POLARISATION AND HEALTH[*]

Cristina Blanco Pérez
Universitat Autònoma de Barcelona

Departamento de Economía Aplicada
Campus de Bellaterra
E-08193 Bellaterra (Cerdanyola del Vallès)
Barcelona
Teléfono: +34 625 37 66 58
Fax: +34 93 581 22 92
E-mail: cristina.blanco.perez@uab.cat

Xavier Ramos[†]
Universitat Autònoma de Barcelona & [†]IZA
Departamento de Economía Aplicada
Campus de Bellaterra
E-08193 Bellaterra (Cerdanyola del Vallès)
Barcelona
Teléfono: +34 93 581 28 68
Fax: +34 93 728 77 66
E-mail: cristina.blanco.perez@uab.cat

ABSTRACT: This paper examines the effect of income polarisation on individual health. We argue that polarisation captures much better the social tension and conflict that underlie some of the pathways linking income disparities and individual health, and which have been traditionally proxied by inequality. We test our premises with panel data for Spain. Results show that polarisation has a detrimental effect on health. We also find that the way the relevant population subgroups are defined is important: polarisation is only significant if measured between education-age groups for each region. Regional polarisation is not significant. Our results are obtained conditional on a comprehensive set of controls, including absolute and relative income.

JEL Classification: I12, D31, C23

1. Introduction.

In this paper we examine, for first time, the relationship between income polarisation and individual health. Some social factors which are known to determine health operate through the social tension and conflict that they generate. Two are especially relevant: the psychosocial stress which results from strategies of dominance and conflict that govern many social structures in modern industrialised societies, and the lower provision of public goods and redistributive policies due to the tension and disagreement between groups with conflictive interests. Since polarisation is the concept that is most closely related to social tension and conflict (Esteban and Ray, 1994), we want to test empirically whether polarisation has a negative effect on individuals' health.

These two pathways are not new; they come from the related and prolific literature on the negative relationship between income inequality and health (see Deaton (2003) for a critical survey). The novelty of the paper, then, is introducing polarisation in the extensive literature that relates distributive issues with health, and showing its empirical relevance.

Our empirical strategy uses panel data from Spain and employs a recently developed econometric method due to Ferrer-i-Carbonell and Frijters (2004), which allows taking full advantage of the time-varying an time-invariant information available in a longitudinal study when modelling an ordinal outcome.

Our findings provide empirical support to our main hypothesis: that is, income polarisation affects individual health in a negative way. Polarisation takes places between groups, and we also find that the way the relevant population subgroups are defined is important: polarisation is only significant if measured between education-age groups for each region, but is not significant between regions. This result is important and rather new, since the empirical literature has mostly focussed on income disparities between regions, and has neglected other population subgroups that we find relevant. Our results are obtained conditional on a comprehensive set of controls, including absolute and relative income, and subjective poverty.

The paper is structured as follows. Section 2 puts forth the theoretical grounds that explain a negative relationship between income polarisation and individual health, and clarifies the differences between polarisation and inequality. Section 3 describes the data and defines the key variables, while Section 4 presents the empirical model and outlines the estimation procedure. Section 5 presents our main empirical findings and Section 6 shows that results are robust to

changes in the polarisation measure and to the inclusion of subjective poverty in the analysis. Finally, Section 7 provides some concluding remarks.

2. Income polarisation and individual health

2.1 Why income polarisation?

We argue that income polarisation affects individual health in at least two ways. First, psychosocial stress, related to strategies of dominance, *conflict* and submission, and prevalent in most industrialised societies, have adverse consequences on health (Wilkinson, 1996, 1997, 1998). Our premise is that income polarisation captures the conflict that underlies psychosocial stress, and thus shows a negative relation with individual health.

