Support for Solidarity and Social Structure

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Abstract

How does popular support for redistribution depend on social structure? In a setting where consumers differ in talent, taste for effort and luck, we analyse the formation of preferences for redistribution in the form of a simple linear tax schedule. Consumers' preferences over redistribution depend on self-interest, incentive issues and fairness. Fairness is understood as a concern that all should get what they deserve. We parametrise fairness to encompass meritocracy (inequality caused by differences in talent and effort deserted) and responsibility sensitive egalitarianism (only differences due to effort deserted) and all cases in between. In the absence of full information, consumers rely on their social network to estimate the relative importance of the different income determinants. But social networks are not a random draw from society, they are typically homophilous (like tend to meet like), and more so in some cases than others. The fundamentals of the network formation process thus determine the consumer's perception of the various income determinants in explaining income inequality, and thereby her most preferred level of redistribution. Finally we also consider the case where consumers also differ in income irrelevant qualities (skin colour, religion, lifestyle...), and study what happens if these income irrelevant qualities become more salient in the network formation process. The model is empirically illustrated by an analysis of the first wave of the European Social Survey (2002-2003) and of the 1987 wave of the General Social Survey for the U.S..

1 Introduction

Throughout the twentieth century, states in advanced economies got, to various degrees, increasingly involved into broadscale redistribution.

At the beginning of the twenty-first century, the sustainability of the (particularly European) extensive welfare states is increasingly under pressure, due to demographic factors, technological evolutions in health-care, international migration, international competition and integration and persistent unemployment. In the face of these challenges, a solid understanding of the determinants of the public support for redistribution seems crucial for the maintainance or reform of the welfare state.

After pioneering work by Coughlin (1980), sociologists and political scientists have extensively studied the empirics of the public support for solidarity and redistribution. Taylor-Gooby (1996) and Coleman (1982) study variations in the support for different redistribution schemes, Svallfors (1997), Fraile and Ferrer (2005) and Jaeger (2006) investigate the impact of different institutional environments on public attitudes towards solidarity and Gilens (1996) and Banting (2000) consider the impact of ethnicity and multiculturalism. In economics, the benchmark analysis of redistribution, solely based on selfish concerns is due to Meltzer and Richards (1981). However, the central insight of this paper, that (disregarding the costs of redistribution) consumers with an income below the mean favour redistribution, such that redistribution is to be expected (more) if the median income is lower than the mean income, was falsified by Perotti (1996) and Rodriguez (1999). Support for redistribution as it is, it seems, can not be explained solely by straightforward selfishness. Bénabou and Ok (2001) integrate the prospects of a higher future income in the analysis (the POUM hypothesis - Prospect Of Upward Mobility) to explain deviations in preferences away from the rate of redistribution which provides the greatest instantaneous benefits. Alesina and La Ferrara (2005) find that an objective measure of social mobility explains indeed a part of the variation in preferences for redistribution. Corneo and Grüner (2000) introduce a second motive for subaverage income consumers to oppose a tax that would make them strictly better off materially: social status. Middle (and upper) class voters oppose redistribution because it blurs their superiority over lower income consumers. Corneo and Grüner (2002) estimate the relative importance of three motivations for support for redistribution, and find that selfish concerns, social status and fairness ('public values') all play an important role.

Fairness entails that voters care about all consumers getting what they deserve. A large body of theoretical literature (Dworkin, 1981, Roemer, 1998) has associated deserted income to factors for which consumers bear some responsibility, and undeserted income to factors over which consumers have had no control. Fairness typically dictates compensation for undeserted income inequalities, but not for deserted income differences. Fong (2001) finds that beliefs about the extent to which success is self-determined (by own effort), rather than exogenously determined (by luck) are important predictors of voters' support for redistribution. Her analysis also confirms that fairness (or indirect reciprocity) seems a major factor in voter support for redistribution. Schokkaert and Devooght (2003) establish in a broader international comparison that people wish to see effort rewarded but misfortune compensated for. Capellen, Sørensen and Tungodden (2006) study the importance of different deservingness criteria in an experimental setting. In sociology, Van Oorschot (2000, 2006) investigates the importance and nature of deservingness criteria of voters in the Netherlands and Europe. He finds that responsibility for neediness generates the largest differences in willingness to help, followed by identity (foreigner or not), reciprocity, social risk (illness, disabled, pensioned, widowed) and finally the magnitude of the need. He also finds that the conditionality (i.e. selectiveness) of solidarity is higher for older voters, for lower education levels, lower socioeconomic status (education and job level) and with voters of the religious right in the Netherlands. In a European sample, the effect of religion vanishes.

Different economists have studied the consequences of the conditionality of fairness in a theoretical framework. Alesina and Angeletos (2005) and Bénabou and Tirole (2006) show how the divergence between the European welfare states and the market-oriented American model can be seen as different equilibria of the same game. In the "American" equilibrium with low taxes, incomes are more strongly linked to effort, which on its turn justifies the low taxes in the eyes of the citizens. The low level of redistribution is then politically supported. In the "European" equilibrium, the effects of differences in effort are taxed away. Thus, social mobility is lower, such that the perception is that incomes are largely determined by factors beyond individual control. Therefore, citizens vote for more redistribution. Piketty (1995) models a similar mechanism at the level of individual family dynasties. If voters estimate social mobility from the history of their own family's history, the same self-enforcing mechanism generates a divergence of high effort, anti-redistribution and low effort, pro-redistribution family dynasties.

This paper studies the impact of social structure on the public support for redistribution. We study the formation of preferences for redistribution in a theoretical framework that generalises the Alesina and Angeletos (2005) in several ways. Like Alesina and Angeletos (2005), we consider three determinants of income (talent, taste for effort and luck) and explicit preferences for fairness. However, where Alesina and

Angeletos only focus on the meritocratic fairness ideal, we parametrise fairness such that it allows for various degrees of responsibility for talent (different forms of responsibility sensitive egalitarianism) Second, contrary to Alesina and Angeletos (2005), consumers do not know the true distribution of the different income determinants in the population. To overcome this, consumers estimate the importance of the three income determinants from their own social network environment. If social networks were entirely random, the social network environment of consumers would provide an unbiased sample of the population, and hence unbiased estimators of the relative importance of the various income determinants. However, social networks are known to display a certain degree of assortativeness or homophily. The term homophily was introduced by Lazarsfeld and Merton (1954) to denote the tendency of consumers to associate with others who are similar to themselves. Social relations prove to be homophilous with respect to many individual characteristics, as the survey of the sociological literature by McPherson, Smith-Lovin and Cook (2001) testifies. We generate social networks in a very simple fashion, and show how the perceived importance of the different factors of income inequality depends on various fundamentals of the network generation mechanism.

The second section of this paper contains an empirical analysis of public support for redistribution, and it's dependence on social structure. The analysis is based on the 2002-2003 wave of the European Social Survey and the 1987 round of the General Social Survey. These last data contain two topical modules which cover our data needs: the GSS topical module on "Socio-Political Participation" and the 1987 International Social Survey Program (ISSP) module on "Social Inequality". The third section provides a formal model of preferences for redistribution and social network structure. The fourth section concludes.

2 The Empirics of Solidarity and Social Structure

2.1 Europe

To estimate the impact of social structure on individual voter preferences for redistribution, we use the first wave of the European Social Survey, which contains the rotating module 'Citizenship, Involvement and Democracy'. The data were collected in 2002 and 2003, consist of 563 variables and cover 42359 respondents in 22 European countries: Austria (AT), Belgium (BE), Switzerland (CH), the Check Republic (CZ), Germany (DE), Denmark (DK), Spain (ES), Finland (FI), France (FR), Great Britain (GB), Greece (GR), Hungary (HU), Ireland (IE), Israel (IL), Italy (IT), Luxemburg (LU), the Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Sweden (SE) and Slovenia (SI). Wherever relevant, the appropriate weights are applied to the sample.

As a measure of preferences for redistribution, we use the variable *gincdif*. The question underlying this variable reads "To what extent you agree or disagree with the following statement: The government should take measures to reduce differences in income levels", with possible answers ranging from 1 Agree strongly to 5 Disagree strongly. Table 1 presents the descriptive statistics of gincdif for all 21 countries.

We estimate preferences for redistribution as a function of various individual characteristics and group affiliations of consumers. The summary statistics of the individual variables other than group affiliations as summarised in table 2 .

Table 1: **Desciptive statistics: Support for redistribution, by country**

cntry	**mean**	**sd**	**p50**	**N**
AT	2.264439	1.110963	2	2136
BE	2.270285	1.061812	2	1861
CH	2.476353	1.0375	2	2005
CZ	2.684633	1.292933	2	1307
DE	2.6694	1.102949	2	2876
DK	3.016393	1.164324	3	1403
ES	1.975448	.8629406	2	1606
FI	1.999493	1.038068	2	1973
FR	1.843309	1.026954	2	1489
GB	2.515923	1.018841	2	2022
GR	1.678985	.7491389	2	2500
HU	1.831598	.8906821	2	1633
IE	2.200425	.9128172	2	1977
IL	1.90318	.9519354	2	2489
IT	1.96498	.9301969	2	1166
LU	2.40837	1.191531	2	1444
NL	2.612263	1.047597	2	2340
NO	2.320404	.950367	2	2030
PL	2.038969	.9273247	2	2052
PT	1.671671	.6921077	2	1459
SE	2.328711	.9295937	2	1947
SI	1.887625	.8577238	2	1495
Total	2.21389	1.052536	2	41210

The variable *hinctnt* is stated monthly household income, divided over 12 categories (see appendix). The variables *hhmmb* and *hhmmbrsq* are respectively the number of individuals in the respondent's household and the square of this last variable. The dummy *rtrd* is one if the respondent is retired. The variables *age* and *man* respectively capture the

Table 2: **Desciptive statistics independent variables**

variable	mean	sd	p50	min	max	N
hinctnt	6.607418	2.355312	7	1	12	18090
hhmmb	2.912764	1.426276	3	1	12	18090
hhmmbrsq	10.51835	10.49319	9	1	144	18090
rtrd	.1962741	.3971892	0	0	1	18090
age	46.04773	16.39628	45	14	96	18090
man	.5231802	.4994762	1	0	1	18090
edulvl	3.102533	1.460707	3	0	6	18090
health	2.114044	.8755477	2	1	5	18090
lrscale	5.131766	2.169801	5	0	10	18090
qfimedu	6.069269	2.731741	7	0	10	18090
sclact	2.782967	.9294625	3	1	5	18090
wkhtot	40.45027	14.84303	40	0	168	18090

age and gender of the respondent. The education level variable *edulvl* indicates the highest degree of the respondent out of seven categories (0 Not completed primary education 1 Primary or first stage of basic 2 Lower secondary or second stage of basic 3 Upper secondary 4 Post secondary, non-tertiary 5 First stage of tertiary 6 Second stage of tertiary). *Health* is the repondents' subjective health state, ranging from 1 (Very good) to 5 (Very bad). The two next variables are used as proxies for the type of fairness criterion the respondent adheres. The first, *lrscale*, indicates where the respondent believes to find herself on a 0 to 10 scale of political orientation (with obviously 0 extremely left and 10 extremely right). The second, *qfimedu*, indicates to what extent the respondent believes that education level should be a criterion for granting immigration permits. The reasoning is that in a framework in which respondents are believed to care about fairness, equal opportunity and egalitarian consumers will not differentiate the merits of potential immigrants with respect to education level, which is not a deserted quality. Laissez-faire and meritocratic consumers most likely see no problem in discriminating immigrants on the basis of education. The selfish motivations for immigration support should be similar for all fairness types (but possibly different w.r.t. income etc.). The next two variables capture two first elements of social structure. For *sclact*, respondents are asked how much they are engaged in social activities compared to their peers of the same age, with answers ranging from 1 (Much less than most) to 5 (Much more than most). The total hours normally worked per week in the main job, overtime included, is captured in the variable *wkhtot*. Regression 1 in table 4 represents the results of a linear regression of the preferences for redistribution, as represented by *gincdif,* on these individual characteristics. Household income (*hinctnt*) is a highly significant predictor of the support for redistribution. The support for redistribution decreases on average when income increases *ceteris paribus*, as selfish concerns predict. The number of household members which have to share this income affects the support for redistribution negatively and in a linear way. The retired dummy is insignificant, and the support for redistribution increases *ceteris paribus* with age, although this effect is neither very large nor very significantly different from 0. Women are on average more supportive towards redistribution than men. The education level of the respondents affects the support for redistribution on average negatively: more educated respondents are *ceteris paribus* less supportive for income redistribution. The effect of subjective health is positive on the support for redistribution, but relatively small and not very significant for a sample of this size. The first fairness type variable, the stated position on the left-right scale, is highly significant with the expected effect, the second fairness type variable is insignificant. The stated level of relative social activity generates no significant effect, but the total number of hours spent at work is very significant. The more hours a respondent spends at work, the more supportive she is towards redistribution.

Table 3: **Average group participation**

variable	**mean**
sportsclub	.3602305
cultorg	.2402182
trdunion	.3311642
profesorg	.1248552
consumorg	.2366242
hmnrghorg	.2103101
epaorg	.1389461
religorg	.1898283
polparty	.0738842
sceduorg	.1195769
socclub	.1621598
otherorg	.1119182

Next, we enter a number of indicators of how the respondents spend their social life. A list of 12 dummy variables indicates whether the respondent has participated, been a member, donated or done any voluntary work for one of the following social organisations: a sportsclub (*sportsclub*), a cultural organisation (*cultorg*), a trade union (*trdunion*), a professional organisation (profesorg), a consumer organisation (*consumorg*), a human rights organisation (*hmnrghtsorg*), an environmental, peace or animal rights organisation (*epaorg*), a religious organisation of church group (*religorg*), a political party (*polparty*), a science or educational organisation (*sceduorg*), a social club (*socclub*) or any other voluntary social organisation (otherorg). Table 3 represents the fraction of the total population which participated in some form in these social organisations. The data on social organisation membership were omitted for the Czech Republic and Switzerland, and these countries are therefore dropped from any further analysis.

Regression 2 in table 4 displays the results of a linear regression of *gincdif* on the individual characteristics above and the list of group memberships. Further, the effect of membership of a cultural organisation, a science or educational organisation, a social club or an other voluntary social organisation is not significantly different from zero. Membership of a trade union, a human rights organisation or a political party on average increases *ceteris paribus* the support for redistribution. Participants of sportsclubs, professional organisations, consumer organisations, environmental, peace and animal rights organisations and religious organisations tend to be *ceteris paribus* less supportive for redistribution. This effect is the greatest for sportsclub participants and the smallest for environmental, peace and animal rights organisations and religious organisations. Participants in consumer organisations and professional organisations would within the model also estimate the relative importance of deserted income determinants higher than then the population average. The same goes for environmental, peace and animal rights organisations and religious organisations, but to a lesser degree.

