2 W}{\partial^2 q_d}} = \frac{1}{f} \frac{dt_d}{dw},$$

where the last equality follows from equation (16). The second-order condition for a maximum in equation (19) implies that  $\frac{\partial^2 W}{\partial^2 q_d} < 0$ . Since  $h'' < 0$  and  $f > 0$ ,  $\frac{dq_d}{dw}$  and  $\frac{dt_d}{dw}$  are both positive. QED

(ii) We have  $\frac{dY^s}{dw} = \frac{dY^s}{dt_d} \frac{dt_d}{dw} = -\left(\frac{1}{f} + \frac{f}{|v_{xx}|}\right) \frac{dt_d}{dw} < 0$ .

(iii) The share of defense expenditures under full employment is given by

$$\frac{G_d}{Y^s} = \frac{q_d Y^s}{Y^s} = q_d.$$

Since, by Claim 1,  $q_d$  is increasing in  $w$ , so is share of defense expenditures in GDP. QED

### Proof of Claim 2

(i) Totally differentiating (25) with respect to  $(e - e_m)$  yields

$$\frac{dt_r^{Im}}{d(e - e_m)} = -v_{xx} + (e - e_m) \frac{v_{xxx}}{v_{xx}} \frac{dt_r^{Im}}{d(e - e_m)} \implies \frac{dt_r^{Im}}{d(e - e_m)} = \frac{-v_{xx}}{1 - \frac{v_{xxx}}{v_{xx}}(e - e_m)}.$$

Since the mean-median spread is positive,  $v_{xxx} \geq 0$  and  $v_{xx} < 0$  this expression is positive.

QED

(ii) Further, totally differentiating (25) with respect to  $t_d$  yields

$$\frac{dt_r^{Im}}{dt_d} = \frac{v_{xxx}}{v_{xx}} \left( \frac{dt_r^{Im}}{dt_d} + 1 \right) (e - e_m) \implies \frac{dt_r^{Im}}{dt_d} = \frac{\frac{v_{xxx}}{v_{xx}}(e - e_m)}{1 - \frac{v_{xxx}}{v_{xx}}(e - e_m)} \equiv \delta_m.$$

Since the mean-median spread is positive,  $v_{xxx} \geq 0$  and  $v_{xx} < 0$ , this expression is non-increasing. The non-increasing impact of  $w$  on  $t_r^{Im}$  now follows directly from the above in conjunction with Claim 1. When  $v_{xxx} = 0$ , the median's ideal point is independent of  $t_d$  and of  $w$ . When  $v_{xxx} > 0$  it is decreasing in  $t_d$  and in  $w$ .

(iii) Since  $\frac{v_{xxx}}{v_{xx}}(e - e_m) < 0$  the denominator in the expression for  $\frac{dt_r^{Im}}{dt_d}$  is positive and larger than the absolute value of  $\frac{v_{xxx}}{v_{xx}}(e - e_m)$ . Hence  $\frac{dt_r^{Im}}{dt_d}$  is smaller than one in absolute value. QED

### Proof of Claim 3

Replacing  $e_m$  with  $\tilde{e} \in [e_m, e_s]$  in equation (25),

$$t_r^I = -v_{xx}[v_x^{-1}(1 - t_r^I - t_d)](e - \tilde{e}).$$

Totally differentiating with respect to  $e - \tilde{e}$  and rearranging

$$\frac{dt_r^I}{d(e - \tilde{e})} = \frac{-v_{xx}}{1 - \frac{v_{xxx}}{v_{xx}}(e - \tilde{e})}.$$

This expression is always positive provided its denominator is positive. Since  $v_{xxx} \geq 0$  and  $e_s > e_m$  by Assumption 2, the denominator is positive for all  $\tilde{e} \in [e_m, e_s]$  when  $e - e_s > 0$ . When  $\frac{v_{xxx}}{v_{xx}}(e - \tilde{e}) < 1$  for all  $\tilde{e} \in [e_m, e_s]$  the denominator is still positive for all  $\tilde{e} \in [e_m, e_s]$ . Hence, for both  $e - e_s > 0$  and  $e - e_s \leq 0$ ,  $t_r^I$  is decreasing in  $\tilde{e}$  for all  $\tilde{e} \in [e_m, e_s]$ . Since  $e_s > e_m$ , it follows that  $t_r^{Is} < t_r^{Im}$ . QED

