

Trust and the Welfare State: the Twin Peaks Curve

Online Appendix

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A1 Extension of the model including corrupt officials

This appendix presents the extension of the model which incorporates the behavior of officials who levy taxes. It is shown that the model still predicts a non-monotonic relation between the share of civic individuals and the size of the welfare state.

Every individual is working during the day and is an official at night. Every official is matched at random with an individual for the purpose of levying taxes. Civic officials do their duty: they levy taxes which are used to distribute benefits. Uncivic officials capture the taxes that they levy.¹

In this context, the tax receipt of the government is reduced by the amount of taxes captured by uncivic officials. When they are officials, uncivic individuals are matched with probability α with a civic individual. In that case, they capture the tax payed by the civic individual if he is productive, which occurs with probability π . When uncivic officials are matched with uncivic individuals, which occurs with probability $1 - \alpha$, they capture the tax with probability $p\pi$. Therefore, uncivic officials capture the tax t with probability $\pi[\alpha + p(1 - \alpha)]$. This implies that the tax receipt of the government is composed of the taxes paid by civic individuals, $t\alpha\pi$, plus those paid by uncivic individuals whose production cannot be hidden, $p\pi(1 - \alpha)$, minus the amount captured by the uncivic officials, $t\pi[\alpha + p(1 - \alpha)]$. Benefits are provided to the $(1 - \pi)$ unproductive individuals and to the $\pi(1 - p)(1 - \alpha)$ productive uncivic individuals who can claim benefits because their production can be hidden. Accordingly, the budget constraint of

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¹Alternatively, our assumption could be that taxes levied by uncivic officials are wasted. This leads to the same qualitative results. We could also assume that the probability of hiding production decreases with the share of civic officials to the extent that civic officials are more conscientious. This does not change the result that the relation between trust and the scope of the welfare state is twin peaked.

the government is

$$t\pi p(1-\alpha)(1-p) = [(1-\pi) + \pi(1-p)(1-\alpha)]b. \quad (\text{A1})$$

- Civic individuals expect to pay the tax t if they are productive and to get benefits b otherwise. They choose the value of t which maximizes expression (2) of the main text subject to the budget constraint (A1), which can be written $b = b(t)$. The first order condition can be written as

$$\phi_c(t) \equiv \frac{-\pi}{y-t} + \frac{1-\pi}{y+b(t)}b'(t) = 0.$$

Let t_{civic} denoted the preferred tax of civic individuals, such that $\phi_c(t_{\text{civic}}) = 0$. The second order condition requires that $\phi'_c(t_{\text{civic}}) < 0$. Therefore, the first order condition implies that $\partial t_c / \partial \alpha$ has the same sign as $\partial \phi_c / \partial \alpha$. Equation (A1) allows us to write $b(t)$ under the form $b(t) \equiv a(\alpha)t$ where a is an increasing function. Thus, we get $\frac{\partial b}{\partial t} = a$, $\frac{\partial b}{\partial \alpha} = a'(\alpha)t > 0$, and $\frac{\partial^2 b}{\partial t \partial \alpha} = a'(\alpha) > 0$, which imply that $\frac{\partial b}{\partial \alpha} \frac{\partial b}{\partial t} = \frac{\partial^2 b}{\partial t \partial \alpha} b$. Therefore, we get

$$\frac{\partial \phi_c}{\partial \alpha} = \frac{1-\pi}{(y_0+b)^2} \left(\frac{\partial^2 b}{\partial t \partial \alpha} y_0 \right) > 0,$$

which implies that $\partial t_{\text{civic}} / \partial \alpha > 0$, i.e. the preferred tax of civic individuals increases with the share of civic individuals.

- When they are officials, uncivic individuals are matched with probability α with a civic individual. In that case, they capture the tax paid by the civic individual if the latter is productive, which occurs with probability π . When uncivic officials are matched with uncivic individuals, they capture the tax with probability $p\pi$. Therefore, uncivic officials capture the tax t with probability $\pi[\alpha + p(1-\alpha)]$. This implies that uncivic individuals choose non negative taxes and benefits which maximize

$$\begin{aligned} & \pi[\alpha + p(1-\alpha)] [\pi [p \ln y + (1-p) \ln(y+b+t)] + (1-\pi) \ln(y_0+b+t)] \\ & + [1 - \pi[\alpha + p(1-\alpha)]] [\pi [p \ln(y-t) + (1-p) \ln(y+b)] + (1-\pi) \ln(y_0+b)], \end{aligned}$$

