Scottish Journal of Political Economy

Scottish Journal of Political Economy, DOI: 10.1111/sjpe.12118, Vol. 63, No. 5, November 2016

A RATIONAL EXPLANATION FOR THE REDISTRIBUTION PARADOX. THEORY AND EMPIRICAL EVIDENCE

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Abstract

The paper provides a rational explanation for the redistribution paradox, whereby low-income individuals seeking more social security prefer a lower taxation although this might imply a reduced welfare. A simple model of tax transfer and redistribution is presented, with various agents facing two different unemployment probabilities. We investigate how the preferred tax rate changes with the probability of being unemployed. We show that, when the probability of unemployment for the less-skilled correlates negatively with that of the highly skilled, the relationship with the tax rate is not monotonic and depends on the level of risk aversion. This theoretical framework is confirmed in an empirical investigation based on microeconomic data, and in a robustness test based on macroeconomic data.

I Introduction

Majority rule voting sometimes delivers different outcomes from those predicted by median voter theory. For instance, being an individual generally on a below-average income, the decisive median voter ought to express a preference for income redistribution, but this does not always happen. Hence the so-called 'redistribution paradox' seen in high-inequality countries where the majority often vote in favor of political programs aiming for lower tax rates and consequently shrinking social transfers (as in the United States, where income distribution is very divided, but many consider its redistribution inadequate).[1] Research on voting for redistribution has focused on a variety of factors, such as measures of income dispersion, cultural values, attitudes, and so on, but has so far failed to fully explain why the empirical evidence is in contrast with the theoretical assumptions. Majority rule voting could be affected

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[1] The expression 'redistribution paradox' appeared for the first time in an article by Korpi and Palme (1998), who established a correlation between welfare states' targeting models and the reduction of its dimension. The term has been used ever since in the broader sense we adopt here, namely to indicate the negative correlation between the Gini index of a given country and how much of its income is redistributed.

by belief-driven cultural values in society at large. For instance, low-income earners may prefer less redistribution because they expect upward mobility (Piketty, 1995; Benabou and Ok, 2001). Similarly, according to the 'pivotal voting' view (Benabou, 2000, Benabou and Tirole, 2006), the median voter may be influenced by the high-income individual's conviction that less public intervention will boost market incentives and growth, so the former joins the latter in voting for a lower tax rate. In a model of dynamic political choice, Hassler *et al.* (2003) suggest that voters with below-average incomes favor a reduction in the tax rates because it is expected to foster innovation, growth, and upward social mobility. According to Alesina and Angeletos (2005), due to the influence of the conviction that merit stems from talent and effort, rather than luck, pave the way to success in life and to the wealth of nations, the median-income individual is willing to promote the expansion of market forces by voting for lower taxation. Finally, recent research papers based on survey experiments explain the redistribution paradox as the result of individuals having limited information about their relative position in the income distribution and about the degree of effectiveness of public redistribution policies (Cruces *et al.*, 2013; Kuziemko *et al.*, 2013).[2]

In our work, we take a different approach to interpreting the redistribution paradox, linking the median voters' choice of tax rate to their risk attitude, depending on their different skills and risk of unemployment in the economy. In a simple theoretical setup in which a population of N individuals is divided into two categories in the labor market, namely the high-skill workers (HS) and the low-skill workers (LS), we consider the possibility of a correlation between the employment opportunities of HS and LS workers, and we investigate the relationship between this, the voters' risk attitude, and their preferences regarding the tax rate. There are several reasons to justify the hypothesis of a negative correlation between the unemployment risk for HS and LS workers. Many empirical studies have come to the conclusion that in most advanced economies, starting with the US, the path of growth in recent decades has been characterized by a rising rate of growth in total factor productivity (TFP) after the rapid diffusion of information technology in the workplace coinciding with a more than proportional fall in the employment rate (e.g., Acemoglu *et al.*, 2014). These developments have prompted some to argue that technology is subject to diminishing returns in its ability to increase employment and growth in GDP (Gordon, 2012). More specifically, the expansion of IT within the firm (with the extensive use of computers documented by many researchers, such as Autor *et al.*, 2003), and the diffusion of robotics in production systems (which supports the hypothesis of a skill-biased technical change [SBTC] advanced by Acemoglu, 2002 2003), are the likely reasons why LS workers are being replaced by much smaller numbers of HS workers in sectors that use IT.

[2] See also Schokkaert and Truyts (2014), who integrate several findings and approaches in a model in which the utility function comprises both a self-interested and a social justice component that refers to the perceived justice of the income distribution. We thank an anonymous reviewer for suggesting this and other references mentioned in the text.