### Proof of Claim 5

As a preliminary, notice that, by differentiating the ideal point  $t_r^{Is} = -v_{xx}(1 - t_r^{Is} - t_d) \cdot (e - e_s)$  of the setter,

$$\frac{dt_r^{Is}}{dt_d} = \frac{\frac{v_{xxx}}{v_{xx}}(e - e_s)}{1 - \frac{v_{xxx}}{v_{xx}}(e - e_s)} \equiv \delta_s. \quad (50)$$

Further, from (31)

$$t_{r3}^{sq} - \bar{t}_r = t_{d2} - t_{d3}. \quad (51)$$

There are two cases to consider:

(i)  $e - e_s \leq 0$ : In this case, given the assumption  $\frac{v_{xxx}}{v_{xx}}(e - e_s) < 1$  from Claim 3,  $\delta_s \geq 0$ , so that a change in  $t_d$  causes a change in the same direction in the setter's ideal point or

does not change it. Hence, when defense expenditures go down between periods 2 and 3 (as shown in the proof of Proposition 2 below for comparative statics determined by the setter and the Executive) the ideal point of the setter goes down or does not change. In parallel, from equation (51),  $t_{r3}^{sq}$  goes up. Hence  $t_{r3}^{sq}$  must be larger than  $t_{r3}^{Is}$  implying that Case 4 does not occur when  $e - e_s \leq 0$ .

(ii)  $e - e_s > 0$ : In this case  $\frac{v_{xxx}}{v_{xx}}(e - e_s) < 0$ , hence (50) implies,

$$|\delta_s| < 1. \quad (52)$$

Further, any local change in  $w$  leads to the following change in  $t_r^{Is}$

$$\frac{dt_r^{Is}}{dw} = \frac{dt_r^{Is}}{dt_d} \frac{dt_d^T}{dw} = \delta_s \frac{dt_d^T}{dw},$$

where  $\frac{dt_d^T}{dw}$  is the overall change in  $t_d^T$  as a result of a change in  $w$ , implying

$$\frac{dt_r^{Is}}{dw} / \frac{dt_d^T}{dw} = \delta_s. \quad (53)$$

From (51) the SQ,  $t_r^{sq}$ , goes up (relative to  $t_{r2} = \bar{t}_r$ ) by the total decrease in the defense tax rate between periods 2 and 3. Equation (52) implies that if  $t_r^{Is}$  goes up, it must move up by less than defense expenditures. It follows that  $t_{r3}^{Is} < t_{r3}^{sq}$  implying again that Case 4 is ruled out. QED.

## Proof of Proposition 2

We first show that  $\frac{dq_{d3}^T}{dw_3} > 0$ . For Case (i) let  $t_{r3} = t_{r3}^{sq}$ . Since  $t_{r3} = t_{r3}^{sq}$ , by  $t_{r3}^{sq} = \bar{t}_r + t_{d2} - t_{d3}$  it must be that

$$f \frac{dq_{d3}^T}{dw_3} = \frac{dt_d}{dw_3} = -\frac{dt_r}{dw_3}.$$

Differentiating the first-order condition of the Executive and imposing this restriction yields:

$$-f \left( -\frac{dq_{d3}^T}{dw_3} \right) + (1 + \gamma) h'' * \left[ (1 + \gamma) \frac{dq_{d3}^T}{dw_3} - 1 \right] = 0,$$

which is rewritten as:

$$\frac{dq_{d3}^T}{dw_3} = \frac{(1 + \gamma) h''}{f + (1 + \gamma)^2 h''} > 0,$$

where for the inequality we have used that  $f + (1 + \gamma)^2 h'' > 0$  as implied by (19).