The third regression in table 4 explicitly controls for country differences, such as institutions, history and culture, by including country dummies. The country of reference is Belgium.

A first observation is that after the inclusion of the country dummies, the attitude of respondents towards education as a determinant of the merits of immigrants becomes significant, while the number of hours worked looses it's significance. Of the social organisations, only sportsclubs, professional organisations, trade unions and human rights groups keep their statistical significance. The sign and hence their interpretation within the model remains constant. The disappearance of the significance of the other social organisation effects indicates that these have in been catching country differences in public support for redistribution (e.g. religious group most likely caught the effects of Northern and Western Europe vs Southern and Eastern Europe).

2.2 United States

The European data are a first indication that social structure has some effect on the public support for redistribution. For a further identifica-

Table 4: Regression results

	(1)		(2)		(3)	
	gincdif		gincdif		gincdif	
hinctnt	0.0773***	(20.76)	0.0874***	(20.95)	0.0615***	(13.28)
hhmmb	-0.0876***	(-4.88)	-0.127***	(-6.79)	-0.0837***	(-4.53)
hhmmbrsq	0.00436	(1.79)	0.00889***	(3.51)	0.00726**	(2.97)
rtrd	-0.0216	(-0.81)	-0.0197	(-0.70)	-0.0247	(-0.90)
age	-0.00140*	(-2.05)	-0.00179*	(-2.48)	-0.00219**	(-3.14)
man	0.180***	(11.28)	0.182***	(10.82)	0.159***	(9.87)
edulvl	0.0931***	(15.59)	0.0764***	(12.30)	0.0755***	(12.25)
health	-0.0242*	(-2.49)	-0.0228*	(-2.27)	-0.0418***	(-4.28)
lrscale	0.0784***	(20.44)	0.0690***	(17.43)	0.0758***	(19.57)
qfimedu	0.00417	(1.38)	0.00431	(1.37)	0.00671*	(2.12)
sclact	0.00679	(0.77)	-0.00356	(-0.38)	-0.00267	(-0.29)
wkhtot	-0.00187***	(-3.30)	-0.00291***	(-4.94)	-0.000213	(-0.37)
sportsclub			0.117***	(6.24)	0.0608***	(3.32)
cultorg			0.00385	(0.18)	0.00820	(0.41)
trdunion			-0.144***	(-8.04)	-0.159***	(-8.54)
profesorg			0.0861**	(3.11)	0.0995***	(3.70)
consumorg			0.0884***	(4.26)	0.0289	(1.41)
hmnrghtsorg			-0.0628**	(-2.86)	-0.0726***	(-3.39)
epaorg			0.0595*	(2.33)	-0.0254	(-0.99)
religorg			0.0592**	(2.76)	-0.0157	(-0.75)
polparty			-0.0908**	(-2.76)	-0.0159	(-0.51)
sceduorg			-0.0120	(-0.44)	0.0277	(1.04)
socclub			-0.00636	(-0.27)	-0.000971	(-0.04)
otherorg			-0.00880	(-0.33)	0.0295	(1.13)
DE					0.422***	(11.56)
DK					0.721***	(16.48)
ES					-0.0818	(-1.77)
FI					-0.253***	(-7.12)
GB					0.228***	(5.95)
GR					-0.477***	(-12.89)
IT					-0.416***	(-9.04)
LU					-0.149*	(-2.40)
NL					0.139	(1.91)
NO					0.333***	(8.91)
PL					-0.0167	(-0.46)
PT					0.0843*	(2.13)
SE					-0.271***	(-5.82)
SI					0.131***	(3.86)
_cons	1.369***	(20.46)	1.510***	(21.70)	1.464***	(20.64)
N	20459		18090		18090	
R^2	0.103		0.120		0.192	

t statistics in parentheses
$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

tion of the model, we investigate a data from the General Social Survey (GSS). The GSS was started by the National Opinion Research Center at University of Chicago in 1972 and collected its 27th round in 2008. We employ the 1987 round of the GSS, because it contains two topical modules which cover our data needs: the GSS topical module on "Socio-Political Participation" and the 1987 International Social Survey Program (ISSP) module on "Social Inequality". The first module provides us with detailed data about group membership. The second module contains not only a broad variety of indications of the support for redistribution, but also questions about the respondents' beliefs about the relative importance of various determinants of income (such as effort, talent, connections, wealth of parents...). The 1987 round of the GSS contains data of 1819 randomly chosen respondents in 616 variables. The data are appropriately weighted wherever necessary to ensure representativity.

We consider three measures for the individual support for redistribution. The first two stem directly from survey questions. First, the variable eqwlth contains respondents answers on the following question. "*Some people think that the government in Washington ought to reduce the income differences between the rich and the poor, perhaps by raising the taxes of wealthy families or by giving income assistance to the poor. Others think that the government should not concern itself with reducing this income difference between the rich and the poor. Here is a card with a scale from 1 to 7. Think of a score of 1 as meaning that the government ought to reduce the income differences between rich and poor, and a score of 7 meaning that the government should not concern itself with reducing income differences. What score between 1 and 7 comes closest to the way you feel?*" A second question, resulting in variable *goveqinc*, asks respondents "*Do you agree or disagree: it is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes.*" The answers to this question vary from 1 (Strongly agree) to 5 (Strongly disagree). The third measure, *givrange*, is constructed from a different series of questions, and serves as a check. The 1987 GSS round contains a series of questions that ask the respondent "*what do you think people in these jobs ought to be paid, how much do you think they should earn each year*" for 11 different professions: a mason, a doctor, a bank clerk, a shop owner, a cabinet member in the federal government, a corporate head, a skilled worker, a farm worker, a secretary, a bus driver and an unskilled worker. The variable givrange indicates for each consumer the difference between the highest and lowest deserted income for these 11 professions. The descriptive statistics and a cross tabulation of the two first variables are displayed in tables 5 and 6 respectively.

Table 5: **Desciptive statistics dependent variables**

variable	**mean**	**sd**	**p50**	**min**	**max**	**N**
eqwlth	3.572228	1.967692	4	1	7	1786
goveqinc	3.134771	1.152863	3	1	5	1484
givrange	137970.1	181440.1	80000	0	997996	1282

Table 6: **Crosstabulation dependent variables**

			goveqinc			
eqwlth	strongly agree	agree	neither	disagree	strongly disagree	Total
govt reduce diff	61	121	63	58	4	307
2	13	45	36	22	7	123
3	13	81	81	83	8	266
4	21	54	109	116	16	316
5	8	27	42	82	25	184
6	2	11	6	47	23	89
no govt action	7	20	7	76	77	187
Total	125	359	344	484	160	1,472

The independent variables employed in this empirical application largely coincide with the variables employed in the analysis for Europe. The household income is written in 1986 dollars in the variable *realinc*. The number of household members and it's squared are contained in *hompop* and *hompopsq* respectively. The variable *age* represents the respondents' age, with ages above 89 written 89. The dummies *female*, *black* and *raceoth* respectively indicate gender, being black and being non-white and non-black. Education level is captured in *degree,* which is the highest diploma, ranging from 0 (less than high school) to 4 (graduate studies). The political orientation of the respondent, as a way of compensating for the different fairness criteria, is caught in the variable *polviews*. The responses on this question can range from 1 (very liberal) to 7 (very conservative). The number of hours spent at work, finally, are represented by the variable *wrkhs*. The descriptive statistics of these variables are displayed in table 7.

The memberships of social organisations are represented by a list of dummy variables which indicate whether the respondent is a member of the following social organisations: fraternity organisation (*fratmem*), a service club (*servmem*), a veterans association (*vetmem*), a political party (*politmem*), a trade union (*unionmem*), a sportsclub (*sportmem*), a youth organisation (*youthmem*), a school service organisation (*schlmem*), a hobby club (*hobbymem*), a science school association

Table 7: **Desciptive statistics independent variables**

variable	**mean**	**sd**	**p50**	**min**	**max**	**N**
realinc	33087.72	23439.07	27500	500	90278	1094
hompop	2.893636	1.530671	3	1	10	1147
hompopsq	10.71404	11.57132	9	1	100	1147
age	39.08377	12.73793	37	18	80	1146
female	.4952049	.5001951	0	0	1	1147
black	.2763731	.4473986	0	0	1	1147
raceoth	.0287707	.1672344	0	0	1	1147
degree	1.439407	1.134321	1	0	4	1147
polviews	3.966117	1.348437	4	1	7	1092
wrkhs	41.02703	14.18662	40	2	89	1147

(*greekmem*), a farmers organisation (*farmmem*), a literature club (*litmem*), a professional organisation (*profmem*) or a church group (*churchmem*). Table 8 shows the membership averages of all these organisations.

Table 8: **Average group participation**

variable	**mean**
fratmem	.0924296
servmem	.0986784
vetmem	.0581498
politmem	.0458554
unionmem	.1760563
sportmem	.2260334
youthmem	.0961199
schlmem	.1418502
hobbymem	.0899471
greekmem	.0590829
farmmem	.0317181
litmem	.0767196
profmem	.1843034
churchmem	.2992958

Table 9 shows the regression results for the three independent variables on the individual characteristics and the group memberships described above.

In all three regressions in table 9, the effect of household income is positive and significant. The selfish effect *ceteris paribus* induces richer respondents again to be on average less supportive to redistribution. Note also that the sample size is quite a lot smaller than for the European application, so the significance levels should be interpreted more leniently. Household size has no significant effect on support for re-

Table 9: Regression results: Redistribution attitudes in function of memberships

	(1) eqwlth		(2) goveqinc		(3) givrange	
realinc	0.00000921***	(0.00000281)	0.00000696***	(0.00000180)	1.016***	(0.314)
hompop	0.0930	(0.121)	-0.0939	(0.0929)	19003.9	(16467.9)
hompopsq	-0.0231	(0.0160)	0.0144	(0.0133)	-2452.6	(2355.1)
age	0.00402	(0.00496)	0.00144	(0.00320)	1854.4***	(570.5)
female	-0.172	(0.122)	0.00368	(0.0778)	-41671.9***	(13607.3)
black	-0.661***	(0.137)	-0.507***	(0.0900)	-606.3	(15672.2)
raceoth	-0.427	(0.358)	-0.154	(0.233)	53563.9	(43129.9)
degree	0.0975	(0.0609)	0.0203	(0.0384)	12757.9*	(6728.1)
polviews	0.167***	(0.0430)	0.116***	(0.0275)	1194.1	(4849.8)
wrkhs	-0.00434	(0.00418)	0.00171	(0.00265)	-41.31	(466.4)
fratmem	0.368*	(0.205)	0.141	(0.133)	-60194.4***	(22980.8)
servmem	-0.0603	(0.209)	0.0837	(0.128)	7881.9	(22301.2)
vetmem	0.0560	(0.250)	-0.0258	(0.156)	-4321.0	(27173.9)
politmem	0.496*	(0.275)	0.0822	(0.173)	70314.2**	(29520.6)
unionmem	-0.422***	(0.151)	-0.162*	(0.0960)	-5785.3	(16680.3)
sportmem	0.300**	(0.146)	0.285***	(0.0916)	15364.6	(15863.3)
youthmem	-0.165	(0.212)	-0.0550	(0.133)	-21549.6	(22895.1)
schlmem	0.163	(0.186)	0.123	(0.117)	-16226.7	(20183.2)
hobbymem	-0.0335	(0.206)	0.00467	(0.125)	-27505.0	(22225.4)
greekmem	0.0815	(0.249)	-0.000188	(0.157)	-27371.8	(26999.8)
farmmem	-0.449	(0.336)	-0.0850	(0.213)	65377.4*	(37429.6)
litmem	-0.257	(0.232)	0.193	(0.145)	4256.4	(24427.5)
profmem	0.174	(0.173)	-0.0542	(0.109)	22132.2	(18566.1)
churchmem	0.0212	(0.135)	0.0240	(0.0857)	1528.7	(14849.7)
_cons	2.766***	(0.405)	2.518***	(0.268)	1683.5	(46133.3)
N	1030		884		819	
R^2	0.120		0.141		0.088	

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

distribution, and neither has age. Females are again more supportive for redistribution. In the first regression the effect is rather weak, in the second regression, the effect even vanishes (and changes sign), but in the third regression, the effect is clearly large and highly significant.. Blacks are significantly more supportive to redistribution in the two first regression, while that effect is not present in the third. Other races as well, but this effect is statistically insignificant. Education still decreases the support for redistribution, but the effect is only statistically significantly different from zero in the third regression (t-statistic 1.6 in the first regression). The effect of political orientation is clearly statistically different from zero and has the expected sign in the two first regressions.. The number of hours worked has no significant effect. Of all memberships of social organisations, service clubs, veterans associations, youth organisations, school service organisations, hobby clubs, a science associations, farmers organisations, literature clubs, professional organisations and church group do not affect the support for redistribution in a way that is statistically significant from zero. Members of fraternities, political parties and sportsclubs are significantly less supportive towards redistribution and union members significantly more according to the first regression. In the second regression, only unions and sportsclubs remain significant.

The 1987 round of the GSS also contains the respondents beliefs about which factors are important for people to get ahead. The answers for each of these factors range from 1 (essential) to 5 (not important at all). We withhold beliefs with respect to 6 different factors: having a wealthy family (opwlth), good education (opeduc), ambition (opambit), natural abilities (opable), hard work (ophrdwrk) and knowing the right people (opknow). The descriptive statistics of these 6 variables are displayed in table 10. Clearly, ambition, effort and education are considered the most important determinants of success. Natural ability comes after, followed further by knowing the right people. The wealth of the family is on average considered the least important factor of the six.

Tables 11 and 12 present the regression results for each of these beliefs on the individual characteristics and the group memberships which were discussed above.

In short, respondents on average believe that having a wealthy family is more important if they are *ceteris paribus* black, male, lower educated and more liberal. Members of sportsclubs on average think that family wealth is less important, and so do church members. For our model, this would imply that churches and sportsclubs are more homophilous in family wealth.