subject to the budget constraint (A1) which can be written as $b = b(t)$. The first order condition can be written

$$\phi_u(t) \equiv \phi_c(t) + f(\alpha) \left(\frac{\pi(1-p)}{y+b+t} + \frac{(1-\pi)}{y_0+b+t} \right) [1 + b'(t)] + \frac{(1-p)\pi}{y-t} + \frac{\pi(1-p)}{y+b} b'(t) = 0,$$

where $f(\alpha) = \frac{\pi[\alpha+p(1-\alpha)]}{[1-\pi[\alpha+p(1-\alpha)]]}$ and $f'(\alpha) > 0$. Let t_{uncivic} denote the preferred tax of the uncivic individuals, such that $\phi_u(t_{\text{uncivic}}) = 0$. For t_{uncivic} to correspond to a maximum, one must have $b'(t_{\text{uncivic}}) > 0$ (otherwise, it would be possible to decrease the tax to increase benefits, which cannot correspond to a maximum). This implies that $\partial \phi_u(t_{\text{uncivic}}) / \partial \alpha > 0$

and then that t_{uncivic} increases with the share α of civic individuals. Moreover, the first order condition implies that $\phi_u(t_{\text{uncivic}}) > \phi_c(t_{\text{uncivic}})$. Together with the second order conditions – $\phi'_c(t_{\text{civic}}) < 0$ and $\phi'_u(t_{\text{uncivic}}) < 0$ – and the unicity of t_c , this inequality implies that $t_{\text{uncivic}} > t_{\text{civic}}$.

Since uncivic individuals support more generous welfare states than civic individuals as in the benchmark model, the reasoning developed in section 2.3 still applies. Therefore, this version of the model predicts the same type of twin peaks relation between the share of civic individuals and the size of the welfare state as before.

A2 Model where trustworthiness is a continuous variable

Let us prove that uncivic individuals want more redistribution than civic individuals and that every individual, whether civic or uncivic, wants more redistribution when surrounded by more civic individuals in the model described in section 2.5 where trustworthiness is a continuous variable.

We assume that the solution to the maximization problem of every individual is unique. From equations (2) and (5), we get

$$V_{\text{uncivic}} - V_{\text{civic}} = (1 - p)\pi \ln \left(\frac{y + b}{y - t} \right),$$

which implies that the share of civic individuals, $\alpha = 1 - F(V_{\text{uncivic}} - V_{\text{civic}})$, decreases with b and increases with t . With this definition of α , the government budget constraint (1) still defines a relation between t and b that is denoted by $b(t)$. Civic individuals maximize (1) with respect to t subject to $b = b(t)$. The first order condition is

$$\phi_c(t) \equiv -\frac{\pi}{y - t} + \frac{1 - \pi}{y_0 + b(t)} b'(t) = 0.$$

The first order condition of the maximization problem of uncivic individuals can be written

$$\phi_u(t) \equiv -\frac{\pi p}{y - t} + \frac{(1 - p)\pi}{y + b(t)} b'(t) + \frac{1 - \pi}{y_0 + b(t)} b'(t) = 0.$$

Let us denote by t_{civic} and t_{uncivic} the tax chosen by civic and uncivic individuals respectively. The second order conditions require that $\phi_c(t)$ and $\phi_u(t)$ are decreasing functions at $t = t_{\text{civic}}$ and $t = t_{\text{uncivic}}$ respectively. For t_{civic} to correspond to a maximum, one must have $b'(t_{\text{civic}}) > 0$ (otherwise, it would be possible to decrease the tax to increase benefits, which cannot correspond to a maximum). Therefore, since

$$\phi_u(t) - \phi_c(t) = (1 - p)\pi \left(\frac{1}{y - t} + \frac{b'(t)}{y + b(t)} \right),$$

it turns out that $\phi_u(t_{\text{civic}}) > \phi_c(t_{\text{civic}})$, which implies, together with $\phi'_u(t_{\text{uncivic}}) < 0$ and the unicity of t_{civic} and t_{uncivic} , that $t_{\text{civic}} < t_{\text{uncivic}}$.