For Case (ii), the detailed algebra is provided in the Additional Appendix. Under this case the comparative statics are determined by the first-order condition of the setter and the condition that implicitly defines  $t_{r3}^{em}$  as the solution for  $t_{r3}$  of the following equation:

$$\begin{aligned}
& (1 - fq_{d3})Y_3^s + (1 - fq_{d3} - t_{r3})(e_m - e) + v(v_x^{-1}(1 - fq_{d3} - t_{r3})) \\
= & (1 - fq_{d3})Y_2^s + (1 - t_2)(e_m - e) + v(v_x^{-1}(1 - t_2)), \tag{54}
\end{aligned}$$

where the right-hand side is the MV's indirect utility when  $t_{r3} = t_{r3}^{sq}$ , hence  $t_3 = t_2$ , while the left-hand side is the MV's indirect utility when  $t_{r3} = t_{r3}^{em}$ . Note that  $q_{d3}$  is held constant between the two alternative values for  $t_{r3}$ . Some algebra shows that:

$$B = 1 - \frac{f}{(1 + \gamma)^2 |h''| - f \left(2 + \frac{f}{|v_{xx}|}\right)} \left(1 + \frac{f}{|v_{xx}|}\right) \left\{ \frac{\Delta Y^s + (1 - t_{d3})/f}{\frac{t_{r3}}{v_{xx}} - (e_m - e)} - 1 \right\}. \tag{55}$$

We distinguish two cases. First, if

$$\Delta Y^s + (1 - t_{d3})/f < 0,$$

which can happen only if  $t_2 < t_3$  (such that  $\Delta Y^s < 0$ ), the term in curly brackets in (55) is negative and  $B > 0$ . However,  $t_{r3}^{em} < t_{r3}^{sq}$  (Case 2, Proposition 1). Hence, this case is excluded. The second case is when  $\Delta Y^s + (1 - t_{d3})/f > 0$ . For this case, if

$$\left[ \frac{t_{r3}}{v_{xx}} + (e - e_m) \right] > [\Delta Y^s + (1 - t_{d3})/f],$$

then the term in curly brackets in (55) is negative and  $B > 0$ .

In Cases (iii.a) and (iii.b) the comparative statics are determined by the first-order conditions of the setter and the Executive. Using  $\frac{dt_r^{ls}}{dq_d} = f \frac{dt_r^{ls}}{dt_d}$  in (50), we can substitute the resulting expression into expression (34) for  $B$  to yield:

$$B = 1 - \frac{f}{|SOC_E|} \left(1 + \frac{f}{|v_{xx}|}\right) \frac{\rho(e - e_s)}{1 - \rho(e - e_s)}, \tag{56}$$

where  $\rho \equiv \frac{v_{xxx}}{v_{xx}} \leq 0$  under the assumption that  $v_{xxx} \geq 0$ . If  $e - e_s \geq 0$ , then  $\frac{\rho(e - e_s)}{1 - \rho(e - e_s)} \leq 0$  implying that  $B$  is unambiguously positive. If  $e - e_s < 0$  and  $\rho$  is not too large in absolute value, then  $1 - \rho(e - e_s) > 0$  (as was required for claim 3), while  $\frac{\rho(e - e_s)}{1 - \rho(e - e_s)} > 0$  is still sufficiently small that  $B > 0$ .

Finally, for all cases together we show that  $t_{r3}^{sq} > t_{r2}$ . Given that  $w_3 < w_2$ ,  $q_{d3} < q_{d2}$ , hence  $t_{d3} < t_{d2}$ , hence  $t_{r3}^{sq} = \bar{t}_r + t_{d2} - t_{d3} > \bar{t}_r = t_{r2}$ . QED