The second pathway is related to the long standing argument in the political economy literature that income disparities increase disagreement and tension between groups with conflictive interests on the provision of public goods, such as health, education or police. Such conflict of interests is likely to reduce the provision of public goods and redistributive policies —see Osberg *et al.* (2003) for a review of the literature.[1] Income disparities may also discourage political participation of poorer individuals relative to better-off citizens, which undermines the political voice of worse-off individuals, and endangers the responsiveness of government to the popular majority and not the elite minority. There is some evidence that supports this view. For instance, Garand and Nguyen (2007) find that in US counties with larger income disparities, "vote turnout tends to be lower in general and especially for disadvantaged people, relative to high-income citizens" (p. 4), while Jacobs and Skocpol (2005) argue that "our governing institutions are much more responsive to the privileged and well-organized narrow interests than to other Americans" (p. 9).

Hence, we hypothesise that greater polarisation leads to lower provision of public goods. Our premise is in line with recent findings on the (negative) relation between (ethnic) polarisation and the share of public spending on public goods (Alesina, Baqir and Esterly, 1999). In so far as these public goods contribute to individual health, polarisation may be seen as a health hazard. However, there is some evidence that indicates that access to medical services does not have large effects on health, especially in adulthood (Adler et al., 1994; House and Williams, 1995). If this was the case, we would expect no effect of polarisation on individual health, at least through this channel.

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[1] However, if increased income disparities imply a poorer median voter, the outcome might be the opposite, since she will favour more social (and especially redistributive) spending (Meltzer and Richard, 1981 and 1983).

Traditionally, the two mechanisms outlined above, despite being related to conflict, have never been linked to the notion of polarisation, but to the concept of inequality. Actually, the relationship between inequality and health has attracted much attention from different disciplines —see Kawachi, Kennedy and Wilkinson (1999) for a nice collection of papers on the topic.[2] Deaton (2003), who argues that there is no direct link between inequality and health, recognises that psychosocial stress is one of the plausible ways through which inequality may relate to health. Indeed Wilkinson (2000) relates inequality to the "stressful strategies of dominance and conflict", which may result in psychosocial stress and deteriorate individual health. Inequality, but also segregation, has been traditionally deemed relevant for the provision of public goods (Meltzer and Richard, 1981 and 1983), although the evidence is mixed: while Lindert (1996) and Moene and Wallerstein (2002) find that inequality across countries is associated with lower public spending, Milanovic (2000) finds the opposite.

In this paper we argue that it is inequality between relevant population subgroups, i.e. alienation, and not simply overall population inequality, which sharpens the differences in collective preferences and leads to disagreement and conflict on the provision of public goods. Of course, the more homogeneous the groups the sharper the differences in preference. We argue that it is polarisation, a notion which is conceptually close to segregation, and not inequality, which should correlate with health. In sum, what is indeed novel in our approach is the focus on conflict, which is brought about by a polarised situation, rather than by a simply unequal one.

Since inequality has been extensively used in the literature to approximate different pathways (see Deaton (2003) for a critical review), it will also be included in our empirical work. One of the major channels through which inequality might still be relevant for individual health is social capital. Income inequality is a determinant of social capital (Brehm and Rahn, 1997; Kawachi *et al.*, 1997; Alesina and La Ferrara, 2000), which in turn is supposed to have a positive effect on individual health (Mellor and Milyo, 2005). Social capital —defined as the features of social organization, such as civic participation, norms of reciprocity and trust in others— facilitate cooperation for mutual benefit (Putnam, 1993:, Glaeser *et al.*, 2002), and generate both psychological (trust and emotional support) and tangible benefits (better access to information, increased civic and community participation or more taste for redistributive and

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[2] Ever since Preston (1975) documented the non-linear relationship between income and health, income inequality has been considered as a determinant of individual health. After much debate (both in the epidemiological and economics literature), the question as to whether there is a direct effect of income inequality on individual health still remains open —see Wilkinson (1992, 1996, 2000), Kawachi, Kennedy and Wilkinson (1999), and Deaton (2003) for different positions on this debate.

collective goods). In so far as inequality is a good proxy for social capital, it is likely to have a negative effect on health. In our empirical analysis, we use club membership and whether speaking often with neighbours as control variables. Nonetheless, since these are rather crude and incomplete indicators of social capital —albeit widely used—, inequality may still exert a significant effect on individual health.