Table 10: **Desciptive statistics beliefs determinants of success**

variable	mean	sd	p50	min	max	N
opwlth	3.418989	1.07175	3	1	5	969
opeduc	1.769074	.7111133	2	1	4	983
opambit	1.693878	.7133366	2	1	5	980
opable	2.320408	.7639689	2	1	5	980
ophrdwrk	1.740102	.7052835	2	1	5	985
opknow	2.650051	.8500734	3	1	5	983

Table 11: Regression results: Beliefs in function of memberships

	(1)		(2)		(3)	
	opwlth		opeduc		opambit	
realinc	0.00000145	(0.00000175)	0.00000257**	(0.00000116)	-0.00000156	(0.00000116)
hompop	0.130	(0.0909)	0.00104	(0.0554)	0.00980	(0.0557)
hompopsq	-0.0196	(0.0130)	-0.00319	(0.00766)	-0.00172	(0.00770)
age	-0.0000878	(0.00311)	-0.000331	(0.00206)	-0.00164	(0.00207)
female	0.308***	(0.0757)	-0.0551	(0.0501)	-0.0696	(0.0504)
black	-0.285***	(0.0875)	-0.153***	(0.0577)	-0.0577	(0.0580)
raceoth	0.292	(0.228)	-0.182	(0.152)	0.333**	(0.153)
degree	0.0819**	(0.0376)	-0.0862***	(0.0249)	-0.00589	(0.0250)
polviews	0.0466*	(0.0269)	0.0213	(0.0177)	-0.0252	(0.0178)
wrkhs	0.00116	(0.00258)	-0.00282*	(0.00171)	-0.00169	(0.00172)
fratmem	0.152	(0.128)	0.0642	(0.0854)	-0.0818	(0.0856)
servmem	0.102	(0.125)	-0.0613	(0.0826)	0.0152	(0.0829)
vetmem	0.0726	(0.153)	-0.000923	(0.102)	-0.136	(0.102)
politmem	-0.223	(0.170)	0.122	(0.112)	-0.0143	(0.112)
unionmem	-0.0995	(0.0949)	0.0863	(0.0623)	0.0579	(0.0628)
sportmem	0.165*	(0.0897)	0.00793	(0.0595)	-0.0455	(0.0598)
youthmem	-0.0641	(0.131)	-0.0432	(0.0859)	-0.129	(0.0868)
schlmem	0.126	(0.115)	-0.140*	(0.0762)	0.0429	(0.0766)
hobbymem	0.167	(0.123)	-0.0795	(0.0815)	-0.0885	(0.0817)
greekmem	-0.213	(0.153)	-0.186*	(0.101)	-0.157	(0.101)
farmmem	-0.166	(0.205)	0.199	(0.136)	0.0110	(0.137)
litmem	-0.0942	(0.139)	-0.236**	(0.0924)	-0.128	(0.0926)
profmem	-0.0933	(0.105)	-0.0871	(0.0700)	-0.00398	(0.0702)
churchmem	0.168**	(0.0832)	0.106*	(0.0552)	0.0972*	(0.0555)
_cons	2.701***	(0.258)	1.978***	(0.171)	2.014***	(0.171)
N	890		902		900	
R^2	0.083		0.086		0.037	

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Regression results: Beliefs in function of memberships

	(1)		(2)		(3)	
	opable		ophrdwrk		opknow	
realinc	0.00000174	(0.00000124)	0.000000372	(0.00000116)	0.00000332**	(0.00000138)
hompop	0.00438	(0.0593)	0.0642	(0.0553)	0.0952	(0.0658)
hompopsq	-0.000760	(0.00820)	-0.0127*	(0.00765)	-0.0188**	(0.00910)
age	-0.00640***	(0.00220)	0.00205	(0.00205)	-0.00223	(0.00245)
female	0.0469	(0.0537)	-0.117**	(0.0500)	0.212***	(0.0595)
black	-0.169***	(0.0618)	0.0902	(0.0576)	-0.286***	(0.0686)
raceoth	-0.206	(0.162)	0.355**	(0.151)	-0.309*	(0.180)
degree	0.117***	(0.0267)	0.0573**	(0.0248)	0.0280	(0.0296)
polviews	0.0439**	(0.0190)	-0.0315*	(0.0177)	0.0460**	(0.0210)
wrkhs	0.000128	(0.00183)	-0.000567	(0.00171)	-0.00125	(0.00203)
fratmem	0.196**	(0.0911)	-0.105	(0.0850)	-0.0972	(0.101)
servmem	0.0599	(0.0882)	-0.0766	(0.0823)	0.0390	(0.0980)
vetmem	0.138	(0.109)	0.0103	(0.101)	0.218*	(0.121)
politmem	0.0794	(0.119)	0.0884	(0.111)	-0.270**	(0.132)
unionmem	-0.0416	(0.0672)	0.247***	(0.0621)	-0.0837	(0.0741)
sportmem	0.0335	(0.0638)	-0.0261	(0.0594)	0.0413	(0.0707)
youthmem	-0.0640	(0.0918)	-0.146*	(0.0856)	-0.0455	(0.102)
schlmem	-0.0422	(0.0815)	0.0158	(0.0760)	0.0536	(0.0904)
hobbymem	0.112	(0.0870)	-0.0293	(0.0811)	0.231**	(0.0966)
greekmem	0.00909	(0.108)	-0.150	(0.101)	-0.0526	(0.120)
farmmem	-0.278*	(0.146)	0.172	(0.136)	0.0646	(0.162)
litmem	-0.141	(0.0986)	-0.0464	(0.0920)	-0.158	(0.110)
profmem	-0.153**	(0.0747)	-0.00826	(0.0697)	-0.0501	(0.0830)
churchmem	0.00232	(0.0591)	0.0938*	(0.0550)	0.0493	(0.0655)
_cons	2.201***	(0.182)	1.651***	(0.170)	2.353***	(0.202)
N	899		903		901	
R^2	0.081		0.062		0.095	

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Richer respondents on average believe that education is less important to get ahead than poorer respondents do. Members of church groups do not believe in education as an important determinant of success either. Further, beliefs in education as a key determinant of success is higher with blacks, more educated people, people who work more hours and with members of school service, science and literature clubs. Would this imply that school service, science and literature clubs are less homophilous in education level? Clearly not. More likely is that in the economic environment proper to members of these clubs, differences in education are key factors of success.

Members of non-white and non-black racial groups and members of church groups believe significantly less in the importance of ambition for success.

The belief in the importance of natural abilities is higher with older respondents, with blacks and with members of farmers and professional associations. Further, it decreases on average with fraternity membership, higher education and a more conservative political orientation.

The respondents who believe on average more in hard work as a determinant of success are the females, conservatives, members of youth associations. On average, members of the non-white non-black race group, more educated people, union members and members of church groups believe significantly less in effort.

The importance of knowing the right people is on average estimated significantly less important if the respondents are richer, younger, female, white, more conservative and member of a veterans association or a hobby club. Members of political parties believe significantly more in the right connections as a key to success.

And how do preferences for redistribution depend on these beliefs then? Table 13, finally, depict the regression results of a regression of the preferences for redistribution on the individual characteristics and the beliefs about the keys to success. We see that only beliefs in education do not have a statistically significant effect on preferences for redistribution. Possibly, this is because education can easily be considered a deserted or undeserted cause of income inequality, depending on the fairness ideal one adheres. Family wealth is only statistically significant in the second regression, although the sign is the same in both. Respondents who believe that family wealth is less important (*opwlth* high) are less supportive to redistribution. All other beliefs are very significant predictors of preferences for redistribution. Those who believe that ambition is more important (*opambit* lower), are less supportive to redistribution and vice versa. The same goes for effort. Those who believe more in effort, are on average less supportive to redistribution. This

Table 13: Regression results: Redistribution attitudes in function of beliefs

	(1) eqwlth		(2) goveqinc		(3) givrange	
realinc	0.00000823***	(0.00000293)	0.00000642***	(0.00000172)	1.021***	(0.310)
hompop	0.0671	(0.151)	-0.0952	(0.100)	16117.8	(16144.2)
hompopsq	-0.0172	(0.0216)	0.0155	(0.0149)	-2441.0	(2301.9)
age	0.00554	(0.00502)	0.00220	(0.00294)	1540.7***	(538.8)
female	-0.290**	(0.125)	-0.122*	(0.0733)	-42962.3***	(13155.1)
black	-0.408***	(0.149)	-0.423***	(0.0877)	-5151.6	(15733.7)
raceoth	-0.239	(0.385)	-0.100	(0.223)	50864.7	(42189.6)
degree	0.105*	(0.0599)	0.0260	(0.0350)	11180.6*	(6291.7)
polviews	0.168***	(0.0458)	0.0943***	(0.0267)	968.5	(4856.0)
wrkhs	-0.00385	(0.00438)	0.00122	(0.00256)	-15.84	(462.2)
opwlth	0.0861	(0.0614)	0.127***	(0.0360)	-1943.9	(6466.0)
opeduc	0.0669	(0.0917)	0.0465	(0.0536)	-14353.0	(9538.3)
opambit	-0.209**	(0.0935)	-0.114**	(0.0547)	-11236.3	(10103.7)
opable	0.255***	(0.0855)	0.106**	(0.0499)	3409.6	(8928.4)
ophrdwrk	-0.256***	(0.0936)	-0.212***	(0.0553)	-5655.8	(9875.7)
opknow	0.192**	(0.0804)	0.129***	(0.0468)	-3370.2	(8459.2)
_cons	2.101***	(0.518)	2.184***	(0.307)	85683.3	(53905.7)
N	893		871		806	
R^2	0.131		0.185		0.070	

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

can be interpreted as evidence that ambition and effort are considered deserted causes of income inequality. Those who believe that natural ability is more important, however, tend on average to be more supportive to redistribution. And the same goes again for connections. This can be considered an indication that natural abilities and connections are understood as undeserted causes of income inequality.

Finally, table 14 illustrates how beliefs about how much a corporate head and a skilled worker make on average are biased in function of the own characteristics of the consumer.

3 Formal model

3.1 Setting

Assume a unit mass infinite population of consumers $\mathcal{I}$, each indexed i or j. The index i is typically employed for the consumer assessing her preferences for redistribution, and j concerns typically consumers observed by her.

Consumers form a social network, choose to exert effort to gain an income and form preferences over the level of redistribution in society, based on the knowledge they gather from their social network.

Table 14: Regression results: Beliefs on professional incomes

	(1)		(2)	
	payexec		payskill	
realinc	1.329***	(0.405)	0.0122	(0.0556)
hompop	21347.6	(21238.8)	-525.6	(2909.1)
hompopsq	-2532.6	(3044.9)	56.83	(417.6)
age	3625.2***	(733.1)	123.6	(100.0)
female	-104487.1***	(17515.8)	-4124.2*	(2394.0)
black	-42000.7**	(20239.2)	-3028.0	(2770.0)
raceoth	-2794.8	(56075.6)	-4172.9	(7332.0)
degree	43281.3***	(8633.0)	2397.4**	(1185.3)
polviews	-2631.6	(6254.4)	554.8	(846.4)
wrkhs	-764.1	(599.6)	-53.36	(81.80)
fratmem	-107147.4***	(29317.8)	707.9	(4021.8)
servmem	-1133.9	(28598.4)	692.0	(3893.0)
vetmem	-22862.2	(35010.7)	-832.2	(4781.1)
politmem	60013.2	(37820.5)	-1225.1	(5206.9)
unionmem	-5539.5	(21475.6)	-436.2	(2950.2)
sportmem	37893.6*	(20454.9)	-416.0	(2801.6)
youthmem	-45850.9	(29565.1)	817.7	(4061.7)
schlmem	-14461.4	(26294.3)	-152.4	(3578.9)
hobbymem	10865.3	(28582.8)	-2601.2	(3902.0)
greekmem	-46157.7	(34630.3)	-4571.4	(4714.1)
farmmem	133898.0***	(47238.8)	2110.8	(6502.5)
litmem	-10624.5	(31679.1)	1580.5	(4337.7)
profmem	52821.0**	(23997.6)	-1885.1	(3289.5)
churchmem	14483.5	(19119.1)	-431.8	(2622.5)
_cons	37549.0	(60058.1)	23124.8***	(8155.8)
N	832		844	
R^2	0.200		0.019	

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Consumers differ in three income determinants: luck, taste for effort and productivity. Let the talent of each consumer i be denoted by $\alpha_i^1 \in \mathbb{R}^+$, her luck by $\varepsilon_i \in \mathbb{R}$ and let taste for effort be denoted $\beta_i \in \mathbb{R}^+$. Luck is zero on average: $E(\varepsilon_i) = 0$. Let the conditional means of each of these income determinants be independent of the value of the other income determinants.

Condition 1 *Let* $E(\varepsilon|\beta, \alpha) = 0$ *and* $E(\beta|\varepsilon, \alpha) = E(\beta)$ *and* $E(\alpha|\varepsilon, \beta) = E(\alpha)$.

Next to talent, consumers can differ in second quality which is income irrelevant (religion, skin colour...). Let consumers differ in these 2 different qualities, summarised by tuple $\alpha_i \equiv [\alpha_i^1, \alpha_i^2]$, distributed according to a joint distribution function $\Phi(\alpha)$, with marginal distributions $\Phi^1(\alpha^1)$ and $\Phi^2(\alpha^2)$. The joint and marginal density functions are denoted respectively $\phi(\alpha)$, $\phi^1(\alpha^1)$ and $\phi^2(\alpha^2)$.

The social network of each consumer i consists of a set of bilateral social relations between consumers. We only care about the direct network neighbourhood of each consumer, such that the social network can be conveniently represented by a many-to-many matching correspondence μ, which indicates for each consumer the set of other consumers with whom she is connected.

Definition 2 (Matching correspondence) *A many-to-many matching correspondence is a correspondence* $\mu : \mathcal{I} \rightrightarrows 2^{\mathcal{I}} : i \rightrightarrows \mu(i)$, *which is symmetric in the sense that* $i, j \in \mathcal{I} : i \in \mu(j) \Leftrightarrow j \in \mu(i)$. *This correspondence attributes to each consumer* $i \in \mathcal{I}$ *a set of consumers* $\mu(i) \subseteq \mathcal{I}$ *with whom she maintains social relations.*

Given the three determinants of income: talent, luck and taste for effort, the pre-tax income of consumer i, denoted m_i, is determined by her efforts $e_i \in \mathbb{R}^+$, her talent and her luck:

$$m_i = \alpha_i^1 e_i + \varepsilon_i.$$

Redistribution is operationalised by a simple linear income tax scheme, with tax rate $\tau \in [0, 1]$, of which all revenues are redistributed as a lump sum transfer $\tau \bar{m}_i$, with $\bar{m}_i = \frac{1}{|\mu(i)|} \int_{j \in \mu(i)} \alpha_j^1 e_j dj$ the average pre-tax income, as estimated from the social network. Hence, the transfer which consumers anticipate to get at a certain tax rate depends on the perceived average income, as estimated from their social network. This is in line with the general finding that rich consumers systematically overestimate the income of the poor, and poor consumers underestimate the income of the rich.

Anticipated post tax consumption c_i, given a tax rate τ and luck ε_i, equals by assumption post-tax income, such that

$$c_i = (1-\tau)\left(\alpha_i^1 e_i + \varepsilon_i\right) + \tau \bar{m}_i$$

Private utility is the difference between consumption and the disutility of effort and utility from the social network:

$$u_i = c_i - \frac{(e_i)^2}{2\beta_i} + \widetilde{u}\left(\mu\left(i\right)\right),$$

with $\widetilde{u}\left(\mu\left(i\right)\right)$ the utility consumers get out of their social network (defined below). This utility depends on the talents of the consumers in consumer $i's$ social network, α_j for $j \in \mu\left(i\right)$, and does not depend on τ or e_i.