**Proof of Claim 6:** Since unemployed individuals do not pay taxes the amount available for transfers under excess capacity is

$$r = t_r Y^d = t_r (C^d + mG_d) = t_r (C^d + mq_d Y^s). \tag{57}$$

The IUF of an unemployment individual is:



$$r + v(1 - q_d + e_i) + h((1 + \gamma)q_d - w).$$

After substitution of (57) this becomes

$$t_r (C^d + mq_d Y^s) + v(1 - q_d + e_i) + h((1 + \gamma)q_d - w).$$

Only the first term of this objective function (which represents the per capita transfer) depends on  $t_r$ . Differentiating this term with respect to  $t_r$  and using the fact that  $\frac{dY^s}{dt_r} = \frac{1}{v_{xx}}$  the first-order condition for the maximization of this term is:

$$(C^d + mq_d Y^s) + t_r mq_d \frac{1}{v_{xx}} = 0.$$

Rearranging

$$t_r^{Iu} = -\frac{v_{xx} Y^d}{mq_d} > 0.$$

The second-order condition is:

$$\frac{2mq_d}{v_{xx}} + \frac{t_r mq_d v_{xxx}}{v_{xx}^3} < 0.$$

Given the assumption  $v_{xxx} \geq 0$  this condition is satisfied for all  $t_r$  between zero and one including, in particular, at  $t_r^{Iu}$ . It follows that the IUF of an unemployed voter has a single peak at  $t_r^{Iu}$ . QED

# Tables

Table 1: Key figures during and around the GD and WW-II

year	$u$	$DEF$	$NDEF$	$TRANS$	$UNINS$	$TAX$	$REV$
1929	3.2	0.87	0.77	0.77	0.00	3.38	3.67
1930	8.9	0.99	0.99	0.88	0.00	3.07	3.29
1931	16.3	1.18	1.18	2.61	0.00	2.35	2.61
1932	24.1	1.53	1.53	1.70	0.00	2.56	2.90
1933	25.2	1.60	2.48	1.95	0.00	4.26	4.61
1934	22.0	1.21	3.79	3.33	0.00	4.85	5.30
1935	20.3	1.36	3.14	3.14	0.00	4.77	5.32
1936	17.0	1.43	5.13	3.22	0.00	5.01	5.97
1937	14.3	1.41	4.13	1.63	0.00	5.44	7.62
1938	19.1	1.63	5.11	2.09	0.46	4.99	7.43
1939	17.2	1.63	4.88	2.17	0.43	4.77	7.16
1940	14.6	2.47	3.94	2.07	0.49	6.11	8.38
1941	9.9	11.29	2.92	1.50	0.32	9.79	12.08
1942	4.7	31.56	1.85	1.30	0.25	11.86	14.02
1943	1.9	42.40	1.16	0.96	0.05	17.32	19.59
1944	1.2	42.99	1.09	1.09	0.05	16.06	18.47
1945	1.9	36.75	0.94	2.33	0.27	16.05	18.92
1946	3.9	11.34	1.66	5.35	1.17	14.71	18.08
1947	3.9	7.45	1.80	4.87	0.66	15.19	17.85
1948	3.8	6.80	2.19	4.75	0.48	13.97	16.08
1949	5.9	7.41	2.96	5.69	0.82	12.27	14.44
1950	5.3	6.67	2.21	5.34	0.51	14.74	16.81

*Notes:*  $u$  = unemployment measured in percent of labor force. Other variables are in percent of GDP, where  $DEF$  = (federal) defense spending,  $NDEF$  = federal non-defense (i.e. civilian) public spending,  $TRANS$  = federal spending on transfers,  $UNINS$  = federal spending on unemployment insurance,  $TAX$  = federal tax revenues and  $REV$  = total federal revenues. Source of data: NIPA (2009) for all series, except for unemployment, which is from the U.S. Census Bureau (2009).