2.2 Income polarisation

Polarisation is best understood as the result of two features: alienation and identification (Esteban and Ray, 1994). In societies where groups or communities are far apart from each other, they are likely to have different collective preferences and pursue different goals and interests. Such distance will give rise to a feeling of *alienation*, which may lead to the lack of understanding of and tolerance for other population groups. Such alienation brings about tension and social and political conflict. Additionally, as groups are internally more homogeneous, because the relevant characteristics of their members are more similar, their members identify more closely with the group, and thus are likely to have a larger feeling of belonging to their group or community, which in turn may also increase the social and political conflict. In sum, the larger the inter-group heterogeneity —alienation— and the intra-group homogeneity — identification—, the larger the polarisation.

Polarisation is fundamentally different from inequality. The early contributors to this literature thoroughly and persuasively explain the distributive differences between polarisation and inequality.[3] Wolfson (1994) shows how polarisation, but not inequality, captures the disappearance of the middle class, and Esteban and Ray (1994) devote large part of their paper to illustrate the distributive features that clearly distinguish polarisation from inequality. Perhaps the most important of those is that polarisation may not be consistent with the principle of transfers, which is a fundamental property in inequality measurement. Suppose a two-group society with intra-group disparities. Rich to poor transfers, consistent with the principle of transfers, will certainly reduce measured inequality but will increase polarisation, as they increase *identification*. A second distinctive feature of polarisation is that it is "*global* in nature, in a way that inequality measures are not" (p. 826). That is, to make polarisation comparisons one has to consider the whole distribution. However, inequality measurement may be "local", and the principle of transfers is a good example since it only looks at two incomes to make

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[3] Notwithstanding this, recent and influential contributions still confound the two concepts or proxy polarisation with some inequality measure. Knack and Keefer (1997), for instance, purport to measure polarisation with an inequality index, and Alesina, Baqir and Easterly (1999) study the relationship between ethnic polarisation and the provision of public goods, and argue that if polarisation of preferences is a function of income —rather than ethnic— polarisation, then income inequality might explain the provision of public goods.

inequality comparisons. Nonetheless, the most relevant difference between polarisation and inequality is that polarisation, and not inequality, may bring about social tension and social and political conflict.

3. Data and variables description

We employ Spanish data from the European Community Household Panel survey (ECHP), a standardized multi-purpose annual longitudinal survey providing comparable micro-data about living conditions in the European Union Member States. We consider the eight waves (1994-2001) of the Spanish sample of the ECHP. As suggested by Cowell and Victoria-Feser (2002), to avoid noise and bias in the estimation of the inequality and polarisation indices due to outliers and extreme incomes, we have trimmed 1% of the upper and lower tails of the income distribution —see also Gravelle and Sutton, 2006 and Weich *et al.*, 2002. The final sample contains 95748 individual-observations that correspond to 15692 individuals. The average length of time in the panel is 6.1 years.

Individual health is measured by a self-assessed measure (SAH), which is taken from the individual answer to the following question: "how is your health in general?" Individuals can report five different answers ordered from "very poor" (value 1) to "very good health" (value 5). The use of subjective measures to evaluate not only health but also other aspects of life has increased in recent years, as empirical evidence on its validity has been accumulating (Clark, Frijters and Shields, 2008). In particular, individual health subjective evaluations of health have been found to be good predictors of morbidity and mortality (Deaton, 2003), even conditional on a physician's examination (see Idler and Benyamini, 1997).

Since our measure of polarisation ought to capture the conflict between exogenously defined population subgroups, and not only the clustering along the income distribution for the overall population, our index of polarisation (*P*) will be the ratio of between to within inequality components (Zhang and Kanbur, 2001).[4] Besides measuring polarisation between regions, as it is usual in the literature, the empirical analysis adds a new feature by arguing that the relevant population subgroups are not regions but individual's reference groups. Then, the obvious question is how to define the reference group to which individuals compare to. Here we define the reference group as individuals who live in the same region, and have about the same age and