Consumers care about a convex combination of their private utility and about fairness, such that the full utility function of consumer i is

$$U_i = (1-\gamma)\, u_i - \gamma \Omega_i,$$

in which $\gamma \in [0,1]$ is a parameter indicating the relative weight of social injustice in overall utility. Ω_i stands for the overall social injustice in society, as perceived by consumer i (further defined below).

Assume that $|\mu\left(i\right)| > 0$, such that one can neglect the effect of the own effort choice on social injustice and average income (since i.has zero mass).

Consumers maximize $E\left(u_i\right)$ for a given expected tax rate τ^e to choose their effort e_i:

$$\max_{e_i} \left(1-\tau^e\right)\left(a_i^1 e_i + \varepsilon_i\right) + \tau^e \bar{m}_i + \widetilde{u}\left(\mu\left(i\right)\right) - \frac{(e_i)^2}{2\beta_i}.$$

This is easily solved to the optimal effort level

$$e_i = \left(1-\tau^e\right) \alpha_i^1 \beta_i$$

such that the resulting pre-tax income can be written:

$$m_i = \left(1-\tau^e\right) \beta_i \left(\alpha_i^1\right)^2 + \varepsilon_i.$$

Denote for notational simplicity $a_i \equiv \left(\alpha_i^1\right)^2$, $\bar{a}_i \equiv \frac{1}{|\mu(i)|} \int_{j \in \mu(i)} \left(\alpha_j^1\right)^2 dj$ and $\bar{\beta}_i \equiv \frac{1}{|\mu(i)|} \int_{j \in \mu(i)} \beta_j dj$.

3.2 Fairness and redistribution

Fairness is defined over incomes in a way similar to Alesina and Angeletos (2005), by taking the average squared difference between a consumer's actual consumption c_j and her deserved (or fair) consumption level $\hat{c}_j$ as a measure of social injustice. Contrary to Alesina and Angeletos, however, consumers do not have full information about the distribution of talent, luck and taste for effort in this model. Instead, they extrapolate the information they gather from their own social network:

$$\Omega\left(\tau|\mu\left(i\right)\right) = \frac{1}{\left|\mu\left(i\right)\right|}\int_{j\in\mu(i)}\left(c_j - \hat{c}_j\right)^2 dj.$$

Different views on fairness can be written in terms of different levels of deserted consumption $\hat{c}_j$. We omit two extreme cases: laissez-faire or libertarian, where $c_j = \hat{c}_j$ (all income differences justified, such that fairness warrants no redistribution at all), and egalitarianism, where $\hat{c}_j = \int_{j\in\mu(i)} c_j dj$ (no income differences justified, fairness dictates complete taxation and complete redistribution). Instead, we consider the more interesting middle cases, where luck is considered to cause undeserted income differences, and income differences due to effort are considered deserted. The extent to which talent is considered deserted is represented by a parameter ζ :

$$\hat{c}_i^{\zeta} = \left(1-\tau\right)\beta_i\left(\zeta a_i + \left(1-\zeta\right)\bar{a}_i\right).$$

The case where $\zeta \in\ ]0,1[$ considers fairness for the case where talent is to some extent the result of luck, and to some extent the result of deserted investments by the consumer. The extreme $\zeta = 1$ represents the meritocratic ideal, where all differences in talent are considered deserted (as considered in Alesina and Angeletos, 2005):

$$\hat{c}_i^{M} = a_i e_i.$$

The other extreme, $\zeta = 0$, represents the case of responsibility sensitive egalitarianism (Fleubaey,2008):

$$\hat{c}_i^{RSE} = \left(1-\tau\right)\bar{a}_i\beta_i.$$

3.2.1 The ideal tax rate

First consider the case where neither selfish motives (i.e. $\gamma = 1$), nor the incentive effects of taxation are taken into account (i.e. effort decisions are fixed for an anticipated tax level τ^e, and consumers cannot adapt their effort choice to a change in taxes. . In this case, we only consider

$\Omega^{\zeta}$and assume that effort is already fixed prior to the tax change at a level $e_i = (1-\tau^e)\beta_i a_i^2$ Under condition 1, Ω^{ζ} can be rewritten[1]:

$$\begin{aligned}\Omega^{\zeta}(\tau|\mu(i)) &= \frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\left(c_j-\hat{c}_j^{\zeta}\right)^2 dj\\ &= (1-\tau)^2 Var(\varepsilon)_i + (1-\tau^e)^2\left(\bar{\beta}_i\right)^2((1-\tau)(1-\zeta)-\zeta\tau)^2 Var(a)_i\\ &\quad +\tau^2(1-\tau^e)^2(\bar{a}_i)^2 Var(\beta)_i,\end{aligned}$$

If ε, β and a are correlated, then the appropriate covariance terms must be taken into account...

First, consider the ideal tax rate, denoted $\tau_i^o(\zeta)$, for a consumer i with a fairness ideal characterised by ζ and network $\mu(i)$. This tax does not take any selfish motives (i.e. $\gamma=1$) neither any incentive

[1]Because:

$$\begin{aligned}&\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\left(c_j-\hat{c}_j^{\zeta}\right)^2 dj\\ &=\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\begin{pmatrix}(1-\tau)\left((1-\tau^e)\beta_j a_j+\varepsilon_j\right)+\tau(1-\tau^e)\bar{a}_i\bar{\beta}_i\\ -\zeta(1-\tau^e)\beta_j a_j-(1-\zeta)(1-\tau^e)\beta_j\bar{a}_i\end{pmatrix}^2 dj\\ &=\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\begin{pmatrix}(1-\tau)\varepsilon_j+(1-\tau)(1-\zeta)(1-\tau^e)\beta_j(a_j-\bar{a}_i)\\ -\tau\zeta(1-\tau^e)\beta_j(a_j-\bar{a}_i)-\tau\bar{a}_i\left((1-\tau^e)\beta_j-(1-\tau^e)\bar{\beta}_i\right)\end{pmatrix}^2 dj\\ &=(1-\tau)^2 Var(\varepsilon)_i+(1-\tau)^2(1-\zeta)^2(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i\\ &\quad+\tau^2\zeta^2(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i+\tau^2(\bar{a}_i)^2(1-\tau^e)^2 Var(\beta)_i\\ &\quad-2(1-\tau)\tau\zeta(1-\zeta)(1-\tau^e)^2\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\beta_j(a_j-\bar{a}_i)\beta_j(a_j-\bar{a}_i)dj\\ &\quad-2(1-\tau)(1-\zeta)(1-\tau^e)^2\tau\bar{a}_i\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\beta_j\left(\beta_j-\bar{\beta}_i\right)(a_j-\bar{a}_i)dj\\ &\quad+2\tau\zeta\tau\bar{a}_i(1-\tau^e)^2\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\beta_j(a_j-\bar{a}_i)\left(\beta_j-\bar{\beta}_i\right)dj\\ &\quad+2(1-\tau)(1-\zeta)(1-\tau^e)\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\varepsilon_j\beta_j(a_j-\bar{a}_i)dj\\ &\quad-2\tau\zeta(1-\tau^e)\frac{1}{|\mu(i)|}\int_{j\in\mu(i)}\varepsilon_j\beta_j(a_j-\bar{a}_i)dj\\ &=(1-\tau)^2 Var(\varepsilon)_i+(1-\tau)^2(1-\zeta)^2(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i\\ &\quad+\tau^2\zeta^2(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i+\tau^2(\bar{a}_i)^2(1-\tau^e)^2 Var(\beta)_i\\ &\quad-2(1-\tau)(1-\zeta)\tau\zeta(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i\\ &=(1-\tau)^2 Var(\varepsilon)_i+(1-\tau^e)^2\left(\bar{\beta}_i\right)^2((1-\tau)(1-\zeta)-\zeta\tau)^2 Var(a)_i\\ &\quad+\tau^2(1-\tau^e)^2(\bar{a}_i)^2 Var(\beta)_i,\end{aligned}$$

effects of taxation on efforts into account. This amounts to minimising perceived social injustice $\Omega^{\zeta}(\tau|\mu(i))$ for efforts fixed at $(1-\tau^{e})\alpha_i^1\beta_i$. This minimisation makes the trade off between undoing unfairness by taxing away income variation which is due to variation in undeserted income determinants at the one hand and generating a new kind of unfairness by taxing away deserted income differences at the other hand.

$$\begin{aligned}
\frac{\delta\Omega^{\zeta}(\tau|\mu(i))}{\partial\tau} &= 0 = -2(1-\tau)\,Var(\varepsilon)_i \\
&\quad -2((1-\tau)(1-\zeta)-\zeta\tau)(1-\tau^{e})^2\left(\bar{\beta}_i\right)^2 Var(a)_i \\
&\quad +2\tau(\bar{a}_i)^2(1-\tau^{e})^2\,Var(\beta)_i \\
\tau_i^o(\zeta) &= \frac{Var(\varepsilon)_i+(1-\zeta)(1-\tau^{e})^2\left(\bar{\beta}_i\right)^2 Var(a)_i}{Var(\varepsilon)_i+(1-\tau^{e})^2\left(\left(\bar{\beta}_i\right)^2 Var(a)_i+(\bar{a}_i)^2 Var(\beta)_i\right)} \\
&= \frac{Var(\varepsilon)_i+(1-\zeta)(1-\tau^{e})^2\left(\bar{\beta}_i\right)^2 Var(a)_i}{Var(m)_i}
\end{aligned}$$

where obviously $Var(m)_i = Var(\varepsilon)_i+(1-\tau^{e})^2\left(\bar{\beta}_i\right)^2 Var(a)_i+(\bar{a}_i)^2(1-\tau^{e})^2\,Var(\beta)_i$. Hence, the ideal tax rate equals the perceived ratio of undeserted income variation to overall income variation. As special case of this tax rule, we see that and for $\zeta = 1$, the meritocratic ideal, the optimal tax rate equals the share of luck in the overall income variation

$$\tau_i^o(1) = \frac{Var(\varepsilon)_i}{Var(m)_i}$$

and for $\zeta = 0$, the responsibility sensitive egalitarian ideal, the optimal tax equals the share of undeserted inequality due to luck and talent in overall income variation

$$\tau_i^o(0) = \frac{Var(\varepsilon)_i+(1-\tau^{e})^2\left(\bar{\beta}_i\right)^2 Var(a)_i}{Var(m)_i}.$$

Clearly, we get the following comparative statics of this ideal tax rate

$$\frac{\partial \tau_i^o(\zeta)}{\partial Var(\varepsilon)_i} = \frac{(\bar{a}_i)^2 (1-\tau^e)^2 Var(\beta)_i + \zeta (1-\tau^e)^2 \left(\bar{\beta}_i\right)^2 Var(a)_i}{\left(Var(m)_i\right)^2} > 0$$

$$\frac{\partial \tau_i^o(\zeta)}{\partial \zeta} = \frac{-(1-\tau^e)^2 \left(\bar{\beta}_i\right)^2 Var(a)_i}{Var(m)_i} < 0$$

$$\frac{\partial \tau_i^o(\zeta)}{\partial Var(a)_i} = (1-\tau^e)^2 \left(\bar{\beta}_i\right)^2 \frac{(1-\zeta)(\bar{a}_i)^2 (1-\tau^e)^2 Var(\beta)_i - \zeta \left(Var(\varepsilon)_i\right)}{\left(Var(m)_i\right)^2} \lesseqgtr 0$$

$$\frac{\partial \tau_i^o(\zeta)}{\partial Var(\beta)_i} = -\frac{(1-\tau^e)^2 (\bar{a}_i)^2 \left(Var(\varepsilon)_i + (1-\zeta)(1-\tau^e)^2 \left(\bar{\beta}_i\right)^2 Var(a)_i\right)}{\left(Var(m)_i\right)^2} < 0$$

$$\frac{\partial \tau_i^o(\zeta)}{\partial \tau^e} = \frac{2(1-\tau^e) Var(\varepsilon)_i \left((\bar{a}_i)^2 Var(\beta)_i + \zeta \left(\bar{\beta}_i\right)^2 Var(a)_i\right)}{\left(Var(m)_i\right)^2} > 0$$

$$\frac{\partial \tau_i^o(\zeta)}{\partial \bar{\beta}_i} = 2(1-\tau^e)^2 \bar{\beta}_i Var(a)_i \frac{(1-\zeta)(1-\tau^e)^2 (\bar{a}_i)^2 Var(\beta)_i - \zeta Var(\varepsilon)_i}{\left(Var(m)_i\right)^2} \lesseqgtr 0$$

$$\frac{\partial \tau_i^o(\zeta)}{\partial \bar{a}_i} = -\frac{2(1-\tau^e)^2 \bar{a}_i Var(\beta)_i \left(Var(\varepsilon)_i + (1-\zeta)(1-\tau^e)^2 \left(\bar{\beta}_i\right)^2 Var(a)_i\right)}{\left(Var(m)_i\right)^2} < 0$$

If the variance of luck, i.e. the importance of undeserted income variation in the overall income variation, increases, then the ideal tax rate increases just as well. Similarly, if the importance of deserted income inequality $Var(\beta)_i$ increases, the ideal tax rate decreases. Since income is multiplicative in talent and effort, the sign of $\frac{\partial \tau_i^o(\zeta)}{\partial \bar{a}_i}$ is similar to that of $\frac{\partial \tau_i^o(\zeta)}{\partial Var(\beta)_i}$. An increase in ζ increases the desertedness of talent, thus increases the deserted income variation and hence decreases the ideal tax rate. Similarly, a higher anticipated tax rate τ^e decreases the effort levels and hence the importance of deserted income inequality compared to the income variation due to luck, which remains constant. For this reason, $\frac{\partial \tau_i^o(\zeta)}{\partial \tau^e}$ is positive.

Note that $\frac{\partial \tau_i^o(0)}{\partial Var(a)_i} > 0$ for the extreme responsibility sensitive egalitarian ideal that attaches no desertedness to talent ($\zeta = 0$), since a greater $Var(a)_i$ increased the relative magnitude of undeserted income variation in this case. At the other hand, $\frac{\partial \tau_i^o(1)}{\partial Var(a)_i} < 0$ for the extreme meritocratic case, where talent is entirely a deserted determinant of income inequality ($\zeta = 1$). For intermediate desertedness of talent, an increase in $Var(a)_i$ increases overall income variation more than it increases undeserted income variation. The sign of $\frac{\partial \tau_i^o(\zeta)}{\partial Var(a_j)_i}$ changes at

$$\bar{\zeta} = \frac{(\bar{a}_i\ )^2 (1-\tau^e)^2 Var(\beta)_i}{(\bar{a}_i\ )^2 (1-\tau^e)^2 Var(\beta)_i + Var(\varepsilon)_i},$$

i.e. where the effect on overall income variation comes to dominate the effect on undeserted income variation. Hence, $\frac{\partial \tau_i^o(\zeta)}{\partial Var(a)_i} > 0 \Leftrightarrow \zeta \in \left[0, \bar{\zeta}\right[$, and this area $\left[0, \bar{\zeta}\right[$ becomes smaller if the variance of luck becomes greater, and becomes smaller if the variance of taste for effort increases.