In our work, we investigate whether preferences regarding the tax rate could be influenced by the expectation of lengthy spells of unemployment for the weakest portion of the labor force. Assuming a constant rate of unemployment in the economy, we show that when there is no relationship between the employment probabilities of LS and HS workers, the LS worker should opt for more public insurance, that is, a higher tax rate, the higher the unemployment risk. But this is not necessarily the case when there is a negative relationship between the two types of workers' employment probabilities. The widening gap between the productivity trends of the HS and LS groups could make the HS workers' contribution to the GDP grow more than the LS workers' contribution to the GDP, and lead to the opposite decision concerning the tax rate.[3] The crucial element influencing the choice of tax rates is the voter's risk attitude. More precisely, when there is no relationship between the chances of employment for LS and HS workers, we show that the demand for social insurance (and therefore for higher tax rates) is higher, the higher the risk of unemployment, as was to be expected. When there is a negative relationship between the LS and HS workers' employment probabilities, however, we prove that such an outcome is no longer monotonic. When LS workers are extremely risk-averse, the outcome may be reversed, that is, the LS worker may prefer a lower tax rate, thus providing a possible explanation for the redistribution paradox. The rationale points to economies where a rising unemployment risk for LS workers stems from technical change prompting a drop in the unemployment risk for HS workers and a rise in GDP; as a consequence, risk-averse individuals might decide to exploit the boost to the economy's efficiency and prefer to take care of themselves (through the market), so they choose lower tax rates rather than opting for more social security (e.g., unemployment benefits). Then, we see if such a result can be empirically validated. To do so, we test the influence of risk attitude on the tax rates preferred by voters in a sample of countries. We provide data to support both the median voter's assumption and the existence of a negative correlation between unemployment risks for HS and LS workers in some countries. We then confirm the theoretical predictions, that is, that when unemployment probabilities for LS and HS workers are not correlated, the chosen tax rate rises with the LS median voter's unemployment risk; when they are negatively correlated, on the other hand, this relationship depends on the voter's degree of risk aversion, so that – beyond a given threshold – the marginal tax rate is lower the higher the risk of unemployment.

This paper is arranged as follows. Section II presents a simple theoretical setup correlating employment probabilities with endogenous preferences for marginal tax rates. Section III describes an empirical analysis that validates our main theoretical findings. This is followed by some final remarks and references. The Appendix contains proofs of the propositions.

[3] The hypothesis that introducing a SBTC could prompt a faster growth by means of increases in TFP has been confirmed on empirical grounds in many advanced economies (Berman *et al*., 1998).

II The Model Setup

Let us assume the following notation: N individuals (generically denoted by i) are divided into two homogeneous categories of workers, where H are highly skilled workers (and $j \in H$ denotes a generic member of this group), and L are less-skilled workers ($k \in L$). We assume that $L > H$. Y_j is j's productivity, and Y_k is that of k; the difference in their skills implies that $Y_j > Y_k$. In an unambiguous setting, the unemployment risk corresponds to the proportion of workers who are unemployed in each category. In the labor market considered, the risk of workers experiencing spells of unemployment differs depending on their skills. HS individuals face a probability p_j of being unemployed and receiving a transfer in the form of unemployment benefits, and the proportion of HS workers who have a job is $(1 - p_j)$. For LS workers, the unemployment risk is p_k, and the proportion of these workers with a job is $(1 - p_k)$.

We initially assume that p_j and p_k are independent unemployment risks. We subsequently omit this assumption and allow for the two risks to become negatively correlated. Public revenues come from a proportional tax rate t, the level of which is chosen by the electorate in the polls. Both HS and LS individuals earn a before-tax factor income Y_i (assumed to equate to their factor's productivity), and are taxed at a rate t. The taxes accruing to public revenues are redistributed to each individual who qualifies as an unemployment transfer TR. We denote total production as $\tilde{Y} = [(1 - p_j)HY_j + (1 - p_k)LY_k]$, which generates a tax revenue amounting to $t\tilde{Y}$. The public budget is balanced: $t\tilde{Y} = (p_jH + p_kL)TR$, where $(p_jH + p_kL) = u$ denotes the overall number of workers who are unemployed, and TR is each worker's unemployment benefit (transfer). Note that *ex-ante* the amount of the transfers that each worker can expect to receive depends on the amount of the taxes collected from all the workers, which is a function of their employment probabilities. We investigate how the probability of employment affects preferences concerning the tax rate. For each group of individuals, the expected utility of their income after tax (or disposable income) is the result of the linear combination of the utilities stemming from income and transfers, weighted by their respective probabilities:

$$\begin{aligned} E(V_j(\cdot)) &= (1-p_j)V[(1-t)Y_j] + p_jV[TR] \\ &= (1-p_j)V[(1-t)Y_j] + p_jV[t\bar{Y}] \end{aligned} \tag{1}$$

$$\begin{aligned} E(V_k(\cdot)) &= (1-p_k)V[(1-t)Y_k] + p_kV[TR] \\ &= (1-p_k)V[(1-t)Y_k] + p_kV[t\bar{Y}] \end{aligned} \tag{2}$$

where we have established that $\bar{Y} = [\tilde{Y}/(p_jH + p_kL)] = [\frac{(1-p_j)}{(p_jH+p_kL)}HY_j + \frac{(1-p_k)}{(p_jH+p_kL)}LY_k]$.