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[4] Zhang and Kanbur's (2001) index is especially suitable to measure polarisation between exogenously defined groups, as opposed to the axiomatically derived measures of income polarisation (e.g. Esteban and Ray, 1994; Wang and Tsui, 2000).

education level, a practice common in the literature of income and happiness (Ferrer-i-Carbonell, 2005).[5]

We use the Theil index to measure inequality, which is especially suitable for our purposes since it decomposes additively into within and between inequality, the two elements required to compute polarisation. As a robustness check we also use the Mean Log Deviation (MLD) —see Section 6. These two inequality indices are the only two that provide and exact additive decomposition, and that use only population- (MLD) and also income-related (for the Theil) weights to aggregate subgroup inequalities to obtain the within component (Cowell, 1980; Shorrocks, 1980)

Besides polarisation and inequality, the covariates include variables that have been shown to have an influence on individual health. Our specifications include income-related variables (family income and average income of the reference group), personal characteristics (age, education, and labour market status), a proxy of social capital (whether talking often with neighbours), and environmental factors (crime or vandalism problems and pollution problems in the area of residence). Health hazardous behaviour variables such as smoking, and the body mass index were also tried but showed systematically insignificant.[6] Descriptive statistics are shown in Appendix Table A1.

4. Empirical model and estimation procedure

The principal aim of the paper is to test whether income polarisation has any effect on self-assessed individual health, which is an ordinal variable that can take 5 discrete ordered values. The empirical analysis assumes that individuals´ answers are comparable among them, which means that an individual reporting a 4 enjoys a better health than one reporting a 2. Nevertheless, and given that health is measured in discrete numbers, the empirical analysis uses a categorical ordered model so as to avoid assuming cardinality. Following the usual notation for ordered categorical models, the equation to be estimated is

$$H_{it}^* = X_{it}\beta + f_i + \varepsilon_{it}, \qquad H_{it} = k \Leftrightarrow H_{it}^* \in [\lambda_k, \lambda_{k+1})$$

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[5] We consider the three education categories provided by the data and bunch individuals into 4 age groups (younger than 25, 25-44, 45-65, older than 65). Since we consider 7 regions (defined as NUTS1), we have 84 reference groups per year.

[6] Recent empirical work for selected European countries obtains similar results (e.g. Theodossiou and Zangelidis, 2006).

where H_{it}^{*} is the latent health status of individual i at time t, H_{it} is the observed one, λ_k is the kth cut-off point for the 5 different k categories, X_{it} is a vector of covariates, f_i are the individual time-invariant unobserved characteristics, and ε_{it} is the usual time-varying error term. The inclusion of fixed effects in an ordered categorical model is not straightforward. In this paper we use an extension derived in Ferrer-i-Carbonell and Frijters (2004) of the widely used fixed-effect binary logit model by Chamberlain (1980) in which the original variable is collapsed into a binary variable by using an individual-specific threshold.[7] Instead of the most common practice of collapsing the original categorical ordinal variable into a binary variable according to an arbitrary threshold that is common for all individuals,[8] the Ferrer-i-Carbonell and Frijters (2004) model recodes the original variable by means of an individual-specific threshold via the free parameter k_i. The first option wastes a lot of the sample information, as all individuals for whom the binary health status variable does not change over the sample period will not contribute to estimation, even if their reported health status ordinal indicator does change. The second option instead allows us to include all individuals whose health status score changes over the sample period, which is the case for 87% of all observations, while studies using the first option usually loose over 50% of the sample observations (e.g. Clark, 2003).

The conditional estimator for β maximises the following likelihood of observing which of the T health status of the same individual are above k_i, given that there are c out of T health status above k_i:

$$L\left[I(H_{i1} > k_i), \ldots, I(H_{iT} > k_i) \,|\, \sum_t I(H_{it} > k_i) = c \right] = \frac{\exp\left\{ \sum_{t=1}^{T} I(H_{it} > k_i) X_{it} \beta \right\}}{\sum_{H \in S(k_i, c)} \exp\left\{ \sum_{t=1}^{T} I(H_{it} > k_i) X_{it} \beta \right\}}$$

Here, $S(k_i, c)$ denotes the set of all possible combinations of $\{H_{i1}, \ldots, H_{iT}\}$ such that $\sum_t I(H_{it} > k_i) = c$. For details on the estimation procedure we refer to Ferrer-i-Carbonell and Frijters (2004).