Again, the effect of $\bar{\beta}_i$ is similar because of the multiplicative structure of income in talent and effort, such that $\frac{\partial \tau_i^o(\zeta)}{\partial \bar{\beta}_i} > 0 \Leftrightarrow \zeta \in \left[0, \widetilde{\zeta}\right[$, and $\frac{\partial \tau_i^o(\zeta)}{\partial \bar{\beta}_i} < 0 \Leftrightarrow \zeta \in \left]\widetilde{\zeta}, 1\right]$, with

$$\widetilde{\zeta} = \frac{(1-\tau^e)^2 (\bar{a}_i)^2 Var(\beta)_i}{Var(\varepsilon)_i + (1-\tau^e)^2 (\bar{a}_i)^2 Var(\beta)_i}$$

3.2.2 With selfish concerns

The vast majority of consumers are also sensitive to their own self-interest when they determine their most preferred tax rate (i.e. $\gamma < 1$). How do these selfish concerns affect the preferred tax rates when consumers do not anticipate the incentive effects of taxation on effort choices? The optimal tax problem of a consumer i who is convinced of fairness ideal Ω^ζ:

$$\max_\tau EU_i = (1-\gamma)\left[(1-\tau) m_i + \tau \bar{m}_i + \widetilde{u}(\mu(i)) - \frac{(e_i)^2}{2\beta_i}\right] - \gamma \Omega^\zeta (\tau | \mu(i)). \tag{1}$$

The first order condition to this problem is

$$(1-\gamma)(\bar{m}_i - m_i) - 2\gamma \begin{pmatrix} -(1-\tau) Var(\varepsilon)_i \\ -((1-\tau)(1-\zeta) - \zeta\tau)(1-\tau^e)^2 \left(\bar{\beta}_i\right)^2 Var(a)_i \\ +\tau (\bar{a}_i)^2 (1-\tau^e)^2 Var(\beta)_i \end{pmatrix} = 0$$

The most preferred tax of consumer i with fairness ideal Ω^ζ is her ideal tax $\tau_i^o(\zeta)$ augmented with a term which trades off fairness and self interest:

$$\tau_i^S(\zeta) = \tau_i^o(\zeta) + \frac{1-\gamma}{2\gamma}\frac{\bar{m}_i - m_i}{Var(m)_i}.^2 \tag{1}$$

[2]With obviously:

$$\tau_i^o(\zeta) + \frac{(1-\gamma)}{2\gamma}\frac{(\bar{m} - m_i)}{Var(m|\mu(i))} > 1 \Rightarrow \tau_i^S(\zeta) = 1$$
$$\tau_i^o(\zeta) + \frac{(1-\gamma)}{2\gamma}\frac{(\bar{m} - m_i)}{Var(m|\mu(i))} < 0 \Rightarrow \tau_i^S(\zeta) = 0.$$

The numerator of the second term contains the marginal post tax income gains or losses of taxation, multiplied by the marginal utility of post-tax income $(1-\gamma)$. The denominator consists of the marginal disutility of social injustice γ and a measure of how much social injustice a selfish bias away from the ideal tax would generate in the perception of consumer i. That is, $2Var(m)_i$ indicates how much income would be shifted away from the ideal situation due to a marginal tax change.

3.2.3 With incentive effects

When taxes change the rewards to effort, consumers adapt their effort choice. Consumers anticipate that all adapt to the new tax rate. With endogenous effort choice, the optimal tax problem of consumer i who is convinced of fairness ideal Ω^{ζ} is:

$$\max_{\tau} EU_i = (1-\gamma)\left[(1-\tau)^2 a_i\beta_i + \tau(1-\tau)\bar{a}_i\bar{\beta}_i - \frac{(1-\tau)^2 a_i\beta_i}{2}\right] - \gamma\Omega^{\zeta}(\tau|\mu(i)). \tag{2}$$

The first order condition is:

$$\Upsilon_i \equiv (1-\gamma)\left[(1-2\tau)\bar{a}_i\bar{\beta}_i - (1-\tau)a_i\beta_i\right] - \gamma\frac{\partial\Omega^{\zeta}(\tau|\mu(i))}{\partial\tau} = 0.$$

The private part of this problem is strictly concave if it satisfies the following condition.

Condition 3 *Let* $\forall i \in \mathcal{I} : \max_{j\in\mu(i)}\left\{a_j\beta_j\right\} < 2\bar{a}_i\bar{\beta}_i$.

The complete tax problem (2) is strictly concave for all parameter values if condition 3 is satisfied and if $\frac{\partial^2\Omega_I^{\zeta}(\tau|\mu(i))}{\partial^2\tau} > 0$. With incentive effects, under condition 1, one can rewrite $\Omega_I^{\zeta}(\tau|\mu(i))$ and it's first two derivatives to τ as

$$\begin{aligned}
\Omega_I^{\zeta}(\tau|\mu(i)) &= (1-\tau)^2 Var(\varepsilon)_i + (1-\tau)^2((1-\tau)(1-\zeta)-\zeta\tau)^2\left(\bar{\beta}_i\right)^2 Var(a)_i \\
&\quad + (1-\tau)^2\tau^2(\bar{a}_i)^2 Var(\beta)_i \\
&= (1-\tau)^2 Var(\varepsilon)_i + (1-\tau)^2(1-\zeta-\tau)^2\left(\bar{\beta}_i\right)^2 Var(a)_i \\
&\quad + (1-\tau)^2\tau^2(\bar{a}_i)^2 Var(\beta)_i \\
\frac{\partial\Omega_I^{\zeta}(\tau|\mu(i))}{\partial\tau} &= -2(1-\tau)Var(\varepsilon)_i - 2(1-\tau)\left(\zeta^2 - 3\zeta(1-\tau) + 2(1-\tau)^2\right)\left(\bar{\beta}_i\right)^2 Var(a)_i \\
&\quad + \left(2\tau - 6\tau^2 + 4\tau^3\right)(\bar{a}_i)^2 Var(\beta)_i \\
\frac{\partial^2\Omega_I^{\zeta}(\tau|\mu(i))}{\partial^2\tau} &= 2Var(\varepsilon)_i + 2\left(\zeta^2 - 6(1-\tau)\zeta + 6(1-\tau)^2\right)\left(\bar{\beta}_i\right)^2 Var(a)_i \\
&\quad + \left(2 - 12\tau + 12\tau^2\right)(\bar{a}_i)^2 Var(\beta)_i
\end{aligned}$$

The factor $2\left(\zeta^2-6(1-\tau)\zeta+6(1-\tau)^2\right)$ is minimal at $\zeta=1$ and $\tau=\frac{1}{2}$, and $\left(2-12\tau+12\tau^2\right)$ is minimal at $\tau=\frac{1}{2}$. Substituting these values into $\frac{\partial^2\Omega_I^{\zeta}(\tau|\mu(i))}{\partial^2\tau}$, we get the following condition to guarantee global strict concavity of the optimal tax problem:

Condition 4 *Let*

$$Var(\varepsilon)_i > \frac{(1-\tau)^2\left(\bar{\beta}_i\right)^2 Var(a)_i + (\bar{a}_i)^2 Var(\beta)_i}{2}$$

Under conditions 3 and 4 (and 1), the choice problem of each consumer i with fairness ideal Ω^{ζ} and network $\mu(i)$ has a unique most preferred tax rate, denoted $\tau_i^*(\zeta)$, for solution, which takes fairness, incentive effects and selfish concerns into account. The comparative statics of this unique solution with respect to the different parameters of the problem can be obtained by the implicit function theorem. For interior solutions, the global strict concavity of the problem makes that[3]:

$$\text{sgn}\left[\frac{\partial\tau_i^*(\zeta)}{\partial z}\right] = \text{sgn}\left[\frac{\partial(\Upsilon_i=0)}{\partial z}\right].$$

Proposition 5 *Under conditions 3 and 4 (and 1), each consumer i with fairness ideal Ω^{ζ} and network $\mu(i)$ has a unique most preferred tax rate $\tau_i^*(\zeta)$, such that*

$$\begin{aligned}
sgn\left(\frac{\partial\tau_i^*(\zeta)}{\partial Var(\varepsilon)_i}\right) &= sgn\left(\gamma 2\left(1-\tau_i^*\right)\right)\geq 0\\
sgn\left(\frac{\partial\tau_i^*(\zeta)}{\partial Var(a)_i}\right) &= sgn\left(\gamma 2(1-\tau)\left(\zeta^2-3\zeta(1-\tau)+2(1-\tau)^2\right)\left(\bar{\beta}_i\right)^2\right)<0\\
&\Leftrightarrow \tau_i^*\in\left[1-\zeta, 1-\frac{\zeta}{2}\right]\\
sgn\left(\frac{\partial\tau_i^*(\zeta)}{\partial Var(\beta)_i}\right) &= sgn\left(-2\gamma\tau_i^*\left(1-3\tau_i^*+2\tau_i^{*2}\right)\left(\bar{a}_i\right)^2\right)\\
&\Rightarrow sgn\left(\left(\tau_i^*-\frac{1}{2}\right)\frac{\partial\tau_i^*(\zeta)}{\partial Var(\beta)_i}\right)<0\\
&\Rightarrow sgn\left(\left(\tau_i^*-\frac{1}{2}\right)\frac{\partial\tau_i^*(\zeta)}{\partial\bar{a}_i}\right)<0
\end{aligned}$$

[3] With sgn: $\mathbb{R}\rightarrow\{-1,0,1\}$:

$$\begin{cases}\text{sgn}(x)=1 \text{ if } x>0\\ \text{sgn}(x)=0 \text{ if } x=0\\ \text{sgn}(x)=-1 \text{ if } x<0.\end{cases}$$

$$
\begin{aligned}
sgn\left(\frac{\partial \tau_i^*(\zeta)}{\partial \zeta}\right) &= sgn\left(2\gamma\left(1-\tau_i^*\right)\left(2\zeta - 3\left(1-\tau_i^*\right)\right)\left(\bar{\beta}_i\right)^2 Var\left(a\right)_i\right) \\
&\Rightarrow sgn\left(\left(2\zeta - 3\left(1-\tau_i^*\right)\right)\frac{\partial \tau_i^*(\zeta)}{\partial \zeta}\right) \geq 0 \\
sgn\left(\frac{\partial \tau_i^*(\zeta)}{\partial \gamma}\right) &= sgn\left(-\left[\left(1-2\tau_i^*\right)\bar{\beta}_i\bar{a}_i - \left(1-\tau_i^*\right)\beta_i a_i\right] - \frac{\partial \Omega_I^{\zeta}\left(\tau_i^*|\mu\left(i\right)\right)}{\partial \tau_i^*}\right) \\
sgn\left(\frac{\partial \tau_i^*(\zeta)}{\partial \beta_i}\right) &= sgn\left(-\left(1-\gamma\right)\left(1-\tau_i^*\right)a_i\right) \leq 0 \\
sgn\left(\frac{\partial \tau_i^*(\zeta)}{\partial a_i}\right) &= sgn\left(-\left(1-\gamma\right)\left(1-\tau\right)\beta_i\right) \leq 0 \\
sgn\left(\frac{\partial \tau_i^*(\zeta)}{\partial \bar{\beta}_i}\right) &= sgn\begin{bmatrix} \left(1-\gamma\right)\left(1-2\tau\right)\bar{a}_i + \\ 4\gamma\left(1-\tau\right)\left(\zeta^2 - 3\zeta\left(1-\tau\right) + 2\left(1-\tau\right)^2\right)\bar{\beta}_i Var\left(a\right)_i \end{bmatrix} \\
sgn\left(\frac{\partial \tau_i^*(\zeta)}{\partial \bar{a}_i}\right) &= sgn\left[\left(1-\gamma\right)\left(1-2\tau\right)\bar{\beta}_i - \gamma 2\left(2\tau - 6\tau^2 + 4\tau^3\right)\left(\bar{a}_i\right) Var\left(\beta\right)_i\right]
\end{aligned}
$$

For $\frac{\partial \tau_i^*}{\partial Var(\beta)_i}$,note that $(1-3\tau_i^*+2\tau_i^{*2})>0$ for $\tau_i^* \in \left]0,\frac{1}{2}\right[$ and $(2\tau_i^*-6\tau_i^{*2}+4\tau_i^{*3})<0$ for $\tau_i^* \in \left]\frac{1}{2},1\right[$. For $\frac{\partial \tau_i^*}{\partial Var(a)_i}$, note that the factor that determines the sign $\left(1-\zeta-\tau_i^*\right)\left[2-\zeta-2\tau_i^*\right]<0 \Leftrightarrow \left(1-\tau_i^*\right) \in \left]\frac{\zeta}{2},\zeta\right[\cap[0,1]$, and hence $\frac{\partial \tau_i^*}{\partial Var(a)_i} < 0 \Leftrightarrow \left(1-\tau_i^*\right) \in \left]\frac{\zeta}{2},\zeta\right[\cap[0,1]$.

Finally, consider the effect of the weight of fairness γ. For internal solutions, note that by the first order condition

$$
\left(1-\gamma\right)\left[\left(1-2\tau_i^*\right)\overline{\beta_i}\bar{a}_i - \left(1-\tau_i^*\right)\beta_i a_i\right] - \gamma\frac{\partial \Omega_I^{\zeta}\left(\tau_i^*|\mu\left(i\right)\right)}{\partial \tau_i^*} = 0
$$

implies that for an internal solution

$$
-\left[\left(1-2\tau_i^*\right)\overline{\beta_i}\bar{a}_i - \left(1-\tau_i^*\right)\beta_i a_i\right] - \frac{\partial \Omega_I^{\zeta}\left(\tau_i^*|\mu\left(i\right)\right)}{\partial \tau_i^*} = -\frac{\left[\left(1-2\tau_i^*\right)\overline{\beta_i}\bar{a}_i - \left(1-\tau_i^*\right)\beta_i a_i\right]}{\gamma}
$$

such that

$$
\begin{aligned}
\operatorname{sgn}\left(\frac{\partial \tau_i^*(\zeta)}{\partial \gamma}\right) &= \operatorname{sgn}\left(-\frac{\left[\left(1-2\tau_i^*\right)\overline{\beta_i}\bar{a}_i - \left(1-\tau_i^*\right)\beta_i a_i\right]}{\gamma}\right) \\
&\Rightarrow \operatorname{sgn}\left(\frac{\partial \tau_i^*(\zeta)}{\partial \gamma}\left(\left(1-\tau_i^*\right)\left(\overline{\beta_i}\bar{a}_i - \beta_i a_i\right) - \tau_i^*\overline{\beta_i}\bar{a}_i\right)\right) < 0.
\end{aligned}
$$

That is: if a consumer is sufficiently more productive than the average such that the loss of income due to higher taxes $\left(1-\tau_i^*\right)\left(\bar{\delta}-\delta_i\right)$ exceeds the income gains from higher transfers, then a higher weight of fairness increases the preferred tax rate. If one benefits directly from redistributive taxation, increasing the weight of fairness decreases the selfish bias and hence decreases the preferred tax rate.