Table 2: Effects of defense spending on alternative measures of federal transfers

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta TR$	$\Delta TR$	$\Delta TR_{EXV}$	$\Delta TR_{EXVSL}$	$\Delta TR$	$\Delta TR$
Period	1931- 2003	1931- 2003	1931- 2003	1931- 2003	1937- 2003	1948- 2003
Const	0.0024 (2.30)	0.0026 (2.62)	0.0028 (3.25)	0.0018 (2.68)	0.0025 (2.31)	0.0032 (2.75)
$\Delta DEF$	-0.068 (-1.97)					
$\Delta DEF_U$		0.0033 (0.15)	0.014 (1.15)	-0.001 (-0.076)	0.0057 (0.22)	-0.17 (-2.08)
$\Delta DEF_D$		-0.110 (-16.1)	-0.063 (-12.4)	-0.065 (-14.3)	-0.12 (-20.4)	0.054 (0.29)
$\Delta Y_U$	-0.026 (-0.73)	-0.057 (-2.01)	-0.054 (-2.95)	-0.026 (-2.24)	-0.060 (-1.59)	-0.056 (-1.46)
$\Delta Y_D$	0.0068 (0.20)	0.017 (0.48)	0.023 (0.88)	0.041 (1.92)	0.080 (3.59)	0.027 (0.28)
AR(1)	0.039 (0.32)	0.028 (0.22)	0.068 (0.77)	0.069 (0.58)	0.12 (0.88)	0.10 (0.58)
$R^2$	0.25	0.34	0.23	0.28	0.44	0.18
DW	1.90	1.89	1.96	1.96	1.84	1.99
H <sub>0</sub> : no ratchet		F=27.4 p=0.00	F=42.1 p=0.00	F=51.6 p=0.00	F=20.6 p=0.00	F=1.01 p=0.32

*Notes:* (1)  $\Delta TR$  = change in GDP share of transfers,  $\Delta TR_{EXV}$  = change in share of transfers net of veteran benefits and  $\Delta TR_{EXVSL}$  = change in share of transfers net of veteran benefits and grants-in-aid to state and local governments,  $\Delta DEF_U$  = change in the share of defense spending when this change positive and zero otherwise,  $\Delta DEF_D$  = idem, when this change is negative and zero otherwise,  $\Delta Y_U$  = GDP growth rate, when this is positive and zero otherwise, and  $\Delta Y_D$  = idem, when this is negative and zero otherwise. All data are from the NIPA (2009). (2) All estimates are obtained by OLS with a Newey-West correction for heteroskedasticity. (3) Numbers in parentheses are t-statistics. (4) DW = Durbin-Watson test statistic. (5) In relevant cases, the last row provides the F-test statistic and p-value for a test of the null hypothesis that there is no ratchet in the effect of defense expenditures on transfers.

Table 3: Ratchets in federal taxes and revenues

	(1)	(2)	(3)	(4)
	$\Delta TAX$	$\Delta REV$	$\Delta TAX ADJ$	$\Delta REV ADJ$
Period	1931- 2003	1931- 2003	1931- 2003	1931- 2003
Const	-0.0027 (-1.89)	-0.0025 (-1.75)	0.0058 (2.17)	0.0059 (2.13)
$\Delta DEF_U$	0.19 (4.58)	0.15 (3.55)	0.13 (1.21)	0.087 (0.77)
$\Delta DEF_D$	0.048 (5.65)	0.034 (3.21)	-0.18 (-3.52)	-0.21 (-3.61)
$\Delta Y_U$	0.062 (1.91)	0.10 (2.89)	-0.27 (-2.14)	-0.23 (-1.73)
$\Delta Y_D$	-0.065 (-2.04)	-0.047 (-1.15)	-0.13 (-2.36)	-0.10 (-1.36)
AR(1)	-0.23 (-1.16)	-0.20 (-1.05)	-0.14 (-1.10)	-0.085 (-0.59)
$R^2$	0.40	0.36	0.43	0.41
DW	2.03	2.04	1.99	1.98
H <sub>0</sub> : no ratchet	11.3 p=0.00	6.69 p=0.01	5.81 p=0.02	4.62 p=0.04

*Notes:* (1)  $\Delta TAX$  = change in GDP share of federal taxes. (2)  $\Delta REV$  = change in GDP share of federal revenues. (3)  $\Delta TAX ADJ$  ( $\Delta REV ADJ$ ) = change in GDP share of adjusted federal taxes (revenues). Adjusted federal taxes (revenues) are defined as federal taxes (revenues) minus interest payments on the public debt, minus debt repayment, and minus defense expenditures as shares of GDP. (4) Data are from the NIPA (2009) and the Bureau of the Public Debt (2009). (5) Further, see Notes to Table 2.