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[7] We will employ the individual mean score of reported health status over the sample period.
[8] For instance, we could recode our five scale ordinal health status variable such that the lower three categories are assigned a value of 0 and the upper two are assigned a value of 1.

5. Empirical Results

Table 1 reports the estimates of basic specifications for the fixed-effects ordered logit models. All specifications include the basic controls but differ in the way the inequality and polarisation variables are introduced. The first two specifications include polarisation between regions and reference groups. The last two introduce, next to polarisation, inequality between regions and reference groups.

Before discussing the main variables of interest, we briefly discuss some of the most interesting explanatory variables. The estimates of the covariates are robust across specifications and have the expected sign, with the exception of unemployment, which shows a positive sign. As usual in the literature, income has a positive effect on health, as it buys goods and services that are health enhancing (Deaton, 2003). Such positive relationship has also proven to be causal —see Frijters *et al*. (2005) for recent evidence. As customary, our income variable refers to the equivalent net household income.[9] Besides absolute income, a recent body of the literature has argued and shown that relative income has also a bearing on individual health. That is, holding own income level fix, the average income in a reference group also affects individual's health status. The direction of the effect, however, is uncertain since there are at least two arguments that work in opposite directions. The traditional model posits that low relative income harms health by increasing relative deprivation and thus psychosocial stress (Wilkinson, 1996, 1997, 1998). Recent evidence, however, suggests a positive relationship between relative income and health, which could be explained by a positive externality brought about by the larger expenditure on health-promoting goods and services in wealthier communities —regardless of own income level (Miller and Paxton, 2006). Here, the relative income is defined as the (log of the) average income of a reference group, defined in the same way as the reference groups of income polarisation. If reference groups are defined only as individuals in the same region, the effect is insignificant. Relative income has a positive and statistically significant sign, which suggests that the level of income of the community is consistent with a positive externality effect, rather than a relative deprivation argument.

As outlined above, social capital was originally approximated by two standard indicators: club membership and whether speaking often with neighbours. However, only the latter is significant and it is finally included in the regression. Recall from our discussion above that, when included, inequality may also capture the effects of social capital on health. Finally, we also control for environmental factors which have been found to affect health (Sassi and Hurst,

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[9] The OECD scale is used to equivalise income. This deflator gives a weight of 1 to the first adult of the household, 0.7 to the rest of the adults, and 0.5 to the children younger than 14 (see Hagenaars *et al*., 1994).

2008), and which include having problems of crime, vandalism and pollution in the area of residence. We find these environmental problems to have a negative correlation with individual health.

The first two specifications show that while polarisation between reference groups is negatively correlated with health, regional polarisation does not have a statistical significant effect on health. This evidence supports our predictions on the negative effect of polarisation on individual health, but also warns that the way population subgroups are defined is important. Our results suggest that tension and conflict occur among groups of people who share basic individual characteristics such as education and age and live in the same region, and not among those individuals who simply reside in different regions, regardless of their personal attributes. As Table 2 shows, polarisation is larger among education-age groups than among regions, and this is because both alienation and identification are larger for the former than for the latter.[10]

The last two specifications introduce inequality between regions and between age-education groups, respectively, to check whether inequality still has some explanatory power beyond polarisation. We find that only income inequality between regions matters for health, but that inequality between age-education groups has no significant effect. If, as suggested above, inequality is a proxy for social capital, our results indicate that it is inequality among individuals of a region that matters, and not only among those individuals with similar basic characteristics. Note that the negative effect of regional inequality obtains in spite of controlling for another social capital variable (i.e. how often talking to neighbours), and that the sign and size of the latter does not change with the inclusion of regional inequality.

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[10] Bear in mind that larger identification means lower within group inequality.