How to interpret these comparative statics with incentive effects? Suppose that we drop any selfish effects and only consider fairness with incentive effects. This amounts to considering the above comparative statics at $\gamma = 1$. Let us figure out what happens to social injustice with incentive effects, when τ increases, and try to separate out the effects due to incentive issues. Since,

$$\begin{aligned}\Omega_I^{\zeta}(\tau|\mu(i)) = &(1-\tau)^2 Var(\varepsilon)_i + (1-\tau)^2\left((1-\zeta)^2 - 2(1-\zeta)\tau + \tau^2\right)\left(\bar{\beta}_i\right)^2 Var(a)_i \\ &+ (1-\tau)^2\tau^2(\bar{a}_i)^2 Var(\beta)_i,\end{aligned}$$

we can distinguish between the incentive and fairness effects of τ :

$$\begin{aligned}\frac{\partial\Omega_I^{\zeta}(\tau|\mu(i))}{\partial\tau} = &-2(1-\tau)\widehat{Var}_i(\varepsilon) - 2(1-\zeta-\tau)(1-\tau)^2\left(\bar{\beta}_i\right)^2 Var(a)_i \\ &+2(1-\tau)^2\tau(\bar{a}_i)^2 Var(\beta)_i \\ &-2(1-\tau)\tau^2(\bar{a}_i)^2 Var(\beta)_i - 2(1-\tau)(1-\zeta-\tau)^2\left(\bar{\beta}_i\right)^2 Var(a)_i \\ = &\left.\frac{\delta\Omega^{\zeta}(\tau|\mu(i))}{\partial\tau}\right|_{\tau^e=\tau} - 2(1-\tau)\tau^2(\bar{a}_i)^2 Var(\beta)_i \\ &-2(1-\tau)\left((1-\zeta)^2 - 2(1-\zeta)\tau + \tau^2\right)\left(\bar{\beta}_i\right)^2 Var(a)_i.\end{aligned} \tag{3}$$

That is, the first three terms on the right hand side of the above equation represent the original effects of fairness in the absence of incentive effects, and the last two terms capture only the incentive effects on fairness. The eventual result of both effects on comparative statics depends on the relative magnitude of both. For $\left(\bar{\beta}_i\right)^2$ and $Var(a)_i$, we know that the fairness effect (i.e. in absence of incentive effects) can be both positive and negative. Consider $Var(a)_i$ ($\left(\bar{\beta}_i\right)^2$ is equivalent). We know that the comparative static for fairness in absence of incentives is $\frac{\partial\tau_i^o(\zeta)}{\partial Var(a_j)_i} > 0$ if $\zeta < \bar{\zeta}$ and is negative if $\zeta > \bar{\zeta}$, with

$$\bar{\zeta} = \frac{(\bar{a}_i)^2(1-\tau^e)^2 Var(\beta)_i}{(\bar{a}_i)^2(1-\tau^e)^2 Var(\beta)_i + Var(\varepsilon)_i}.$$

The incentive effect, at the other hand, is always positive, since it reduces the deserted inequality. As a result, the sign of the overall effect is

$$\operatorname{sgn}\left(\frac{\partial\tau_i^*(\zeta)}{\partial Var(a)_i}\right) = \operatorname{sgn}\left((1-\zeta-\tau)^2 + (1-\zeta-\tau)(1-\tau)\right)$$

where the first terms concerns the incentive effects, and the second fairness in the absence of incentive effects. Clearly, $\frac{\partial \tau_i^*(\zeta)}{\partial Var(a)_i} < 0$ only if $\tau > 1 - \zeta$ (such that $1 - \zeta - \tau < 0$) and

$$\begin{aligned}
(1-\zeta-\tau)^2 &< -(1-\zeta-\tau)(1-\tau) \\
-(1-\zeta-\tau) &< (1-\tau) \\
\zeta &< 2(1-\tau) \\
1 - \frac{\zeta}{2} &> \tau
\end{aligned}$$

Hence, $\frac{\partial \tau_i^*(\zeta)}{\partial Var(a)_i} < 0$ only if $\tau \in \left]1-\zeta, 1-\frac{\zeta}{2}\right[$, since for $1 - \tau > \zeta$ both the incentive effect and fairness effect are positive, and for $\tau > 1 - \frac{\zeta}{2}$, the negative fairness effect is dominated by the positive incentive effect.

Similarly, the effects of $(\bar{a}_i)$ and $Var(\beta)_i$ are equivalent, such that we only consider $Var(\beta)_i$ .We know that the pure fairness effect is negative $\frac{\partial \tau_i^o(\zeta)}{\partial Var(\beta)_i} < 0$, and can easily see in equation 3 that the incentives effect is positive. The overall effect is then

$$\text{sgn}\left(\frac{\partial \tau_i^*(\zeta)}{\partial Var(\beta)_i}\right) = \text{sgn}\left(2(1-\tau)^2 \tau (\bar{a}_i)^2 - 2(1-\tau)\tau^2 (\bar{a}_i)^2\right)$$

which is positive if

$$\begin{aligned}
(1-\tau) &> \tau \\
\tau &< \frac{1}{2},
\end{aligned}$$

i.e. when the incentive effect dominates the fairness effect.

Let us finally consider the effect of ζ. The direct fairness effect was

$$-2(1-\tau)^2 \left(\bar{\beta}_i\right)^2 Var(a)_i < 0,$$

while the incentive effect

$$-4(1-\tau)(1-\tau-\zeta)\left(\bar{\beta}_i\right)^2 Var(a)_i \lesseqgtr 0$$

is negative if $1 - \tau > \zeta$. The overall effect is negative as long as

$$\begin{aligned}
-2(1-\tau)^2 &< 4(1-\tau)(1-\tau-\zeta) \\
(1-\tau) &> \frac{2}{3}\zeta.
\end{aligned}$$

That is, if $(1-\tau) < \zeta$ the incentive effect is positive, and if $(1-\tau) < \frac{2}{3}\zeta$ then this effect dominates, such that $\frac{\partial \tau_i^*(\zeta)}{\partial \zeta} > 0$. For ζ sufficiently deserted, taxation reduces the deserted inequality enough such that the incentive effects come to dominate the direct effect of having more deserted inequality. Otherwise, the increase of deserted inequality motivates a decrease in optimal tax levels.

3.3 Solidarity and Network Structure

Consumers estimate the variances of ε, β and a, as well as the averages $\bar{\beta}_i$ and $\bar{a}_i$ from their social network. However, a well documented fact about social networks is that they tend to be homophilous in certain qualities of consumers: like tend to meet like much more than proportionally. We generate homophilia in a very simply network formation model. We consider the effects of varying the degree of homophilia and consider the effects of heteroskedasticity, i.e. of $Var(\varepsilon)$ and $Var(\beta)$ dependent on α, in a very simple network formation model. Next, we consider the case where α is multidimensional and both professional qualities and income irrelevant qualities (skin colour, religion, lifestyle...) matter for network formation. We study what happens if these income irrelevant qualities become more salient.

3.3.1 A simple network setting

Assume that maintaining a social relation comes at a constant disutility cost $\bar{c} > 0$, and that the benefits $B(i,j)$ from a relationship are decreasing in the distance between two consumers in terms of talents α. Assume that the benefits of a relationship between two consumers i and j on the distance between their squared innate talents α_i and α_j such that

$$B(i,j) = \xi \frac{1}{\sum_k \delta^k \left| \left(\alpha_i^k\right)^2 - \left(\alpha_j^k\right)^2 \right|},$$

with ξ a parameter indicating constant marginal utility of $\frac{1}{\sum_k \delta^k \left| \left(\alpha_i^k\right)^2 - \left(\alpha_j^k\right)^2 \right|}$. Establishing a relationship is worthwhile if

$$\frac{1}{\sum_k \delta^k \left| \left(\alpha_i^k\right)^2 - \left(\alpha_j^k\right)^2 \right|} \geq c,$$

with $c \equiv \frac{\bar{c}}{\xi}$. Hence, the distance is measured with a generalised Mahalanobis metric, where the weights δ^k (with $\delta^k > 0$ and $\sum_k \delta^k = 1$) indicate the importance of a dimension k to a social relationship.

3.3.2 Unidimensional α

Consider first the case where α is unidimensional, such that $\delta^1 = 1$. Hence, in forming a social network, only the professional qualities matter, and consumer i's network consists of $\mu(i) = \left\{ j \middle| |a_i - a_j| \leq \frac{1}{c} \right\}$. Let $\bar{\phi}^1(a) \equiv \phi^1(\sqrt{a})$, $\bar{\Phi}^1(a) \equiv \Phi^1(\sqrt{a})$ and likewise $\bar{\phi}^2\left(\left(\alpha_j^2\right)^2\right) \equiv \phi^2\left(\alpha_j^k\right)$,

$\bar{\Phi}^2\left(\left(\alpha_j^2\right)^2\right) \equiv \Phi^2\left(\alpha_j^2\right)$. In this case, the perceived variance of α^1 is

$$Var\left(a\right)_i = \frac{\int_{a_i-\frac{1}{c}}^{a_i+\frac{1}{c}} \left(z-\bar{a}_i\right)^2 \bar{\phi}^1\left(z\right) dz}{\bar{\Phi}^1\left(a_i+\frac{1}{c}\right)-\bar{\Phi}^1\left(a_i-\frac{1}{c}\right)}.$$

with

$$\bar{a}_i = \frac{\int_{a_i-\frac{1}{c}}^{a_i+\frac{1}{c}} s\bar{\phi}^1\left(s\right) ds}{\bar{\Phi}^1\left(a_i+\frac{1}{c}\right)-\bar{\Phi}^1\left(a_i-\frac{1}{c}\right)}$$

Consider first

$$\begin{aligned}\frac{\partial \bar{a}_i}{\partial c} &= \frac{-\left(\left(a_i+\frac{1}{c}\right)\bar{\phi}^1\left(a_i+\frac{1}{c}\right)+\left(a_i-\frac{1}{c}\right)\bar{\phi}^1\left(a_i-\frac{1}{c}\right)\right)+\left(\bar{\phi}^1\left(a_i+\frac{1}{c}\right)+\bar{\phi}^1\left(a_i-\frac{1}{c}\right)\right)\bar{a}_i}{c^2\left(\bar{\Phi}^1\left(a_i+\frac{1}{c}\right)-\bar{\Phi}^1\left(a_i-\frac{1}{c}\right)\right)} \\ &= \frac{\left(\bar{a}_i-\left(a_i+\frac{1}{c}\right)\right)\bar{\phi}^1\left(a_i+\frac{1}{c}\right)+\left(\bar{a}_i-\left(a_i-\frac{1}{c}\right)\right)\bar{\phi}^1\left(a_i-\frac{1}{c}\right)}{c^2\left(\bar{\Phi}^1\left(a_i+\frac{1}{c}\right)-\bar{\Phi}^1\left(a_i-\frac{1}{c}\right)\right)}\end{aligned}$$

which is positive iff

$$\frac{\bar{a}_i-\left(a_i-\frac{1}{c}\right)}{\left(a_i+\frac{1}{c}\right)-\bar{a}_i} > \frac{\bar{\phi}^1\left(a_i+\frac{1}{c}\right)}{\bar{\phi}^1\left(a_i-\frac{1}{c}\right)}$$

The perceived variance is

$$\begin{aligned}\frac{\partial Var\left(a\right)_i}{\partial c} &= \frac{\begin{pmatrix} -2\int_{a_i-\frac{1}{c}}^{a_i+\frac{1}{c}}\left(z-\bar{a}_i\right)\frac{\partial \bar{a}_i}{\partial c}\bar{\phi}^1\left(z\right)dz \\ -\begin{pmatrix}\left(\left(a_i+\frac{1}{c}\right)-\bar{a}_i\right)^2\bar{\phi}^1\left(a_i+\frac{1}{c}\right) \\ +\left(\left(a_i-\frac{1}{c}\right)-\bar{a}_i\right)^2\bar{\phi}^1\left(a_i-\frac{1}{c}\right)\end{pmatrix} \\ +\left(\bar{\phi}^1\left(a_i+\frac{1}{c}\right)+\bar{\phi}^1\left(a_i-\frac{1}{c}\right)\right)Var\left(a\right)_i\end{pmatrix}}{c^2\left(\bar{\Phi}^1\left(a_i+\frac{1}{c}\right)-\bar{\Phi}^1\left(a_i-\frac{1}{c}\right)\right)} \\ &= \frac{\begin{matrix}\left(Var\left(a\right)_i-\left(\left(a_i+\frac{1}{c}\right)-\bar{a}_i\right)^2\right)\bar{\phi}^1\left(a_i+\frac{1}{c}\right) \\ +\left(Var\left(a\right)_i-\left(\left(a_i-\frac{1}{c}\right)-\bar{a}_i\right)^2\right)\bar{\phi}^1\left(a_i-\frac{1}{c}\right)\end{matrix}}{c^2\left(\bar{\Phi}^1\left(a_i+\frac{1}{c}\right)-\bar{\Phi}^1\left(a_i-\frac{1}{c}\right)\right)},\end{aligned}$$

which is negative iff

$$\begin{aligned}&\left(Var\left(a\right)_i-\left(\left(a_i+\frac{1}{c}\right)-\bar{a}_i\right)^2\right)\bar{\phi}^1\left(a_i+\frac{1}{c}\right) \\ &+\left(Var\left(a\right)_i-\left(\left(a_i-\frac{1}{c}\right)-\bar{a}_i\right)^2\right)\bar{\phi}^1\left(a_i-\frac{1}{c}\right) < 0.\end{aligned}$$

A necessary condition for this is that Φ^1 is not so skewed around α_i^1 that either

$$Var(a)_i - \left(\left(a_i + \frac{1}{c}\right) - \bar{a}_i\right)^2 < 0$$

or

$$Var(a)_i - \left(\left(a_i - \frac{1}{c}\right) - \bar{a}_i\right)^2 < 0.$$

Note that this means that

$$\bar{a}_i + \sqrt{Var(a)_i} < a_i + \frac{1}{c}$$

or

$$\bar{a}_i - \sqrt{Var(a)_i} > a_i - \frac{1}{c}.$$

Condition 6 *Let Φ^1 be such that around all a_i it is true that*

$$\left[\bar{a}_i - \sqrt{Var(a)_i}, \bar{a}_i + \sqrt{Var(a)_i}\right] \subset \left[a_i - \frac{1}{c}, a_i + \frac{1}{c}\right].$$

Although the two other income determinants are in expectation independent of talent α, it is possible that the conditional variances of both ε and β depend on a. Let $Var(\varepsilon|\alpha)$ and $Var(\beta|\alpha)$ depend linearly on α, such that

$$Var(\varepsilon|a) = V_\varepsilon + a\varrho_\varepsilon$$

and

$$Var(\beta|a) = V_\beta + a\varrho_\beta,$$

with $V_\varepsilon > 0$ and $V_\beta > 0$ constants and $\varrho_\varepsilon \in \mathbb{R}$ and $\varrho_\beta \in \mathbb{R}$ coefficients that characterise the linear heteroskedasticity. Homoskedasticity is characterised by $\varrho_\varepsilon = 0$ and $\varrho_\beta = 0$, while a negative coefficient ϱ_ε or ϱ_β indicates that the variance of ε and β respectively decreased as talent increases. The perceived variance of luck is for a consumer i

$$Var(\varepsilon)_i = V_\varepsilon + \frac{\varrho_\varepsilon}{|\mu(i)|} \int_{a_i - \frac{1}{c}}^{a_i + \frac{1}{c}} s\bar{\phi}^1(s)\, ds$$

and the perceived variance of taste for effort

$$Var(\beta)_i = V_\beta + \frac{\varrho_\beta}{|\mu(i)|} \int_{a_i - \frac{1}{c}}^{a_i + \frac{1}{c}} s\bar{\phi}^1(s)\, ds.$$

This leads us to a first set of conclusions about the dependence of $\tau_i^*(\zeta)$ on c, Φ^1, V_ε, V_β, ϱ_ε and ϱ_β.