Now, to analyze the impact of changes in the share of civic individuals on the preferred tax of every individual, let us assume that the distribution of parameter T , which measures trustworthiness, changes so that the share α of civic individuals increases. Assuming that the second order conditions of the maximization problems of all individuals are satisfied, the first order conditions imply that $\partial t_i / \partial \alpha$ has the same sign as $\partial \phi_i / \partial \alpha$, for $i = \text{civic}, \text{uncivic}$. We get

$$\frac{\partial \phi_c}{\partial \alpha} = \frac{1 - \pi}{(y_0 + b)^2} \left(\frac{\partial^2 b}{\partial t \partial \alpha} (y_0 + b) - \frac{\partial b}{\partial \alpha} \frac{\partial b}{\partial t} \right).$$

Equation (5) allows us to write $b = b(t) \equiv a(\alpha)t$ where a is an increasing function. Thus, we get $\frac{\partial b}{\partial t} = a$, $\frac{\partial b}{\partial \alpha} = a'(\alpha)t > 0$, and $\frac{\partial^2 b}{\partial t \partial \alpha} = a'(\alpha) > 0$, which imply that $\frac{\partial b}{\partial \alpha} \frac{\partial b}{\partial t} = \frac{\partial^2 b}{\partial t \partial \alpha} b$. Therefore, we have

$$\frac{\partial \phi_c}{\partial \alpha} = \frac{1 - \pi}{(y_0 + b)^2} \left(\frac{\partial^2 b}{\partial t \partial \alpha} y_0 \right) > 0,$$

which implies that $\partial t_c / \partial \alpha > 0$. A similar computation proves that $\partial t_{\text{uncivic}} / \partial \alpha > 0$. Therefore, we have shown that the preferred tax of civic and uncivic individuals increases when the share of civic individuals raises.

A3 Bootstrapped p-values for piecewise regressions

The asymptotic distribution of the maximum \mathbb{F} -statistic has been derived by Andrews (1993, 2003). Associated p-values have been approximated by Hansen (1997). Yet, Diebold and Chen (1996) have shown that this asymptotic distribution cannot be used for a finite sample without a sizable risk of over-rejecting the null hypothesis of no breakpoint. To solve this issue, Diebold and Chen (1996) developed a method to construct relevant p-values thanks to a bootstrap approach. In what follows, we rephrase Diebold and Chen (1996) in order to describe how we implement their method for each pair of dependent and independent variables used in the main text.

We first estimate expression (7) of the main text under the null hypothesis of no breakpoint. In other words, we estimate the following equation:

$$z_i = a_0 + b_0 x_i + \varepsilon_i, \forall x_i,$$

We store estimated coefficients \hat{a}_0 and \hat{b}_0 from which we construct predicted values of z , i.e. $\hat{z}_1, \dots, \hat{z}_n$ and residuals $\hat{\varepsilon}_1, \dots, \hat{\varepsilon}_n$. Here is where the bootstrap procedure formally starts. We randomly draw (with replacement) a sample of n residuals from $\{\hat{\varepsilon}_1, \dots, \hat{\varepsilon}_n\}$ and construct a pseudo-data sample by adding these values to \hat{z}_i , for $i = 1, \dots, n$. We then apply the procedure described in the main text to look for the optimal breakpoint within this pseudo-

sample and store the corresponding maximum F-statistic. We repeat this procedure 10,000 times, which allows us to construct a distribution of the test statistic. Finally, we compute the bootstrapped p-value as the probability, relative to the constructed distribution, of obtaining a larger maximum F-statistic than the one actually obtained from the original data sample.

We use the same approach to construct the distribution of test-statistics for the differences in intercepts and slopes above and below the breakpoint, and for the discontinuity, such that p-values of these tests also take into account that the breakpoint has been endogenously determined.

A4 Robustness of individual-level evidence

Results presented in the main text show that support for the welfare state is strongly associated with an agent’s cooperative behavior, with generalized trust, and with the perceived behavior of others. We have shown that these beliefs are substantial determinants of support for the welfare state. Yet beliefs in the determinants of success and in social mobility have likewise been shown to be strong determinants of the demand for redistribution. In this appendix, we investigate whether the correlations we uncovered persist when these alternative beliefs are taken into account.