Table 1. Individual health and polarisation (estimated with Theil index)
Fixed-Effects Ordered Logit model, ECHP 1994-2001

Covariates	*Specif.1* Coeff.	p-value	*Specif.2* Coeff.	p-value	*Specif.3* Coeff.	p-value	*Specif.4* Coeff.	p-value
Ln(family income)	0.053	0.016	0.056	0.011	0.050	0.021	0.052	0.018
Ln(average income reference group)	0.310	0.002	0.356	0.000	0.277	0.006	0.305	0.002
Age	-0.107	0.000	-0.109	0.000	-0.114	0.000	-0.108	0.000
Age squared	0.0004	0.000	0.0004	0.000	0.0004	0.000	0.0004	0.000
Secondary education	0.082	0.085	0.093	0.050	0.077	0.107	0.090	0.062
Tertiary education	0.141	0.041	0.163	0.018	0.128	0.063	0.146	0.034
Unemployed	0.083	0.014	0.084	0.013	0.083	0.014	0.083	0.014
Inactive	-0.075	0.019	-0.073	0.024	-0.076	0.019	-0.076	0.019
Separated	-0.037	0.752	-0.039	0.740	-0.038	0.748	-0.037	0.754
Divorced	0.188	0.268	0.192	0.260	0.187	0.272	0.190	0.265
Widowed	-0.022	0.805	-0.016	0.853	-0.022	0.801	-0.022	0.804
Single	0.067	0.290	0.067	0.294	0.068	0.281	0.068	0.285
Do not talk often to neighbours	-0.231	0.000	-0.233	0.000	-0.231	0.000	-0.231	0.000
No crime problems in area	0.138	0.000	0.139	0.000	0.138	0.000	0.138	0.000
No pollution problems in area	0.139	0.000	0.139	0.000	0.139	0.000	0.139	0.000
Polarisation (between reference groups)[1]	-0.933	0.000			-0.819	0.000	-0.947	0.000
Polarisation (between regions)			0.382	0.540				
Inequality (between reference groups)[1]							-0.527	0.214
Inequality (between regions)					-2.354	0.008		
Log likelihood	-39602		-39612		-39599		-39602	
No. Observations	95748		95748		95748		95748	

[1] Reference groups defined over education and age for each region and year.

Table 2. Polarisation and its components by wave, using Theil index*

Year	*Polarisation* Groups	Regions	*Alienation* Groups	Regions	*Identification* Groups	Regions
1994	0.204	0.082	0.025	0.012	0.123	0.145
1995	0.198	0.108	0.024	0.015	0.120	0.141
1996	0.193	0.098	0.022	0.013	0.115	0.136
1997	0.211	0.128	0.025	0.018	0.120	0.143
1998	0.191	0.122	0.023	0.017	0.118	0.138
1999	0.184	0.139	0.020	0.018	0.109	0.128
2000	0.188	0.116	0.020	0.014	0.105	0.122
2001	0.191	0.150	0.019	0.017	0.101	0.116
All years	0.196	0.116	0.022	0.015	0.115	0.135

* Between and within inequality components computed using the Theil index. Groups are defined by age and education for each region and wave. Alienation is the between inequality component, and for age-education groups it is the average of between inequalities for all regions. Identification is the within inequality component.

6. Robustness checks

This section shows that our main result —i.e. the negative effect of polarisation between reference groups on health— is robust to using a different polarisation measure and to including (subjective) poverty in the analysis. We measure polarisation using an alternative index of inequality that also decomposes additively, and obtain similar results. Table 3 shows the estimates of the same four basic specifications presented in Table 1 where polarisation and inequality have been computed using the MLD —instead of the Theil index. Polarisation continues to have a detrimental effect on health only when computed between age-education groups. However, inequality now shows a negative and significant effect both between reference groups and between regions (specifications 3 and 4).