Table 4: Average income taxes by income groups during and around the GD and WW-II

year	1000	2000	5000	10,000	25,000	50,000	100,000
1939	0.0	1.6	2.8	5.6	11.2	18.7	33.4
1940	0.4	2.2	3.4	6.9	17.0	29.4	44.3
1941	2.1	5.9	9.7	14.9	28.9	41.8	53.2
1942	8.9	13.7	18.4	23.9	38.5	51.6	64.6
1943	10.7	16.7	22.1	27.8	42.6	56.1	69.7
1944	11.5	17.3	22.1	27.6	42.4	55.9	69.9
1945	11.5	17.3	22.1	27.6	42.4	55.9	69.9
1946	9.5	14.3	18.4	23.5	37.5	50.3	63.5
1947	9.5	14.3	18.4	23.5	37.5	50.3	63.5
1948	6.6	11.6	16.2	21.2	34.4	46.4	58.8

*Notes:* Figures are average taxes, i.e. taxes divided by taxable income. Taxable income is income minus deductions. Rates are calculated for a single individual with one exemption. Source: Wallis (2006), page 5-114.

## Figures

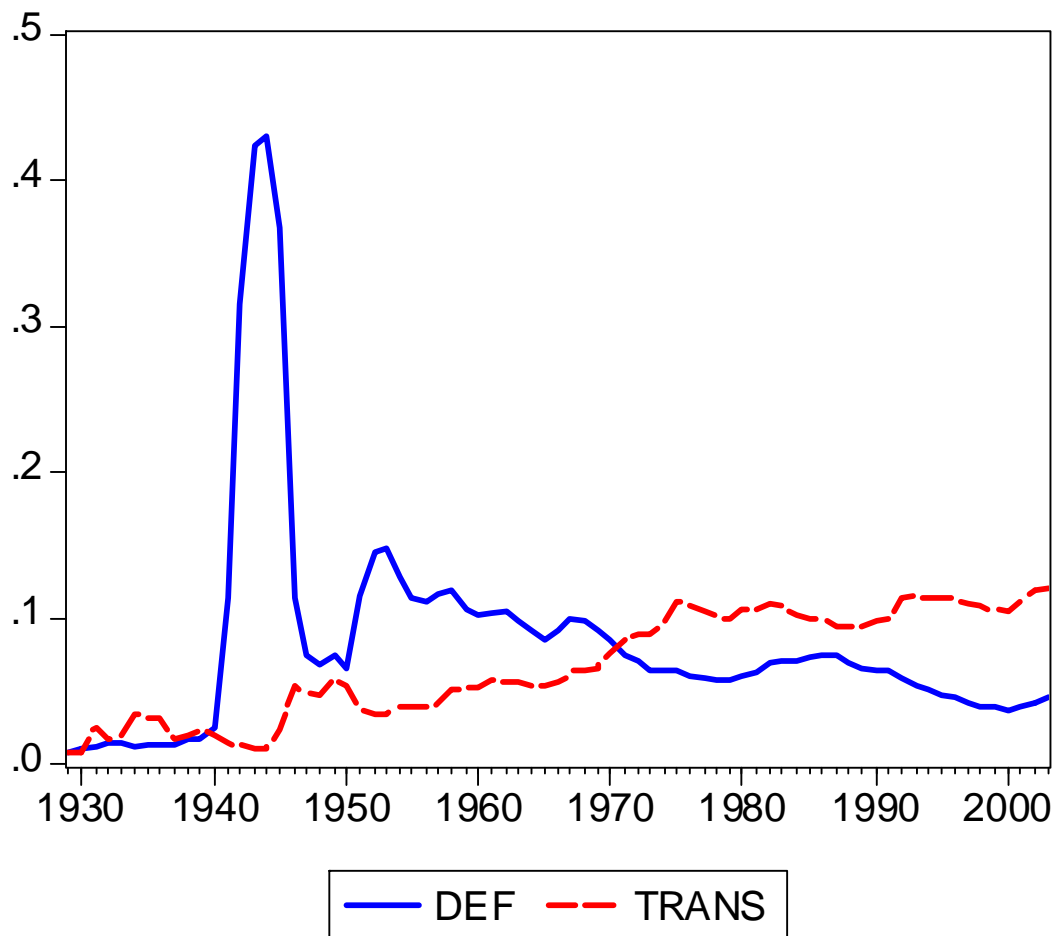


Figure 1: Shares of federal transfers and defense spending in GDP

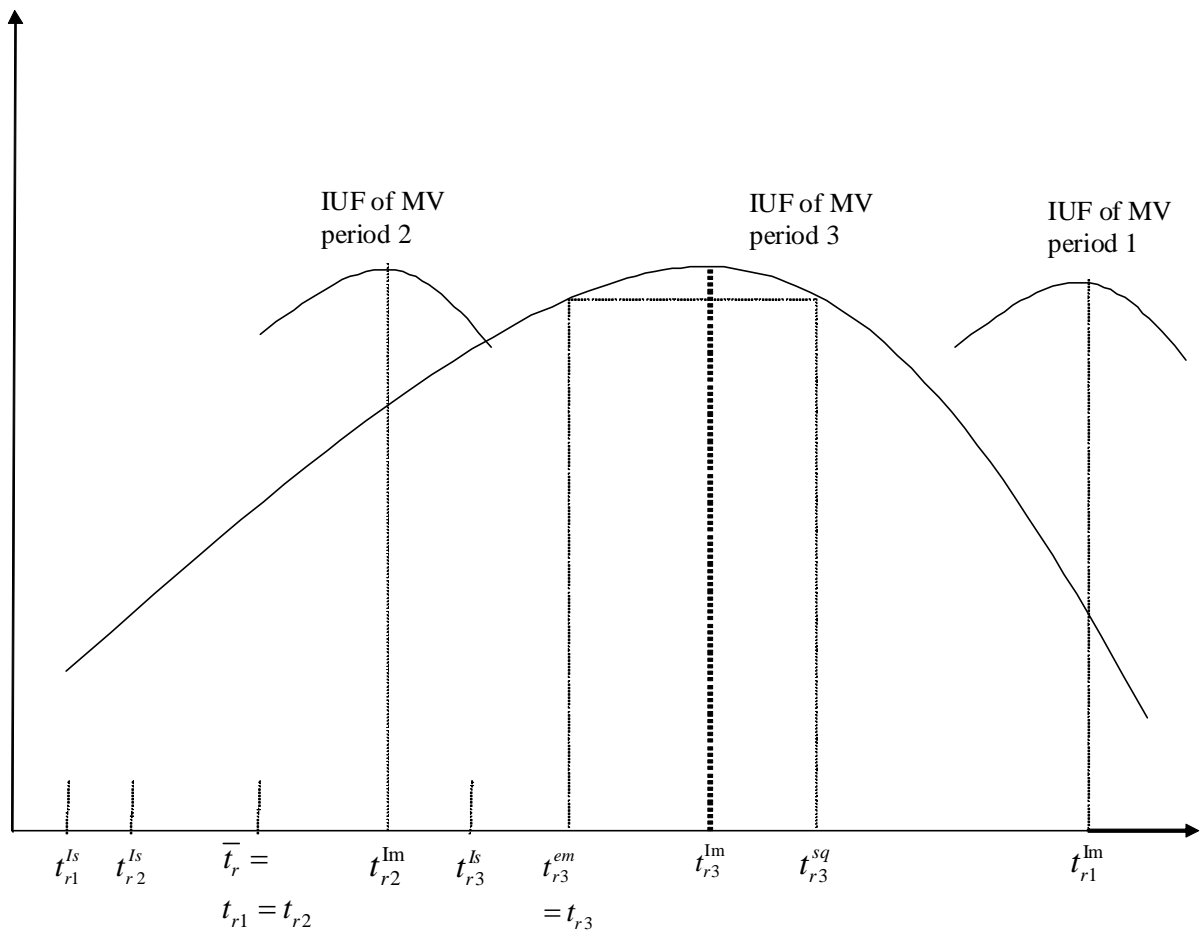


Figure 2: The post-WW-II equilibrium redistribution tax rate (Proposition 1, Case 2)