Alesina and La Ferrara (2005) have shown that beliefs in the determinants of success in life are strongly correlated with the demand for redistribution. More precisely, the belief that success is more likely to be determined by luck than by effort induces a higher demand for redistribution. On the contrary, people who think that they can climb the social ladder by their own hard work are more likely to demand less redistribution by the state. While the ESS does not include a question yielding information about belief in the role of luck as a determinant of success, the WVS does. In table A3, we capture the feeling that success is determined by hard work rather than by chance using the following question from the WVS: “Hard work brings success.” Possible answers are on a scale between 1 and 10: 1 means “In the long run, hard work usually brings a better life,” whereas 10 means “Hard work does not generally bring success – it’s more a matter of luck and connections.” In this table, we replicate correlations between indicators of individuals’ civic behavior and the support for the welfare state, but adding *luck* as covariate. There is no perfect overlap between waves of the WVS that include questions about luck and those that include civicness-related questions. Hence, the number of observations is strongly reduced in some columns of this table with respect to samples used in table 4. The results of these regressions suggest that, despite the smaller size of the sample, the correlation between civicness and support for the welfare state generally holds when controlling for *luck*. Point estimates are always negative. Furthermore, they are statistically different from zero at the 1% confidence level for three out of our six measures of civicness. The last column of table A3 shows that the relationship between trust and support

for the welfare state also holds when controlling for *luck*.

Clark and D'Angelo (2010) have shown that reaching a higher point on the social ladder than one's parents is also an indicator of social mobility associated with political preferences that reflects weaker support for the welfare state. Such mobility can be observed using the difference between the education of the respondent and the education of his parents. This measure of social mobility is likely to reflect realized and expected increasing (or decreasing) social mobility. In line with this reasoning, if an individual has a higher level of education than his parents, then his demand for redistribution should be weaker. In contrast with what precedes, while the WVS does not include relevant information about parents' education, the ESS does. In table A4, we use the ESS and show that the correlation between variables that depict trust in others or the perceived behavior of compatriots and support for the welfare state is still statistically significant when social mobility is taken into account. In order to capture social mobility, we construct dummy variables for each difference between the level of education of the respondent and that of his parents. This approach takes into account all the possible upward or downward mobilities. We measure education using a 7-item scale which ranges from "not completed primary education" to "second stage of tertiary." The interaction between respondents' education and parents' education gives a set of 49 dummy variables. We construct two sets of dummy variables using the education of the father and the education of the mother. We include the two sets of social mobility measures in regressions of support for the welfare state on the different measures of trust and perceived behavior of compatriots. All specifications include individual control variables and country fixed effects. The estimated coefficients are virtually identical to those estimated in table 5 using country fixed effects. These results mean that the effect of these variables on support for the welfare state persists when realized or expected social mobility is taken into account.

References

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Table A1: Definitions of covariates from the World Values Survey.

Age	Respondent's age in years.
Gender	Respondent's gender. Equals 1 for males, and 0 for females.
Education	Respondent's highest educational level attained. The scale ranges from 1, "inadequately completed primary education", to 8, "university with degree/higher education".
Income	Respondent's income decile. From 1 to 10.
Religiosity	Answer to the following question: " <i>Apart from weddings, funerals and christenings, about how often do you attend religious services these days?</i> ". Answers range from 0, " <i>Never practically never</i> ", to 7, " <i>More than once a week</i> ".
Political orientation	Answer to the following question: " <i>In political matters, people talk of "the left" and "the right." How would you place your views on this scale, generally speaking?</i> ". Answers range from 0, " <i>Left</i> ", to 10, " <i>Right</i> ".
Marital status	Respondent's marital status, coded using three dummy variables for "separated / divorced", "widowed", and "never married". "Married" is the reference category.
Employment status	Respondent's employment status, coded using five dummy variables for "unemployed", "in education", "disabled", "retired", and "other". "Employed" is the reference category.

Table A2: Definitions of covariates from the European Social Survey.

Age	Respondent's age in years.
Gender	Respondent's gender. Equals 1 for males, and 0 for females.
Education	Respondent's years of full-time education completed.
Income	Respondent's income decile. From 1 to 10.
Religiosity	Answer to the following question: " <i>How religious are you?</i> ". Answers range from 0, " <i>Not at all religious</i> ", to 10, " <i>Very religious</i> ".
Political orientation	Answer to the following question: " <i>In politics people sometimes talk of "left" and "right". Using this card, where would you place yourself on this scale, where 0 means the left and 10 means the right?</i> ". Answers range from 0, " <i>Left</i> ", to 10, " <i>Right</i> ".
Marital status	Respondent's marital status, coded using three dummy variables for "separated / divorced", "widowed", and "never married". "Married" is the reference category.
Employment status	Respondent's employment status, coded using five dummy variables for "unemployed", "in education", "disabled", "retired", and "other". "Employed" is the reference category.