Table 3. Individual health and polarisation estimated using MLD
Fixed-Effects Ordered Logit model, ECHP 1994-2001

Covariates	Specif. 1 Coeff.	p-value	Specif.2 Coeff.	p-value	Specif.3 Coeff.	p-value	Specif. 4 Coeff.	p-value
Ln(family income)	0.053	0.014	0.056	0.010	0.049	0.025	0.052	0.018
Ln(average income reference group)	0.329	0.001	0.369	0.000	0.255	0.012	0.326	0.001
Age	-0.106	0.000	-0.112	0.000	-0.119	0.000	-0.109	0.000
Age squared	0.0004	0.000	0.0004	0.000	0.0004	0.000	0.0004	0.000
Secondary education	0.086	0.071	0.095	0.046	0.075	0.118	0.098	0.042
Tertiary education	0.149	0.030	0.167	0.016	0.121	0.078	0.158	0.021
Unemployed	0.083	0.014	0.084	0.013	0.083	0.014	0.083	0.014
Inactive	-0.075	0.020	-0.073	0.024	-0.076	0.018	-0.076	0.019
Separated	-0.037	0.750	-0.038	0.743	-0.039	0.741	-0.037	0.753
Divorced	0.189	0.266	0.192	0.258	0.185	0.277	0.191	0.261
Widowed	-0.020	0.814	-0.016	0.852	-0.021	0.812	-0.020	0.816
Single	0.067	0.293	0.067	0.293	0.070	0.273	0.068	0.284
Do not talk often to neighbours	-0.232	0.000	-0.233	0.000	-0.231	0.000	-0.232	0.000
No crime problems in area	0.139	0.000	0.139	0.000	0.138	0.000	0.139	0.000
No pollution problems in area	0.139	0.000	0.139	0.000	0.138	0.000	0.139	0.000
Polarisation (reference groups)[1]	-0.824	0.001			-0.683	0.006	-0.859	0.001
Polarisation (regions)			0.737	0.293				
Inequality (reference groups)[1]							-0.780	0.034
Inequality (regions)					-4.390	0.000		
Log likelihood	-39607		-39612		-39593		-39604	
No. Observations	95748		95748		95748		95748	

[1] Reference groups defined over education and age for each region and year.

Relative poverty has been adduced to have a deleterious effect on health (Deaton, 2003; Wagstaff and Van Doorslaer, 2000; Wilkinson, 1996). Certain kind of socioeconomic problems (e.g. unemployment, debts, housing and marital problems) have negative psychological effects on individuals. This stress may affect health directly, for example, by weakening the immunological system and favouring the appearance of other illnesses, or it may affect health indirectly, by inducing an increase in alcohol or drugs consumption (McIsaac and Wilkinson

1995). We capture this stress, and the related psychological effects, by a subjective account of financial difficulties. In particular, individuals report whether they are able to make ends meet.[11] Table 4 shows the estimates of our four base models when this subjective poverty measure is included. As expected, (subjective) poverty has a deleterious effect on individual health. Additionally, the income level becomes insignificant. Most importantly for us, polarisation is robust both in size and precision to the inclusion of subjective poverty. This suggests that the negative psychological effects caused by the perception of being poor do not confound the negative polarisation effects on health.

Table 4. Adding subjective poverty to the base models of Table 1 [1]
Fixed-Effects Ordered Logit model, ECHP 1994-2001

Covariates	Specif. 1		Specif.2		Specif.3		Specif. 4	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Difficulties to make ends meet	-0.195	0.000	-0.195	0.000	-0.196	0.000	-0.195	0.000
Ln(family income)	0.031	0.157	0.034	0.122	0.029	0.191	0.030	0.170
Ln(average income reference group)	0.307	0.002	0.353	0.001	0.273	0.007	0.302	0.003
Age	-0.111	0.000	-0.113	0.000	-0.119	0.000	-0.112	0.000
Age squared	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary education	0.086	0.072	0.097	0.042	0.080	0.093	0.093	0.053
Tertiary education	0.145	0.035	0.167	0.016	0.132	0.056	0.151	0.029
Unemployed	0.095	0.005	0.096	0.005	0.094	0.005	0.095	0.005
Inactive	-0.069	0.032	-0.067	0.038	-0.070	0.031	-0.069	0.032
Separated	-0.025	0.828	-0.027	0.816	-0.026	0.824	-0.025	0.829
Divorced	0.206	0.226	0.209	0.219	0.204	0.230	0.207	0.224
Widowed	-0.016	0.853	-0.011	0.903	-0.016	0.850	-0.016	0.853
Single	0.087	0.173	0.086	0.176	0.088	0.167	0.087	0.169
Do not talk often to neighbours	-0.229	0.000	-0.231	0.000	-0.229	0.000	-0.230	0.000
No crime problems in area	0.130	0.000	0.131	0.000	0.130	0.000	0.130	0.000
No pollution problems in area	0.131	0.000	0.131	0.000	0.131	0.000	0.131	0.000
Polarisation (reference groups) [2]	-0.927	0.000			-0.809	0.000	-0.941	0.000
Polarisation (regions)			0.386	0.536				
Inequality (reference groups) [2]							-0.537	0.206
Inequality (regions)					-2.430	0.006		
Log likelihood	-39554		-39563		-39550		-39553	
No. Observations	95748		95748		95748		95748	