From now on, we focus only on LS workers, based on the assumption that they are the decisive voters when it comes to choosing tax rates. Let the utility functions in equation (2) take the CRRA form $V(x) = \frac{x^{1-\sigma}}{1-\sigma}$ where x is

disposable income and transfer. By maximizing the expected utility functions in equation 2 w.r.t. t it is easy to derive the level of taxation that the LS worker prefers:

$$t_k^* = \left\{1 + \left[\left(\frac{1-p_k}{p_k}\right)\left(\frac{Y_k}{\bar{Y}}\right)^{1-\sigma}\right]^{\frac{1}{\sigma}}\right\}^{-1} \tag{2'}$$

When we look at how the optimal level of taxation t^* responds to changes in the probability of employment, we must bear in mind that LS workers are the decisive voters according to the median voter hypothesis.[4] Being rational, risk-averse voters who expect a higher risk of their being unemployed to coincide with a lower level of social security (since the revenues available for welfare are more limited when fewer workers have jobs and more of them are receiving unemployment benefits), LS individuals should vote for higher levels of insurance. In fact, when the unemployment risks for HS and LS workers are not correlated, the risk-averse LS workers will seek more security and therefore opt for higher taxation rates, the higher the unemployment risk:

Proposition 1: When there is no relationship between the unemployment risks for LS and HS workers, $\frac{\partial t_k^*}{\partial p_k} > 0$.

Proof: In Appendix. □

In countries with a negative correlation between the unemployment risks for HS and LS workers, however, the decisive LS median voter tends to favor a lower taxation rate. Let us assume that $p_j = \alpha(1 - p_k)$, with $\alpha \geq 1$ and $p_k \in (\frac{\alpha-1}{a}, 1)$. The hypothesis of a negative correlation between the chances of LS and HS workers having a job is supported by SBTC theory, whereby a change in production technology that increases the relative productivity of HS workers over that of LS workers results in a widening productivity gap between the two, which in turn prompts an increase in the relative demand for HS workers and a consequent rise in the proportion of LS workers who are unemployed, and thereby leading to a rise in total GDP. This amounts to setting $\alpha \geq \frac{L}{H}$, which implies $\frac{\partial \tilde{Y}}{\partial p_k} > 0$. We need to assume that a probability range of p_k (i.e., $p_k \in (\frac{\alpha-1}{a}, 1)$) is needed for p_j to maintain the normalization property of probabilities, showing a negative relationship with p_k at the same time. But this also implies that, for any uniform or symmetrical probability distributions for p_j and p_k, the unemployment risk for LS workers stochastically dominates the risk for HS workers. In other words, its likelihood is (ex ante) higher, a property consistent with our comments on the employment probabilities of HS and LS workers in the introduction. We can now show that the following holds:

[4] We confirm the median voter hypothesis in the empirical section. See Section III below.

Proposition 2: When $p_j = \alpha(1 - p_k)$, the sign of $\partial t_k^*/\partial p_k$ depends on σ. A threshold level $\check{\sigma}$ exists. If $\sigma \leq \check{\sigma}$, the optimal t rises as the unemployment risk increases: $\partial t_k^*/\partial p_k > 0$. If $\sigma > \check{\sigma}$, the opposite is true: $\partial t_k^*/\partial p_k < 0$.

Proof: In Appendix. □

We recall that σ denotes the constant relative risk aversion parameter. Proposition 2 shows that LS workers prefer more social security (higher taxation) as their unemployment risk rises – unless they are very risk-averse ($\sigma > \hat{\sigma}$), in which case they will vote for lower taxation. The outcome can be intuitively deduced by looking at the LS workers' objective function and at the fiscal budget. It is easy to see from the LS workers' expected utility function in equation (2') that the tax rate t can be seen as a way of shifting consumption across the two states. Any rise in the LS workers' risk of unemployment increases the weight of utility when unemployed vis-a-vis when they are in employment, and also reduces unemployed consumption (i.e., the transfer they receive), thereby increasing the marginal utility of unemployed consumption. Both effects induce LS workers to choose a higher tax rate. On the other hand, a decrease in the risk of HS workers being unemployed has the effect of increasing transfers, reducing the marginal utility of unemployed consumption, and consequently prompting the LS workers' preference for a lower tax rate.

Proposition 2 considers these two changes at once. The role of σ is easy to explain: the stronger the preference for smooth consumption across states, the more the voter is inclined to ask for a lower tax rate, since this is a way to shift some of the consumption towards the employed state when aggregate tax revenues and consumption in the jobless state have increased. A comparative static analysis confirms the result. From simulations of the behavior of $\check{\sigma}$ (see the Appendix) we can see that this threshold increases as the unemployment risk for the LS worker rises, as expected. It likewise decreases as α and Y_j increase because this implies, ceteris paribus, higher fiscal revenues so LS workers can expect higher unemployment benefits due respectively to a rise in the elasticity of substitution between LS and HS workers (parameter α) and to an increase in HS workers' productivity (Y_j). This confirms the intuition outlined above: the stronger the effect on the GDP, the lower the risk aversion threshold beyond which LS workers would prefer a lower taxation rate.

III Empirical Analysis

Data

In this Section, we conduct an empirical analysis to test Propositions 1 and 2. The former proposition predicts that, when p_j and p_k are not related, as the unemployment risk for the LS median voter increases, so does the voter preferred marginal tax rate. The latter proposition predicts that, when p_j and p_k are (negatively) related, this relationship depends on the degree of the median

voter's risk aversion: beyond a certain threshold, we should expect the preferred marginal tax rate to decrease as the unemployment risk increases.

To test these hypotheses, we use microeconomic data provided by the 2010–2012 World Values Survey (WVS), wave 6.[5] The WVS provides a set of information on people's characteristics, values, beliefs and behavior. It has been conducted by a global network of scientists and experts since 1981, using representative national surveys on more than 100 countries. Our dataset initially includes 60 countries and 86,272 observations.