Proposition 7 *Under conditions 3 and 4 (and 1), and for $\gamma > 0$, we find the following ceteris paribus comparative statics*
$\tau_i^*(\zeta)$ *increases with* V_ε *and decreases with* V_β
If $\varrho_\beta = 0$, *then* $\frac{\partial \tau_i^o(\zeta)}{\partial \rho_\varepsilon} \geq 0$, $\frac{\partial^2 \tau_i^o(\zeta)}{\partial \bar{a}_i \partial \varrho_\varepsilon} \gtrless 0$, $\frac{\partial \tau_i^*(\zeta)}{\partial \rho_\varepsilon} \geq 0$ *and* $\frac{\partial^2 \tau_i^*(\zeta)}{\partial \bar{a}_i \partial \varrho_\varepsilon} < 0$ *if*

$$Var(\varepsilon)_i > \left(1 - 6\tau + 6\tau^2\right)(\bar{a}_i)^2 Var(\beta)_i - \left(\zeta^2 - 6(1-\tau)\zeta + 6(1-\tau)^2\right)\left(\bar{\beta}_i\right)^2 Var(a)_i$$

If $\varrho_\varepsilon = 0$ *then* $\frac{\partial \tau_i^o(\zeta)}{\partial \rho_\beta} \geq 0$, $\frac{\partial^2 \tau_i^o(\zeta)}{\partial \rho_\varepsilon \partial \bar{a}_i} > 0$ *if*

$$3V_\varepsilon + 3(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i > (1-\tau^e)^2(\bar{a}_i)^2\left(V_\beta + 3\bar{a}_i\varrho_\beta\right)$$

and both $\frac{\partial \tau_i^*(\zeta)}{\partial \rho_\beta} \geq 0$ *and* $\frac{\partial^2 \tau_i^*(\zeta)}{\partial \rho_\beta \partial \bar{a}_i} \leq 0$ *for* $\tau_i^* \in \left[0, \frac{1}{2}\right]$ *and both* $\frac{\partial \tau_i^*(\zeta)}{\partial \rho_\beta} \geq 0$ *and* $\frac{\partial^2 \tau_i^*(\zeta)}{\partial \rho_\beta \partial \bar{a}_i} \geq 0$ *for* $\tau_i^* \in \left[\frac{1}{2}, 1\right]$.
If $\varrho_\varepsilon = \varrho_\beta = 0$ *and under condition 6, then increasing* c *increases* $\tau_i^*(\zeta)$ *if* $\frac{\partial \bar{a}_i}{\partial c} > 0$ *and* $(1-\tau_i^*) \in \left]\frac{\zeta}{2}, \zeta\right[\cap \left]\frac{1}{2}, 1\right]$ *or if* $\frac{\partial \bar{a}_i}{\partial c} < 0$ *and* $(1-\tau_i^*) \in \left]\frac{\zeta}{2}, \zeta\right[\cap \left[0, \frac{1}{2}\right[$.
It decreases $\tau_i^*(\zeta)$ *if* $\frac{\partial \bar{a}_i}{\partial c} > 0$ *and* $(1-\tau_i^*) \notin \left]\frac{\zeta}{2}, \zeta\right[\cup \left[0, \frac{1}{2}\right]$ *or if* $\frac{\partial \bar{a}_i}{\partial c} < 0$ *and* $(1-\tau_i^*) \notin \left]\frac{\zeta}{2}, \zeta\right[\cup \left[\frac{1}{2}, 1\right]$.

Proof. For $\tau_i^o(\zeta)$ and $\rho_\beta = 0 : \tau_i^o(\zeta) = \frac{V_\varepsilon + \varrho_\varepsilon \bar{a}_i + (1-\zeta)(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i}{V_\varepsilon + \varrho_\varepsilon \bar{a}_i + (1-\tau^e)^2\left(\left(\bar{\beta}_i\right)^2 Var(a)_i + (\bar{a}_i)^2 V_\beta\right)}$, such that

$$\begin{aligned}\frac{\partial \tau_i^o(\zeta)}{\partial \rho_\varepsilon} &= \frac{\bar{a}_i Var(m)_i - \bar{a}_i\left(V_\varepsilon + \varrho_\varepsilon \bar{a}_i + (1-\zeta)(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i\right)}{\left(Var(m)_i\right)^2} \\ &= (1-\tau^e)^2 \frac{\bar{a}_i\left(\zeta\left(\bar{\beta}_i\right)^2 Var(a)_i + (\bar{a}_i)^2 V_\beta\right)}{\left(Var(m)_i\right)^2} > 0,\end{aligned}$$

$$\frac{\partial^2 \tau_i^o(\zeta)}{\partial \rho_\varepsilon \partial \bar{a}_i} = (1-\tau^e)^2 \frac{\begin{pmatrix} \left(\zeta\left(\bar{\beta}_i\right)^2 Var(a)_i + 3(\bar{a}_i)^2 V_\beta\right)\left(Var(m)_i\right) \\ -2\left(\zeta\left(\bar{\beta}_i\right)^2 Var(a)_i + (\bar{a}_i)^2 V_\beta\right)\left(\varrho_\varepsilon \bar{a}_i + 2(1-\tau^e)^2(\bar{a}_i)^2 V_\beta\right)\end{pmatrix}}{\left(Var(m)_i\right)^3} \lesseqgtr 0$$

For $\tau_i^o(\zeta)$ and $\rho_\varepsilon = 0 : \tau_i^o(\zeta) = \frac{V_\varepsilon + (1-\zeta)(1-\tau^e)^2\left(\bar{\beta}_i\right)^2 Var(a)_i}{V_\varepsilon + (1-\tau^e)^2\left(\left(\bar{\beta}_i\right)^2 Var(a)_i + (\bar{a}_i)^2\left(V_\beta + \bar{a}_i\varrho_\beta\right)\right)}$, such that

$$\frac{\partial \tau_i^o(\zeta)}{\partial \rho_\beta} = (1-\tau^e)^2 \frac{(\bar{a}_i)^3 \left(V_\varepsilon + (1-\zeta)(1-\tau^e)^2 (\bar{\beta}_i)^2 Var(a)_i\right)}{(Var(m)_i)^2} > 0$$

$$\frac{\partial^2 \tau_i^o(\zeta)}{\partial \rho_\beta \partial \bar{a}_i} = (1-\tau^e)^2 \frac{\begin{array}{c} 3(\bar{a}_i)^2 \left(V_\varepsilon + (1-\zeta)(1-\tau^e)^2 (\bar{\beta}_i)^2 Var(a)_i\right)(Var(m)_i) \\ -2(\bar{a}_i)^3 \left(V_\varepsilon + (1-\zeta)(1-\tau^e)^2 (\bar{\beta}_i)^2 Var(a)_i\right) \\ \left((1-\tau^e)^2 \left(2(\bar{a}_i) V_\beta + 3(\bar{a}_i)^2 \varrho_\beta\right)\right) \end{array}}{(Var(m)_i)^3}$$

$$= (1-\tau^e)^2 (\bar{a}_i)^2 \frac{\begin{array}{c} \left(V_\varepsilon + (1-\zeta)(1-\tau^e)^2 (\bar{\beta}_i)^2 Var(a)_i\right) \\ \left(\begin{array}{c} 3V_\varepsilon + 3(1-\tau^e)^2 \left((\bar{\beta}_i)^2 Var(a)_i + (\bar{a}_i)^2 \left(V_\beta + \bar{a}_i \varrho_\beta\right)\right) \\ -2\left((1-\tau^e)^2 \left(2(\bar{a}_i)^2 V_\beta + 3(\bar{a}_i)^3 \varrho_\beta\right)\right) \end{array}\right) \end{array}}{(Var(m)_i)^3}$$

$$= (1-\tau^e)^2 (\bar{a}_i)^2 \frac{\begin{array}{c} \left(V_\varepsilon + (1-\zeta)(1-\tau^e)^2 (\bar{\beta}_i)^2 Var(a)_i\right) \\ \left(\begin{array}{c} 3V_\varepsilon + 3(1-\tau^e)^2 (\bar{\beta}_i)^2 Var(a)_i \\ -(1-\tau^e)^2 (\bar{a}_i)^2 \left(V_\beta + 3\bar{a}_i \varrho_\beta\right) \end{array}\right) \end{array}}{(Var(m)_i)^3}$$

Hence, $\frac{\partial^2 \tau_i^o(\zeta)}{\partial \rho_\varepsilon \partial \bar{a}_i} > 0 \Rightarrow 3V_\varepsilon + 3(1-\tau^e)^2 (\bar{\beta}_i)^2 Var(a)_i > (1-\tau^e)^2 (\bar{a}_i)^2 \left(V_\beta + 3\bar{a}_i \varrho_\beta\right)$

For $\tau_i^*(\zeta)$ and $\rho_\beta = 0$:

$$\frac{\partial \tau_i^*(\zeta)}{\partial \rho_\varepsilon} = 2\gamma(1-\tau)\bar{a}_i \geq 0$$

$$\frac{\partial^2 \tau_i^*(\zeta)}{\partial \rho_\varepsilon \partial \bar{a}_i} = -2\gamma(1-\tau) \frac{\begin{array}{c} 2Var(\varepsilon)_i + 2\left(\zeta^2 - 6(1-\tau)\zeta + 6(1-\tau)^2\right)(\bar{\beta}_i)^2 Var(a)_i \\ -(2-12\tau+12\tau^2)(\bar{a}_i)^2 Var(\beta)_i \end{array}}{\left(\begin{array}{c} 2Var(\varepsilon)_i + 2\left(\zeta^2 - 6(1-\tau)\zeta + 6(1-\tau)^2\right)(\bar{\beta}_i)^2 Var(a)_i \\ +(2-12\tau+12\tau^2)(\bar{a}_i)^2 Var(\beta)_i \end{array}\right)^2}$$

which is negative if

$$Var(\varepsilon)_i > \left(1-6\tau+6\tau^2\right)(\bar{a}_i)^2 Var(\beta)_i - \left(\zeta^2 - 6(1-\tau)\zeta + 6(1-\tau)^2\right)(\bar{\beta}_i)^2 Var(a)_i$$

For $\tau_i^*(\zeta)$ and $\rho_\varepsilon = 0$:

$$\frac{\partial \tau_i^*(\zeta)}{\partial \rho_\beta} = -\gamma\tau\left(2 - 6\tau + 4\tau^2\right)(\bar{a}_i)^3$$

$$\frac{\partial^2 \tau_i^*(\zeta)}{\partial \rho_\beta \partial \bar{a}_i} = \frac{\left(\begin{array}{c} 2\gamma\tau\left(2-6\tau+4\tau^2\right)(\bar{a}_i)^2 \\ \left(\begin{array}{c} 3\left(Var(\varepsilon)_i + \left(\zeta^2 - 6(1-\tau)\zeta + 6(1-\tau)^2\right)\left(\bar{\beta}_i\right)^2 Var(a)_i\right) \\ +(\bar{a}_i)^2\left(1-6\tau+6\tau^2\right) Var(\beta)_i \end{array}\right)\end{array}\right)}{\left(\begin{array}{c} 2Var(\varepsilon)_i + 2\left(\zeta^2 - 6(1-\tau)\zeta + 6(1-\tau)^2\right)\left(\bar{\beta}_i\right)^2 Var(a)_i \\ +\left(2-12\tau+12\tau^2\right)(\bar{a}_i)^2 Var(\beta)_i \end{array}\right)^2}$$

Under condition ??, the fraction is always negative such that $\frac{\partial^2 \tau_i^*(\zeta)}{\partial \rho_\beta \partial \bar{a}_i} \leq 0$ for $\tau_i^* \in \left[0, \frac{1}{2}\right]$ and $\frac{\partial^2 \tau_i^*(\zeta)}{\partial \rho_\beta \partial \bar{a}_i} \geq 0$ for $\tau_i^* \in \left[\frac{1}{2}, 1\right]$. ■

The easiest are the effects of V_ε and V_β : all other things equal, an increase in V_ε increases $\tau_i^*(\zeta)$ and and an increase in V_β decreases $\tau_i^*(\zeta)$ .If $\varrho_\varepsilon < 0$ and $\varrho_\beta = 0$, two things happen if a consumer moves from less to more talented consumers in her network (i.e. as $\bar{a}_i$ increases). The higher $\bar{a}_i$, the lower the undeserted income variation due to luck and the more the deserted income variance due to taste for effort is magnified. This causes consumers who are surrounded by more talented consumers have a higher ideal tax rate. If $\varrho_\varepsilon > 0$ and $\varrho_\beta = 0$, then both effects work in opposite directions, and hence the effect is ambiguous $\frac{\partial^2 \tau_i^o(\zeta)}{\partial \bar{a}_i \partial \varrho_\varepsilon} \gtrless 0$. If $\varrho_\varepsilon = 0$ and $\varrho_\beta > 0$, then consumers who are surrounded by more talented consumers tend to see more deserted income variation: they see more variation in taste for effort and this variation is magnified more by a higher $\bar{a}_i$. This induces consumers with a higher $\bar{a}_i$ to desire a higher ideal tax rate as well as a higher optimal tax rate $\tau_i^*(\zeta)$ as long as the incentive effects are not too great yet $\tau_i^* \in \left[0, \frac{1}{2}\right]$ .For $\varrho_\varepsilon = 0$ and $\varrho_\beta < 0$, both effects work again in opposite directions. Finally, an increase in c decreases $Var(\alpha)_i$ under condition 6, while the effect on $\bar{a}_i$ depends on the sign of

$$\frac{\bar{a}_i - \left(a_i - \frac{1}{c}\right)}{\left(a_i + \frac{1}{c}\right) - \bar{a}_i} - \frac{\bar{\phi}^1\left(a_i + \frac{1}{c}\right)}{\bar{\phi}^1\left(a_i - \frac{1}{c}\right)}.$$

The last two lines of proposition 7 collect the cases where the effects of a change in c through $Var(a)_i$ and $\bar{a}_i$ work unambiguously in the same direction, as indicates by proposition 5.