[1] Polarisation and inequality computed using the Theil index.
[2] Reference groups defined over education and age for each region and year.

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[11] We have recoded the original ordinal answers on a 6 point scale, running from "with great difficulty" to "very easily" to a dummy variable that takes a value of 1 if individuals report being able to make ends meet "with great difficulty", "with difficulty" or "with some difficulty", and zero for the other 3 categories: "fairly easily", "easily" or "very easily".

7. Conclusions

We argue that income polarisation has a negative impact on individual's health and provide empirical evidence that supports our theoretical arguments. Income polarisation increases social tension and conflict, which in turn may create psychosocial stress and reduce the provision of certain public goods, both of which affect health. These two pathways are empirically tested using longitudinal data. Individual health is proxied by a self-reported measure of own health. The empirical analysis uses a recent econometric development due to Ferrer-i-Carbonell and Frijters (2004), which estimates an ordinal categorical model with fixed effects. By using this model, one imposes interpersonal comparability of self-assessed health only at the ordinal level.

Besides defining polarisation between regions, the paper introduces polarisation between reference groups. That is, we postulate that the relevant comparison group may not be the region but individuals with similar characteristics. We find that polarization is only relevant between reference groups and not between regions. Thus, our results challenge what has been traditionally assumed in the literature, i.e. that it is regions that matters. Clearly then, more research needs to be done to understand which are the relevant comparison groups that affect not only individual health but perhaps also other economically relevant outcomes, such as subjective perceptions of welfare and poverty.

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Appendix

Table A1. Summary Statistics

Covariates	Mean	St. Dev.	Min.	Max.
Self-assessed health	0.46	0.50	0	1
Difficulties to make ends meet	0.63	0.48	0	1
Ln(family income)	8.90	0.57	6.55	10.32
Ln(average income reference group)	9.02	0.26	8.54	9.98
Age	46.32	19.38	16	92
Secondary education	0.17	0.38	0	1
Tertiary education	0.14	0.36	0	1
Unemployed	0.09	0.28	0	1
Inactive	0.52	0.50	0	1
Separated	0.01	0.12	0	1
Divorced	0.01	0.09	0	1
Widowed	0.09	0.29	0	1
Single	0.29	0.45	0	1
Do not talk often to neighbours	0.05	0.21	0	1
No crime problems in area	0.82	0.38	0	1
No pollution problems in area	0.87	0.34	0	1
Polarisation Theil (reference groups)[1]	0.20	0.05	0.10	0.43
Polarisation MLD (reference groups)[1]	0.17	0.05	0.09	0.37
Polarisation Theil (regions)	0.12	0.02	0.08	0.15
Polarisation MLD (regions)	0.11	0.02	0.08	0.13
Inequality Theil (reference groups)[1]	0.11	0.02	0.01	0.37
Inequality MLD (reference groups)[1]	0.12	0.03	0.01	0.47
Inequality Theil (regions)	0.14	0.02	0.10	0.19
Inequality MLD (regions)	0.14	0.02	0.11	0.18

[1] Reference groups defined over education and age for each region and year.