From the original sample, we first omit the countries where no information is available on individuals' employment status (Argentina and Morocco), and the countries where people are not allowed to vote (China, Palestine and Qatar). Second, we omit individuals who did not answer the question (V227): 'When elections take place, do you vote always, usually or never?', or who did not have the right to vote, or who provided inappropriate answers. Third, we reject observations where no information on education and employment status are available, or where individuals did not answer the corresponding questions (V248 for education and V229 for employment status). Fourth, we ignore observations concerning retired people and pensioners because they are not part of a country's labor force. Finally, we exclude observations where no information, or no answer, is available concerning our redistribution and risk aversion variables. The final sample consists of 63,564 observations.

As a preliminary step, we first check whether the median voter assumption is justified. To do so, we look at the distribution of voters by level of formal education: the median voter assumption holds if the majority of the voters in the sample are poorly educated. We define individuals as being poorly educated, and consequently low-skill, if their highest level of educational attainment is 'incomplete secondary: university-preparatory type' (as reported in question V248 of the WVS questionnaire),[6] while individuals who have at least a 'complete secondary, university-preparatory type' of education are considered well-educated, and consequently highly skilled. Then, we consider as voters all those individuals who, for national elections, responded to the question (V227) with 'always' or 'usually'.[7]

Table 1 shows that almost 53% of voters are LS workers. Although a large proportion of voters are well educated, the median voter can be assumed to be an individual with an incomplete secondary school education at best.

[5] See http://www.worldvaluessurvey.org

[6] We also conduct two robustness checks. First, we restrict the number of voters to the individuals who answered 'always' to question V227. The picture remains much the same, with 52.31% of voters having an incomplete secondary school education at best. Second, we look at the distribution of voters (at national elections) by social and income class (see questions V238 and V239). We find that almost 73% of voters belong to the lower, working or lower-middle classes, and that almost 60% of voters belong to the lower five income classes on a ten income-class scale.

[7] The results do not change if we include voters at local elections (question V226).

Table 1
Distribution of voters by level of education

Highest educational level attained	*N.*	%	Cumulative %
No formal education	2174	4.11	4.11
Incomplete primary	2658	5.02	9.13
Complete primary	5349	10.11	19.24
Incomplete secondary school: techincal/vocational type	3657	6.91	26.15
Complete secondary school: techincal/vocational type	10,036	18.97	45.12
Incomplete secondary school: university-preparatory type	3987	7.53	52.65
Complete secondary school: university-preparatory type	9872	18.66	71.30
Some university-level education, without degree	4392	8.30	79.60
University-level education, with degree	10,793	20.40	100.0
Total*	52,918	100.0	

*Total refers to the number of individuals who always or usually voted in national elections.

Empirical strategy

The empirical analysis consists of three steps. The first is the definition of low-skill (LS) and high-skill (HS) worker unemployment, which enables us to distinguish between countries where the two variables are (negatively) correlated or are not. Question V229 of the WVS questionnaire relates to respondents employment status. We define a dummy for LS unemployed (U_{LS}) that equals 1 if an individual is both unemployed and poorly educated, for example, with an incomplete secondary school education.[8] Similarly, we define a dummy for HS unemployed (U_{HS}) that equals 1 if an individual is unemployed and well-educated, for example, with at least a secondary school diploma. In the final sample, 6.99% (4,441 observations) of individuals are LS unemployed, while 4.03% (2,564 observations) are HS unemployed.

The second step is to identify two sub-samples of countries where propositions 1 and 2 can be tested. To do so, we compute the pairwise correlation between U_{LS} and U_{HS} by country and we test countries where the correlation is not statistically significant for Proposition 1, while we test countries where the correlation is negative and statistically significant for Proposition 2. We find that Pearson overall correlation between U_{LS} and U_{HS} is -0.057, statistically significant at 1% level. Then we identify a set of 16 countries[9] where such a correlation remains statistically significant (at least at 10% level), while for the remaining 39 countries, the correlation is negative but not statistically different

[8] We also adopt an alternative definition of LS and HS unemployment, considering income instead of education as proxy for the workforce skill level. In particular, we define an individual who is unemployed and belongs to the bottom five of ten income brackets as LS unemployed (U_{LS}) , whereas a HS unemployed (U_{HS}) individual is a person who is not working and belongs to the top five income brackets. When we repeat our empirical analysis using these two variables, we find no change in our results. The estimates are available from the authors on request.

[9] Algeria, Azerbaijan, Armenia, Brazil, Colombia, Georgia, Ghana, Kyrgyzstan, Mexico, Philippines, Rwanda, South Africa, Spain, Tunisia, United States, and Zimbabwe.

from zero.[10] The former sub-sample comprises 21,667 observations (34.09% of observations in the sample), and the latter 41,897 observations (65.91%).

The third step is to delineate the empirical model. The baseline equation that we estimate is as follows:

$$R_i = \beta_0 + \beta_1 U_{LS_i} + \varepsilon_i \tag{3}$$

where i is the individual, R is a variable measuring the individual preference for redistribution, U_{LS} is the LS unemployment dummy and ε is the error term. To test Proposition 1, equation (3) is estimated on the sub-sample of countries for which U_{LS} and U_{HS} are not significantly correlated. Proposition 1 is valid if: (i) the estimated coefficient β_1 is positive and statistically significant; and (ii) this result is independent of the individual degree of risk aversion. To check for this, we re-estimate equation (3) while interacting U_{LS} with our proxy of risk version σ as follows:

$$R_i = \beta_0 + \beta_1 U_{LS_i} + \beta_2 \sigma_i + \beta_3 (U_{LS_i} \cdot \sigma_i) + \varepsilon_i \tag{4}$$

We then look at the estimated coefficient β_3; if it is not statistically different from zero, this means that the effect of an increase in U_{LS} on R is unaffected by the level of the individuals risk aversion.