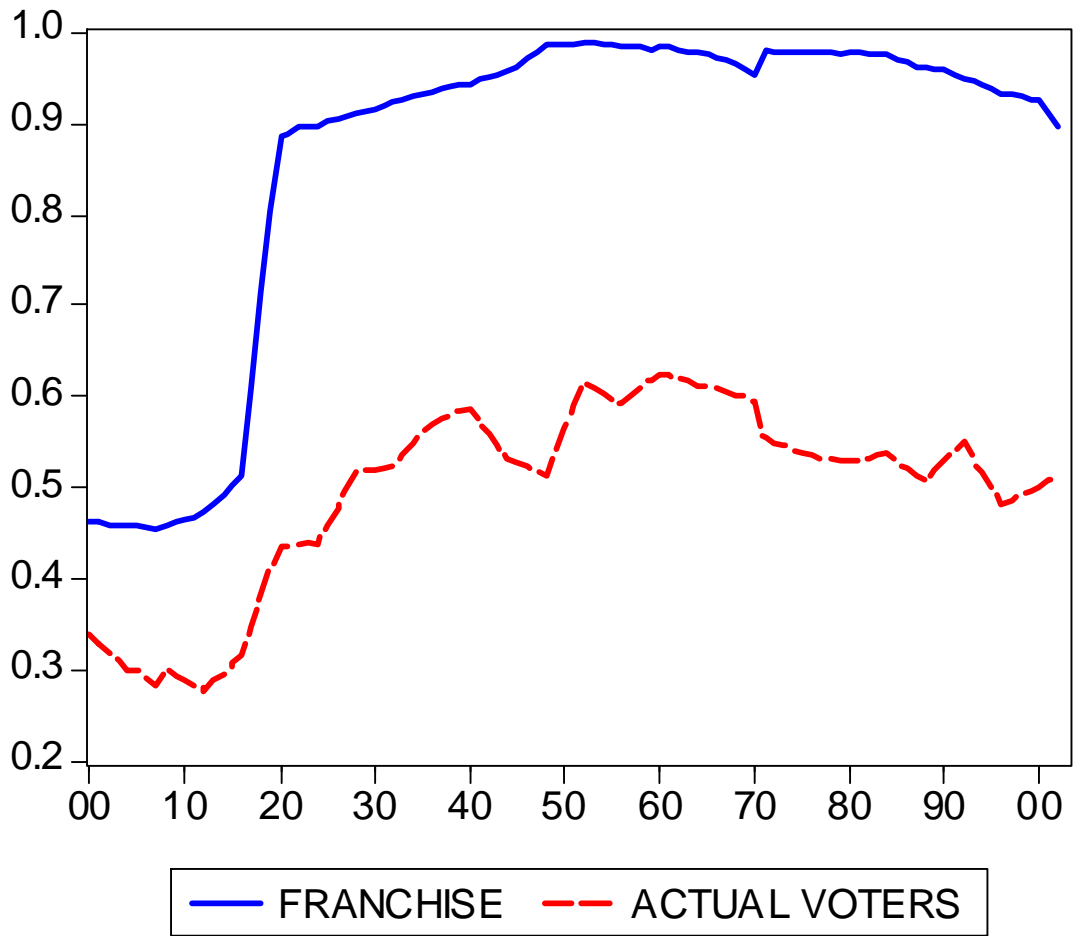


Figure 3: Franchise and actual voters as shares of population of voting age