Table A3: Relationship between the support for the welfare state and civism, taking into account the perception of success.

Dependent variable: support for the welfare state							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Civism (benefits)	-0.166*** (0.047)						
Civism (transport)		-0.126*** (0.046)					
Civism (taxes)			-0.074 (0.050)				
Civism (bribe)				-0.062 (0.045)			
Civism (litter)					-0.415 (0.179)		
Civism (stolen goods)						-0.207*** (0.058)	
Trust							0.180*** (0.034)
Luck	-0.010 (0.011)	-0.005 (0.011)	-0.008 (0.011)	-0.007 (0.011)	-0.018 (0.022)	-0.015 (0.012)	-0.008 (0.011)
Observations	87,720	86,528	89,187	89,319	3,907	44,638	89,602
R-squared	0.110	0.113	0.109	0.109	0.079	0.111	0.110

*** p<0.01, ** p<0.05, * p<0.1. White heteroskedastic standard errors (clustered by country \times wave) in parentheses. OLS regressions. Data from World Values Survey. In addition to the same covariates as those used in table 4, all regressions include year and country fixed effects, and a constant term. The support for the welfare state is measured using the following question: "I'd like you to tell me your views on various issues. How would you place your views on this scale? 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. We need larger income differences as incentives versus Incomes should be made more equal". Variables starting with *Civism* are equal to 1 if the respondent answers "never justifiable" to the following question: "Please tell me for each of the following statements whether you think it can always be justified, never be justified, or something in between, using this card"; variables are equal to 0 for all other answers. Statements used are: "Claiming government benefits to which you are not entitled"; "Avoiding a fare on public transport"; "Cheating on taxes when you have a chance"; "Someone accepting a bribe in the course of their duties"; "Throwing away litter in a public place"; "Buying stolen goods". Trust is measured using the following question: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" The variable equals 1 for "Most people can be trusted" and 0 for "Can't be too careful". Luck is the answer, on a scale from 1 to 10, to the following question: "How would you place your views on this scale? 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 chose any number in between. Hard work brings success." On the scale, 1 is associated with "In the long run, hard work usually brings a better life", and 10 is associated with "Hard work doesn't generally bring success - it's more a matter of luck and connections".

Table A4: Relationship between the support for the welfare state, trust, and perceived behavior of compatriots, taking into account prospects of upward mobility.

Dependent variable: support for the welfare state						
	(1)	(2)	(3)	(4)	(5)	(6)
Most people can be trusted	0.072*** (0.013)					
Most people try to be fair		0.049*** (0.013)				
Most people try to be helpful			0.049*** (0.014)			
Many people manage to obtain benefits and services to which they are not entitled				0.199*** (0.028)		
Most unemployed people do not really try to find a job					0.232*** (0.040)	
Employees often pretend they are sick in order to stay at home						0.174*** (0.026)
Education × father's education & education × mother's education	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,238	28,157	28,214	27,525	28,051	27,597
R-squared	0.097	0.094	0.094	0.099	0.104	0.099

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. White heteroskedastic standard errors (clustered at the country level) in parentheses. OLS regressions. Data from European Social Survey, round 4. All regressions include country fixed effects and a constant term, as well as all covariates used in table 5. The support for the welfare state is measured using the following question: “Many social benefits and services are paid by taxes. If the government had to choose between increasing taxes and spending more on social benefits and services, or decreasing taxes and spending less on social benefits and services, which should they do?”. Answers range from 0, “Government should decrease taxes a lot and spend much less on social benefits and services”, to 10, “Government should increase taxes a lot and spend much more on social benefits and services”. The variable *most people can be trusted* is the answer, on a scale from 0 to 10, to the following question: “Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?”. The variable *most people try to be fair* is the answer, on a scale from 0 to 10, to the following question: “Do you think that most people would try to take advantage of you if they got a chance, or would they try to be fair?”. The variable *most people try to be helpful* is the answer, on a scale from 0 to 10, to the following question: “Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?”. The last three independent variables are approvals to the following statements: “Many people manage to obtain benefits and services to which they are not entitled”, “Most unemployed people do not really try to find a job”, and “Employees often pretend they are sick in order to stay at home”. Answers range from 1 if the respondent agrees strongly, to 5 if he disagrees strongly.