To test Proposition 2, we consider the sub-sample of individuals belonging to countries where U_{LS} and U_{HS} are negatively and significantly correlated. Then we split this sample into two further groups according to the individual's degree of risk aversion, and we re-estimate equation (3) separately on each of the two groups. If Proposition 2 holds, we expect β_1 to be positive and statistically significant where individuals are scarcely risk-averse, and β_1 to be negative and statistically significant where individuals are strongly risk-averse.

Variables

To measure individual preference for redistribution, we consider the answer to the following question: 'Rate your views on this scale, where 1 means you agree completely with the statement on the left, 10 means you agree completely with the statement on the right, and if your views fall somewhere in between, you can choose any number in between'; to the left of the scale there is the statement (V96) 'Incomes should be made more equal', and to the right the statement 'We need larger income differences as incentives for individual effort'. Respondents thus answer on a 10-point scale, where lower values reflect a preference for redistribution and higher values reveal a preference for income inequality.[11]

[10] These results are confirmed when we compute the tetrachoric correlation between U_{LS} and U_{HS}.

[11] We also define an alternative redistribution variable, using the question: 'Please rate to what degree you consider each of the following things an essential characteristic of democracy, on a scale of 1 to 10, where 1 means <<not at all an essential characteristic of democracy>> and 10 means definitely <<an essential characteristic of democracy>>'. The statement of interest is (V137): 'The State makes people's income equal'. We take the corresponding answers to generate a new ordinal variable ranging between 1 and 10, where higher values indicate a stronger preference for income redistribution. Although the results of our estimates remain qualitatively the same, when testing for Proposition 2, the signs of the estimated coefficients are as expected, but β_1 is not statistically significant in the sub-sample of strongly risk-averse individuals.

Table 2
Preference for redistribution: distribution of the answers

R	*N.*	%	Cumulative %
1 Incomes should be made more equal	8665	13.63	13.63
2	3776	5.94	19.57
3	5164	8.12	27.70
4	4992	7.74	35.44
5	8720	13.72	49.16
6	6418	10.10	59.26
7	6978	10.98	70.23
8	6972	10.97	81.20
9	4053	6.38	87.58
10 We need larger income differences	7896	12.42	100.0
Total	63,564	100.0	

The answers from 1 to 10 contribute to defining our proxy for redistribution, *R*. Table 2 shows the distribution of these answers in the sample.

To give a more intuitive interpretation of the estimates, we reverse the sign of the answers, and assume that an individual reveals a greater preference for redistribution the higher the value of *R*. Since *R* is an ordinal variable, we estimate equations 1 and 2 using an ordered probit model.[12]

To provide a direct measure of risk aversion, we use the answer to the question: 'Please indicate for each description whether the person described is very much like you, like you, somewhat like you, not like you, or not at all like you', where the statement of interest is (V76): 'Adventure and taking risks are important to this person'. Answers are ranked on a 6-point scale, where 6 ('not like me') indicates an individual who is strongly risk-averse and 1 identifies an individual who is strongly risk-prone. We therefore define σ as a categorical variable ranging from 1 to 6, which increases with the degree of a given individual risk aversion. Table 3 shows the distribution of the answers in the sample as a whole: we note that the median individual is fairly risk-neutral.

Results

Tables 4 and 5 show the results of our estimation. Table 4 refers to the empirical test of Proposition 1. Column 1 shows that, when U_{LS} and U_{HS} are not correlated, LS individuals becoming unemployed increase their preference for income equality (i.e., for redistribution), as *R* also increases. Column 2 shows that this positive relationship holds irrespective of the individual degree of risk aversion. In particular, the estimated coefficients reveal that: (i) in the absence of any risk aversion, a higher U_{LS} is related to a higher *R*; (ii) in the absence of any LS unemployment, a higher σ is also related to a higher *R*; and (iii) when U_{LS} and *R* interact, their estimated coefficient is not statistically significant. Taken together, these results confirm the validity of Proposition 1.

[12] As a robustness check, we standardize *R* and estimate equations 3 and 4 using ordinary least squares (OLS). We do not find any relevant difference in the results.

Table 3
Risk aversion: distribution of the answers

σ	*N.*	%	Cumulative %
1 Very much like me	7337	11.54	11.54
2 Like me	11,132	17.51	29.06
3 Somewhat like me	11,918	18.75	47.81
4 A little like me	11,034	17.36	65.16
5 Not like me	13,421	21.11	86.28
6 Not at all like me	8722	13.72	59.26
Total	63,564	100.0	

Table 4
Proposition 1: ordered probit estimates

	(1)	(2)
U_{LS}	0.114***	0.158**
	(0.026)	(0.063)
σ		0.035***
		(0.003)
$U_{\mathrm{LS}} * \sigma$		−0.011
		(0.017)
N	41,897	41,897
Pseudo R^2	0.001	0.001

Notes: all the estimates include also a constant term. Bootstrapped standard errors in brackets.
***significant at 1% level; **significant at 5% level; *significant at 10% level.