3.3.3 Two-dimensional α

Consider next the case where α is two-dimensional ($K = 2$). Although α^2 is income irrelevant, it does matter for the utility one gets out of a social relation. In this case,

$$\mu(i) = \left\{ j | \delta^1 |a_i - a_j| + (1-\delta^1) \left| (\alpha_i^2)^2 - (\alpha_j^2)^2 \right| \le \frac{1}{c} \right\}.$$

The generalised Mahalanobis weight δ^1 now indicates the importance of the professional talent or productivity α^1 for a social relationship, relative to the non-productive quality α^2. If δ^1 decreases (the relative importance of the nonproductive quality increases), then the range of productivities observed in the social network $\mu(i)$ increases. In the Cartesian $\left(a, (\alpha^2)^2\right)$ plane, if $\delta^1 \in]0,1[$, then $\mu(i)$ is a rhombus with edges

$$\left\{ \left(a_i - \frac{1}{c\delta^1}, (\alpha_i^2)^2\right), \left(a_i, (\alpha_i^2)^2 + \frac{1}{(1-\delta^1)c}\right), \left(a_i + \frac{1}{c\delta^1}, (\alpha_i^2)^2\right), \left(a_i, (\alpha_i^2)^2 - \frac{1}{(1-\delta^1)c}\right) \right\}.$$

If $\delta^1 = 1$, then $\mu(i) = \left\{ j | \alpha_j^1 \in \left[a_i - \frac{1}{c}, a_i + \frac{1}{c}\right] \right\}$,i.e. a vertical band of width $\frac{2}{c}$ around a_i, on which the perceived distribution coincides with $\bar{\phi}^1$. For $\delta^1 = 0$, the social network is a horizontal band around $(\alpha_i^2)^2$, i.e. $\mu(i) = \left\{ j | (\alpha_j^2)^2 \in \left[(\alpha_i^2)^2 - \frac{1}{c}, (\alpha_i^2)^2 + \frac{1}{c}\right] \right\}$. In this case we get that $\forall i,j \in \mathcal{I} : Var(a)_i = Var(a)_j$ and $\bar{a}_i = \bar{a}_j$, such that $\tau_i^o(\zeta) = \tau_j^o(\zeta)$.

What happens if $\delta^1 \in]0,1[$ changes, e.g. if the productive dimension of α becomes more salient for social network formation? First, note that the four points $\left\{ \left(a_i \pm \frac{1}{c}, (\alpha_i^2)^2 \pm \frac{1}{c}\right) \right\}$ are always on the frontier. Indeed, the edges of the rhombus pivot around these four points. The perceived variance of the productive talent is

$$Var(a)_i = \frac{1}{|\mu(i)|} \int_{(\alpha_i^2)^2 - \frac{1}{(1-\delta^1)c}}^{(\alpha_i^2)^2 + \frac{1}{(1-\delta^1)c}} \int_{a_i + \frac{(1-\delta^1)}{\delta^1}\left|(\alpha_i^2)^2 - z\right| - \frac{1}{\delta^1 c}}^{a_i - \frac{(1-\delta^1)}{\delta^1}\left|(\alpha_i^2)^2 - z\right| + \frac{1}{\delta^1 c}} (s - \bar{a}_i)^2 \bar{\phi}(s,z)\, ds dz$$

with

$$\bar{a}_i = \frac{1}{|\mu(i)|} \int_{(\alpha_i^2)^2 - \frac{1}{(1-\delta^1)c}}^{(\alpha_i^2)^2 + \frac{1}{(1-\delta^1)c}} \int_{a_i + \frac{(1-\delta^1)}{\delta^1}|\alpha_i^2 - z| - \frac{1}{\delta^1 c}}^{a_i - \frac{(1-\delta^1)}{\delta^1}|\alpha_i^2 - z| + \frac{1}{\delta^1 c}} s\bar{\phi}(s,z)\, ds dz.$$

If the two marginal distributions $\bar{\Phi}^1$ and $\bar{\Phi}^2$ are independent, then we can define the perceived density function of a around a_i as

$$\psi(a|\alpha_i, \delta^1) = \phi^1(\alpha^1) \int_{(\alpha_i^2)^2 - \frac{1}{(1-\delta^1)c} + \frac{\delta^1}{(1-\delta^1)}|a_i - a|}^{(\alpha_i^2)^2 + \frac{1}{(1-\delta^1)c} - \frac{\delta^1}{(1-\delta^1)}|a_i - a|} \phi^2(z)\, dz,$$

and the variance can be written as

$$Var(a)_i = \frac{1}{|\mu(i)|} \int_{a_i - \frac{1}{\delta^1 c}}^{a_i + \frac{1}{\delta^1 c}} (s - \bar{a}_i)^2 \psi(s|\alpha_i, \delta^1)\, ds$$

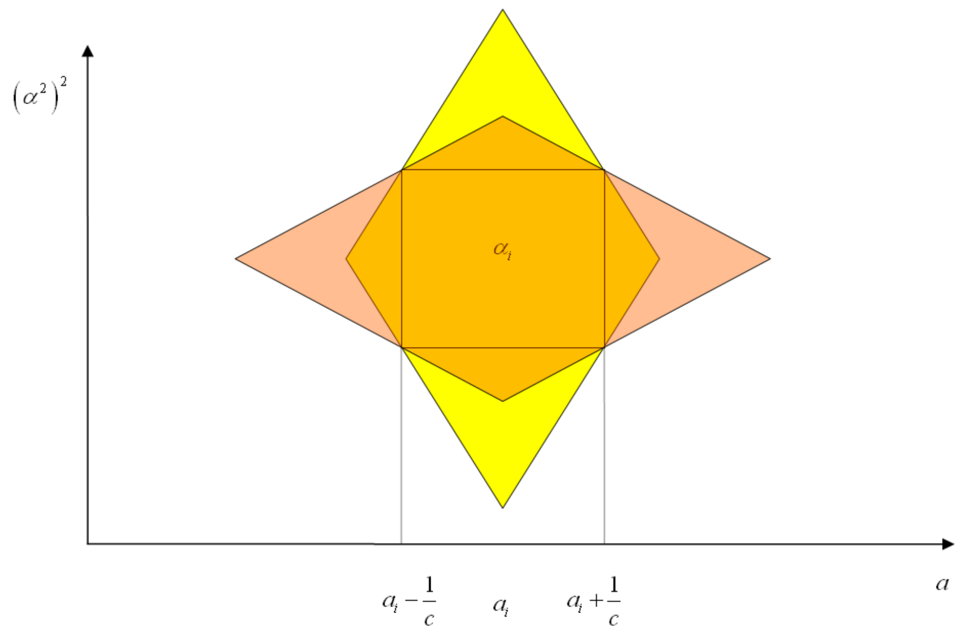

Figure 1: Network $\mu(i)$ as a rhombus for two values of δ^1

3.3.4 Simplest case: Φ uniform and independent

Let us consider the simplest case, with Φ^1 and Φ^2 uniform and independent, and their support compact on the rectangle $[\theta_L, \theta_R] \times [\theta_D, \theta_U]$ .Then

$$|\mu(i)| = \frac{2}{L_1 L_2} \left(\frac{1}{c^2 \left(1 - \delta^1\right) \delta^1} \right),$$

with $L_1 = \theta_R - \theta_L$ and $L_2 = \theta_U - \theta_D$.

The perceived density function is in this case

$$\frac{\psi(a|\alpha_i, \delta)}{|\mu(i)|} = \begin{cases} \left(c\delta^1\right)^2 |a - a_i| & \text{for } a \in \left[a_i - \frac{1}{c\delta^1}, a_i + \frac{1}{c\delta^1}\right] \\ 0 & \text{for } a \notin \left[a_i - \frac{1}{c\delta^1}, a_i + \frac{1}{c\delta^1}\right] \end{cases},$$

i.e. a symmetric triangular density function, around mean a_i on range $\left[a_i - \frac{1}{c\delta^1}, a_i + \frac{1}{c\delta^1}\right]$. If productive talents rather than other qualities become more salient in the formation of social networks, then consumers get to see less variation in productive talents. This decline in the salience of the unproductive quality can be interpreted as a result of the downfall of the great ideologies or of secularisation. An alternative interpretation is the revolutionary improvement of transport and communication infrastructure, which has reduced the salience of the location of consumers, and has enhanced the potential to form more homophilous networks. If talent is sufficiently undeserted ($\zeta < \bar{\zeta}$), then the ideal tax rate decreases with as productive talents become more important to network formation. A decay in the importance of nonproductive talents causes an increase of the ideal tax rate if productive talents are deemed sufficiently deserted. The most preferred tax rate τ_i^* decreases as as the salience of productive talents δ^1 increases as long as talent is sufficiently undeserted ($\tau < 1-\zeta$), as consumers then get to see less undeserted income variation, or when the tax rate is already sufficiently high ($\tau > 1 - \frac{\zeta}{2}$), because consumers are then more worried about the incentive effects of taxation. In between, for $\tau_i^* \in \left[1-\zeta, 1-\frac{\zeta}{2}\right]$, taxes are still sufficiently low and talent sufficiently deserted for an increase in the salience of productive talents to warrant a raise in the most preferred tax rate, since this now reduces the perceives variation in (mainly) deserted inequality in talent. A rise in the utility cost of maintaining a social relation, through c, generates similar effects.

Proposition 8 *If Φ^1 and Φ^2 are uniform and independent on the compact rectangle $[\theta_L, \theta_R] \times [\theta_D, \theta_U]$ and if $\mu(i) \subset supp(\Phi)$,*
then an increase in δ^1 decreases $\bar{a}_i$ and $Var(a)_i$. Similarly, an increase in c decreases both $\bar{a}_i$ and $Var(a)_i$.
If $\varrho_\varepsilon = \varrho_\beta = 0$ and, then $\frac{\partial \tau_i^o(\zeta)}{\partial \delta^1} > 0$ if $\zeta > \bar{\zeta}$ and $\frac{\partial \tau_i^o(\zeta)}{\partial \delta^1} < 0$ if $\zeta < \bar{\zeta}$.
If $\varrho_\varepsilon = \varrho_\beta = 0$, then $\frac{\partial \tau_i^*(\zeta)}{\partial \delta^1} \geq 0$ if $\tau_i^* \in \left[1-\zeta, 1-\frac{\zeta}{2}\right]$, and $\frac{\partial \tau_i^*(\zeta)}{\partial \delta^1} \leq 0$ if $\tau_i^* \notin \left[1-\zeta, 1-\frac{\zeta}{2}\right]$.
If $\varrho_\varepsilon = \varrho_\beta = 0$, then $\frac{\partial \tau_i^*(\zeta)}{\partial c} \geq 0$ if $\tau_i^* \in \left[1-\zeta, 1-\frac{\zeta}{2}\right]$, and $\frac{\partial \tau_i^*(\zeta)}{\partial c} \leq 0$ if $\tau_i^* \notin \left[1-\zeta, 1-\frac{\zeta}{2}\right]$.

Proof. The second raw moment of $\psi(a|\alpha_i, \delta)$ is

$$\begin{aligned}
\overline{(a_i)^2} &= \frac{1}{6}\left(\begin{array}{c} \left(a_i - \frac{1}{c\delta^1}\right)^2 + \left(a_i + \frac{1}{c\delta^1}\right)^2 + (a_i)^2 + a_i\left(a_i + \frac{1}{c\delta^1}\right) \\ +a_i\left(a_i - \frac{1}{c\delta^1}\right) + (a_i)^2 - \left(\frac{1}{c\delta^1}\right)^2 \end{array}\right) \\
&= \frac{1}{6}\left(2(a_i)^2 + 2\left(\frac{1}{c\delta^1}\right)^2 + (a_i)^2 + 3(a_i)^2 + \left(\frac{1}{c\delta^1}\right)^2\right) \\
&= (a_i)^2 + \frac{1}{6}\left(\frac{1}{c\delta^1}\right)^2 = (a_i)^2 + Var(a)_i.
\end{aligned}$$

such that

$$Var(a)_i = \frac{1}{6}\left(\frac{1}{c\delta^1}\right)^2.$$

This implies that the perceived variance of talent decreases as δ^1 increases.

$$\frac{\partial Var\,(a)_i}{\partial \delta^1} = -\frac{1}{6c^2}\left(\frac{1}{\delta^1}\right)^3 < 0$$

as long as $\mu\,(i) \subset \text{supp}(\Phi\,(\alpha))$. Similarly

$$\frac{\partial Var\,(a)_i}{\partial c} = -\frac{1}{6c^3}\left(\frac{1}{\delta^1}\right)^2 < 0.$$

■

4 Conclusion

How do preferences for redistribution depend on social structure? In a setting where consumers differ in talent, taste for effort and luck, the formation of preferences for redistribution in function of social was modelled in a framework reminiscent of Alesina and Angeletos (2005). In this framework, consumers' preferences over redistribution depend on self-interest, incentive issues and fairness. Fairness is understood as a concern that all should get what they deserve. Fairness was parametrized to encompass meritocracy (inequality caused by differences in talent and effort deserted) and responsibility sensitive egalitarianism (only differences due to effort deserted) and all cases in between. If consumers do not anticipate the effect of a change in taxation on the effort choices of all, then the most preferred level of redistribution is a simple increasing function of the ratio of undeserted income variation over total income variation. Consumers then make the trade off between taxing away unfairness in the form of undeserted income variation and generating new unfairness by reducing deserted income differences. If consumers do anticipate changes in effort choices due to changes in the tax rate, then the most preferred tax rate is a more complicated function of the relative importance of undeserted income variation in the overall income inequality. However, consumer typically have no accurate information about the true distribution of these deserted and undeserted income determinants. Instead, consumers rely on their social network to estimate their relative importance, and these social networks are typically homophilous (like tend to meet like). Social networks thus provide a biased sample of the population, thus causing variation in support for solidarity, even among consumers with an identical fairness ideal. The fundamentals of the simple network formation process thus determine the consumer's perception of the importance of the various income determinants and hence the preferred level of redistribution.

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