Table 5
Proposition 2: ordered probit estimates

	(1) $\sigma \leq 4$	(2) $\sigma > 4$	(3) $\sigma \leq 5$	(4) $\sigma = 6$
U_{LS}	0.032*	−0.072*	0.036**	−0.227***
	(0.021)	(0.040)	(0.017)	(0.063)
N	14,804	6863	18,649	3018
Pseudo R^2	0.001	0.001	0.001	0.010

Notes: all the estimates include also a constant term. Bootstrapped standard errors in brackets.
***Significant at 1% level; **significant at 5% level; *significant at 10% level.

Table 5 shows the results when equation (3) is used to test for Proposition 2 on the sample of individuals for which U_{LS} and U_{HS} are (significantly) negatively correlated. In Columns 1 and 2, we split this sample by median level of risk aversion (e.g., 4), so Column 1 refers to individuals with a degree of risk aversion up to 4, and Column 2 to those whose risk aversion is 5 or more. The estimates show that β_1 is positive but weakly significant in Column 1, and negative, but still significant at 10% level, in Column 2. In other words,

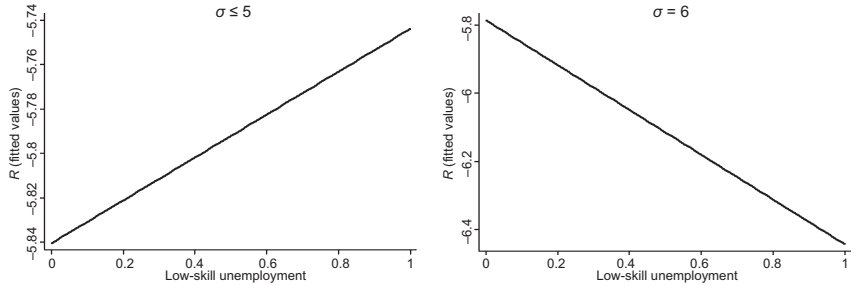


Figure 1. The relationship between R and U_{LS} when U_{LS} and U_{HS} are negatively correlated.

when σ is low, LS unemployed people continue to increase their preference for redistribution, as R also increases; but when σ is high, a higher risk of unemployment leads LS workers to favor income inequality. This picture becomes more obvious if the risk aversion threshold is raised to 5, as in Columns 3 and 4. The estimated β_1 becomes not only larger in magnitude, but also strongly significant, especially in the sample of individuals whose σ is very high (e.g., taking a value of 6).[13] The results are clearer still in Figure 1, where we plot the R, U_{LS} relationship when $\sigma \leq 5$ (left graph) and $\sigma = 6$ (right graph).

Taken together, these results confirm the validity of Proposition 2.

We finally test Propositions 1 and 2 using macroeconomic data. To do so, we merge different data sources. First, we use the data on the tax burden (as a percentage of GDP) and total unemployment provided by the Heritage Foundation. To measure risk aversion, we use two different indicators. One is based on the analyses on countries' cultural traits conducted by Gary Hofstede (Hofstede, 1980; Hofstede *et al.*, 2010). In particular, we consider the uncertainty avoidance index (UAI), which expresses the degree to which members of a society feel uncomfortable with uncertainty and ambiguity. The other is the global risk attitude computed by Vieider, Chmura and Martinsson (Vieider *et al.*, 2012) (VCM), which is derived from a series of fully controlled and incentivized experiments conducted in 30 countries. Then, we split the sample of 75 available countries using the information on the correlation between U_{LS} and U_{HS} emerging from the microeconomic analysis based on the WVS. When we test Proposition 1, we find that the estimated coefficient of unemployment on the tax burden is positive but not statistically significant. Since we have only a limited number of countries to test Proposition 2, we cannot estimate equation 1. We find, however, that the average tax burden of countries with values of UAI (or VCM) above the median is much lower (0.191) than that of countries where the UAI (and the VCM) is below the median. The results are not shown here for reasons of space, but are available but are available as online supplementary material in Data S1 Robustness tests.

[13] These results remain statistically significant, albeit at 10% level, when we cluster the standard errors by country.

IV Concluding Remarks

This paper shows that in economies where the HS and LS workers different employment probabilities are inversely correlated, the median voter rational choice of tax rate is for a lower tax rate due to an increase in their risk aversion. The redistribution paradox, which states that a voter on a below-average income might prefer lower taxation although this implies a lower level of social security, can indeed be interpreted as a rational choice for the LS median voter, depending on their level of risk aversion and on whether or not their risk of being jobless correlates negatively with that of the HS workers. We find that very risk-averse LS workers might prefer to exploit a potential improvement in the dynamic efficiency of the economy because they could benefit from lower taxation both directly (having a higher income when employed) and indirectly (obtaining higher unemployment benefits during spells of unemployment). So they would vote for a lower tax rate providing they are sufficiently risk-averse. The stronger their preference for smooth consumption, the more they will be willing to lower the tax rate because a drop in the unemployment risk for HS workers raises tax revenues and consequently also the LS workers consumption when unemployed. Even individuals with below-average incomes, instead of voting for more social protection, will prefer to take care of themselves and choose a lower tax rate. This is the most effective way for a highly risk-averse, LS worker to shift some consumption towards the employed state once transfers have increased.

We empirically test this hypothesis on microeconomic data coming from the 2010–2012 World Values Survey, which provides direct information on individual preferences for redistribution and risk aversion. Our estimates show that, when the risk of unemployment for HS and LS workers are not correlated, a higher probability of LS workers becoming unemployed correlates with a stronger preference for income redistribution, regardless of the workers level of risk aversion. When the two risks are negatively and significantly correlated, the relationship between LS unemployment and income redistribution remains positive for low levels of risk aversion, but turns negative for high levels of risk aversion. These results are robust in relation to the use of alternative definitions of LS unemployment and preference for redistribution, and to alternative estimation techniques.

Appendix: Proof of Propositions

Proof of Proposition 1

Let us rewrite equation 3 as follows:

$$t_k^*(p_k) = \frac{1}{1 + \left(\left(\frac{1-p}{p} \right) \left(\frac{Y_k[p_j H + p_k L]}{(1-p_k)LY_k + (1-p_j)HY_j} \right)^{1-\sigma} \right)^{\frac{1}{\sigma}}} \tag{A1}$$

Differentiating equation A1 w.r.t. p_k, and rearranging it, we obtain the following expression:

$$\frac{\partial t_k^*}{\partial p_k} = A\left[\frac{1}{p_k} + (1-p_k)(\sigma - 1)B \right] \tag{A2}$$

where we set $A = \frac{\left(\frac{uY_k}{\tilde{Y}}\right)^{1-\sigma}}{p_k \sigma \left(1 - \frac{1}{p_k}(p_k - 1)\left(\frac{uY_k}{\tilde{Y}}\right)^{1-\sigma}\right)^{\frac{1}{\sigma}+1}}$, $B = \frac{\left[Y_j(1-p_j)H + Y_k(L+p_j H)\right]L}{u\tilde{Y}}$. Note that $A > 0$, $B > 0$. The sign of the derivative therefore depends on the sign of σ. Bearing in mind that $\sigma \in (0,1) \cup (1,\infty)$, we distinguish between two cases: a) let $\sigma \in (1,\infty)$; it is easy to see that $t_k'(p_k) > 0$.; b) let $\sigma \in (0,1)$; we see that $t_k'(p_k) < 0 \Leftrightarrow \sigma < 1 - \frac{1}{Bp_k(1-p_k)}$. But $\frac{1}{Bp_k(1-p_k)} > 1 \Leftrightarrow \left[Y_j(1-p_j)H + Y_k(L + p_j H)\right] L p_k (1-p_k) < (p_j H + p_k L)\left[(1-p_j)HY_j + (1-p_k)LY_k\right]$. We can simplify the disequality and rewrite it as $(p_k - 1)(1-p_k)p_j LHY_k < \left[p_k^2(1-p_j)LH + p_j(1-p_j)H^2\right]Y_j$, which is always satisfied. We would then have $\sigma < 0$, which is impossible.

Proof of Proposition 2

Assuming that $p_j = \alpha(1 - p_k)$, with $\alpha \geq \frac{L}{H}$, we can rewrite equation 3 as follows:

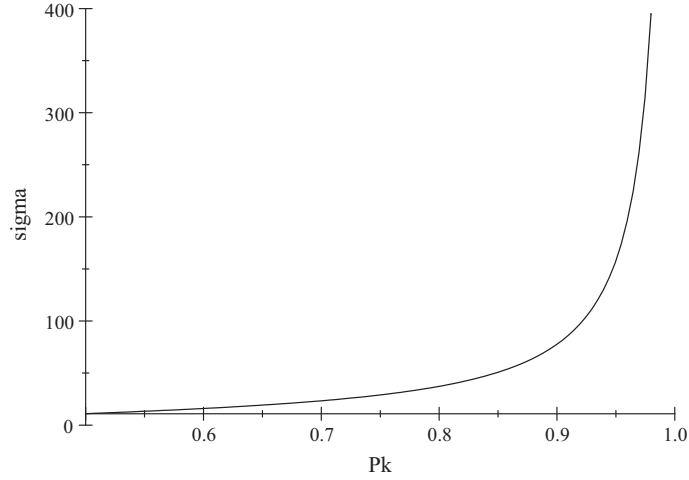
$$t_k^*(p_k) = \frac{1}{1 + \left(\left(\frac{1-p}{p} \right) \left(\frac{p_j Y_k (L - \alpha H) + \alpha H Y_k}{p_k\left(\alpha H Y_j - L Y_k\right) - (\alpha - 1)HY_j} \right)^{1-\sigma} \right)^{\frac{1}{\sigma}}} \tag{A3}$$

Differentiating the expression for t_k^* in 7 w.r.t. p_k and simplifying, we obtain the following expression:

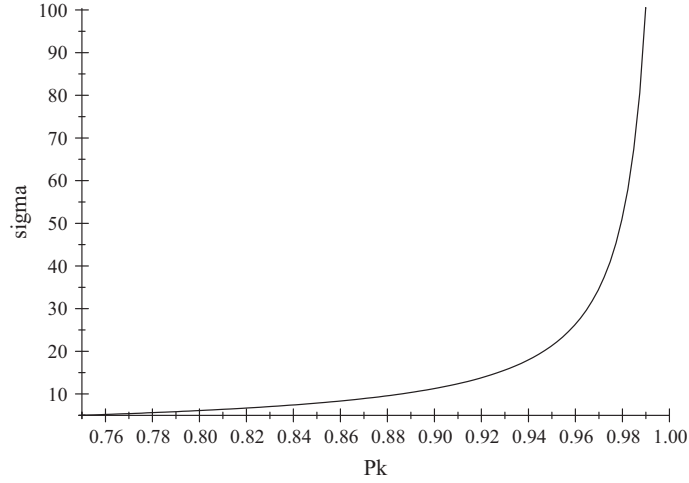
$$\partial t_k^* / \partial p_k = G\left[\frac{1}{p_k} + (1-p_k)(\sigma - 1)D \right]$$

where we set $G = \frac{\Xi^{1-\sigma}}{p_k \sigma \left(1 - \frac{1}{p_k}(p_k - 1)\Xi^{1-\sigma}\right)^{\frac{1}{\sigma}+1}}$, $\Xi = -\frac{\alpha Y_k H + p_k Y_k (L - \alpha H)}{-HYj[1 - \alpha(1-p_k)] - p_k L Y_k}$, $D = \left[\frac{-\alpha H Y_j + L Y_k}{-HY_j[1-\alpha(1-p_k)] - p_k L Y_k} - \frac{L - \alpha H}{\alpha H(1-p_k) + p_k L}\right]$. We see that $D > 0$, based on the assumption that $p_k \in (\frac{\alpha - 1}{\alpha}, 1)$, and $\Xi > 0$, so $G < 0$ and the sign of the derivative depends on the term between square brackets. As before, $\sigma \leq 1 \Leftrightarrow \partial t_k^* / \partial p_k \geq 0$. For $\sigma > 1$, $\partial t_k^* / \partial p_k \leq 0$ if $\sigma > 1 + \frac{1}{p_k(1-p_k)D}$. Let us

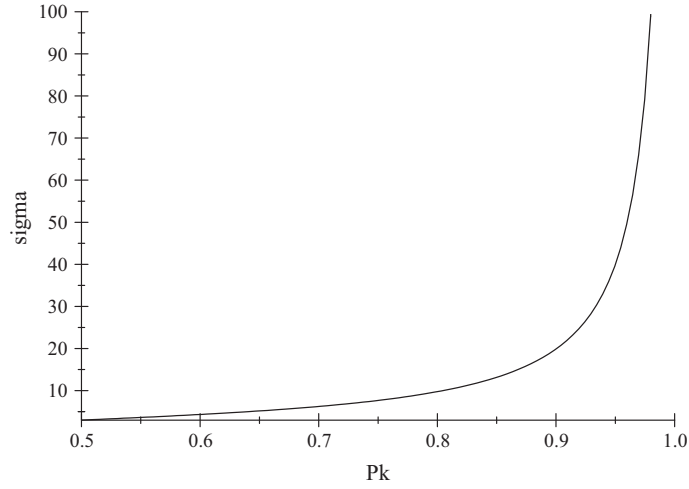
call $\breve{\sigma} = 1 + \frac{1}{p_k(1-p_k)D}$. It is hard to characterize the equation for $\breve{\sigma}$ analytically. We simulate $\breve{\sigma}$ in the figures below and show that values of p_k exist for which $\breve{\sigma} < 1$, and this is a sufficient condition for $\sigma > \breve{\sigma}$.



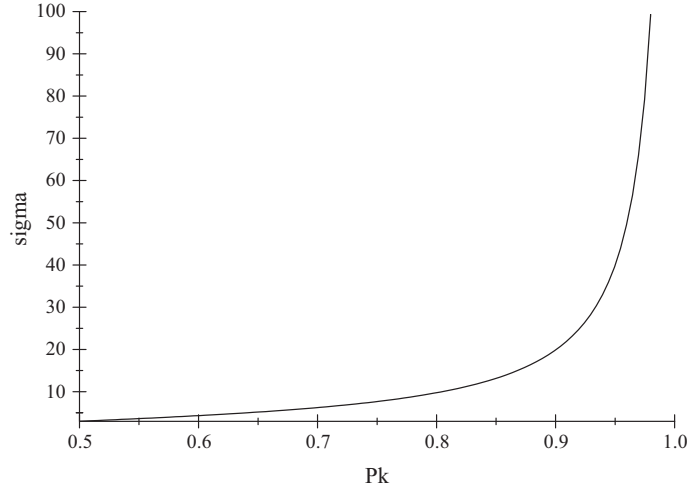
Simulation 1. Values: $Y_k = 1$, $Y_j = \frac{12}{10}$, $\alpha = 2$, $H = 50$, $L = 100$, $p_k \in (.5, 1)$.



Simulation 2: $Y_k = 1$, $Y_j = \frac{12}{10}$, $\alpha = 3$, $H = 50$, $L = 100$, $p_k \in (.75, 1)$.



Simulation 3: $Y_k = 1$, $Y_j = 2$, $\alpha = 2$, $H = 50$, $L = 100$, $p_k \in (.5, 1)$.



Simulation 4: $Y_k = 1$, $Y_j = 2$, $\alpha = 3$, $H = 50$, $L = 100$, $p_k \in (.75, 1)$.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Data S1. Robustness tests.

Date of receipt of final manuscript: 4 January 2016