# Is there more than one linkage between Social Network and Inequality?

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**Abstract**

The paper aims to analyse how income inequality affects social networks. Using microdata from ECHP, we measure the role of income inequality in influencing social network strength in fourteen European Countries. We also test the link between social network and within and between components of inequality based on grouped individuals with the same education: higher income inequality - related to the changing education premia - affects social network formation among individuals through two different channels, higher inequality between different individuals could raise the formation of social networks (clustered networks), while higher inequality within similar individuals could halt the social networks. Hence, the paper introduce some new evidences, using ECHP for testing the networks-inequality nexus and being able to construct directly inequality indices from the microdata as well their decomposition. Many results confirm our predictions: total income inequality affects formation of social network negatively; results also support our idea of "clustered networks" boosted by the rise in inequality.

Keywords: Social Network, Inequality, Clustered Network, Envy, Emulation.

JEL classification: C25, D31, D63, D71, Z13.

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# 1 Introduction

The main issue of the paper is to investigate how income inequality affects social capital. We focus on the definition of social capital as social network, that is social relation among individuals (neighbours and friends) and club participation, instead of measuring social capital as generalized trust. In particular, using individual level data from European Community Household Panel[1] (ECHP) we investigate the role of income inequality in influencing social network strength in the European Countries. Then, we also study how income differences among similar individuals and between different individuals affect social networks, using the between and within inequality components based on the level of education.

On the meaning of social capital we can recall Putnam (1993): *...features of social organisation, such as trust, norms (or reciprocity), and networks (of social engagement), that can improve the efficiency of society by facilitating co-ordinated actions.*

Hence, social capital has a wide and variable definition: generalized trust, social network, civic participation and quality of life.

Several empirical studies have just established that income inequality has a strong and negative effect on social capital. Studying how generalised trust is affected by some individual characteristics and income and racial heterogeneity of the community, Alesina and La Ferrara (2000) show that income inequality - as measured by the Gini index - affects generalized trust negatively with respect the US, using GSS data for the period 1974-1994. Bjornskov (2006) finds that social polarization measured by income inequality and ethnic heterogeneity reduces trust among individuals. By using two measures of income inequality, the Gini Index and Percentile ratios, Gustavsson and Jordahl (2006) find a negative relation between trust and inequality, mainly due to the stronger effect of changes in the bottom of income distribution.

Our main idea is that increasing income inequality, which raises polarization in income distribution, affects negatively the formation of social relations among individuals. In particular, changes in total income inequality could have two different effects on social networks: on one hand, higher income inequality causes a decrease in social network formation through envy mechanism, on the other hand it could bring the poorer ones to improve their social links through emulation of the richer ones.

In order to introduce and explain our idea of "clustered networks", besides the general relation between social network and total income inequality, we also test the link between social network and within and between components of inequality. It has just been shown that the increase in income

[1]We know that ECHP is not a specific and usual survey for social capital while European Social Survey is more pertaining on the matter, nevertheless ECHP offered detailed information on income and covered a longer period (1994-2001).

inequality can be explained also by the changes in the return to education [2]. Our main idea is that increasing income inequality - related to the changing education premia - affects social network formation among individuals through two different channels:

- increasing inequality between different individuals could raise the formation of social networks,
- increasing inequality within similar individuals could halt the social networks.

By using three individual levels of education (low, medium, high), we decompose total income inequality in between and within components. We expect that between inequality affects social network positively while within inequality negatively[3].

We find that social network is affected by individual characteristics as well the characteristics of the society in terms of inequality.

Social network intensity is measured using three different proxies alternatively: club (participation in club), friends (frequency in speaking with friends) and neighbours (frequency in speaking with neighbours), that correspond respectively to three levels of social network: anonymous, wide and narrow social network level.

As dependent variables are categorical ones, we estimate the relation by using probit model (for club) and ordered probit model (for friends and neighbours)[4].

Many results confirm our predictions: total income inequality affects formation of social network negatively; increases and decreases in inequality respectively at the top and the bottom of income distribution increase the probability to form social network among individuals. These results support our idea of "clustered networks" boosted by the rise in inequality, that is while top-bottom growing differentials worsen the formation of social network between different individuals, the sliding of middle class toward the bottom of income distribution leads similar individuals to join social networks.

The paper is structured as follows. Section 2 presents some important contribution of the previous literature about the validity of social capital measurement. Section 3 discuss the hypothesis, the used methodology, the potential determinants and some descriptive statistics about the economic relation between income inequality and social network. Section 4 presents

[2]See for some evidence: Juhn, Murphy, Pierce, 1993; Goldin, Katz, 1999

[3]Total income inequality is measured by the Gini Index and Percentile Ratios, while we decompose the Generalized Entropy Indexes for within and between components of income inequality.

[4]We choose the pooled panel method for several reasons, for example we check for the dynamic completeness condition and the Wald test allow us to accept the pooled panel method (Woolridge, 2002).

the econometric evidence and the results of our estimations. Finally, the last section concludes.

## 2 Social capital definition and heterogeneity

It's hard to define social capital because of its wide and variable definition. Social capital has been studied almost only in social sciences for a long time. Economic attention became more and more important only around '90s with Bourdieu (1980), Coleman (1988), Putnam (1993).

Since their studies, social capital became one of the most researched socio-economic topic. Several economists and sociologists have improved the concept of social capital and many empirical studies has been carried out.

Based on some previous empirical studies[5], we can observe that social capital can have several meanings:

- generalized trust;
- confidence in institution;
- **social network (social relationship and membership);**
- political participation;
- civic awareness and social norms;
- quality of life.

Generalized trust is a measurement of the degree of trust among people. Confidence in institution represents people trust towards several kinds of institutions such as government, parliament, political parties, European Union, justice system, et cetera. About social network it is possible to distinguish into two definitions: social network as social interactions (that is club participation) and social network as social relation (that is social relationship among relatives, friends and neighbours). Political participation is political parties membership and it includes active and passive participation. Civic awareness is the involvement of people in social activities, such as voluntary organization, reading newspaper and watching television about local news. Quality of life refers to the degree of violence in society, services to citizens, concerning for pollution.

Several empirical studies have contributed in identify some kind of relationship between social capital and some economic performance. Focusing on the meaning of social capital as generalized trust, Alesina and La Ferrara

[5]See Alesina and La Ferrara (2000), Gustavsson and Jordahl (2006), Leigh (2006), Sabatini(2005) for the principal differences on the definition of social capital in empirical studies

(2000) study how income inequality and racial heterogeneity affect social capital. Firstly, they find that generalized trust depend on both individual experiences and features and community characteristics. In particular, low trust level among US citizens depend on: recent traumatic experiences (i.e divorce, financial misfortune), belonging to a group historically discriminated (blacks and women), living in racially heterogeneous communities with high level of income inequality.

Also Bjornskov (2005) study the relation between generalized trust and income and ethnic heterogeneity among some Countries and he finds that higher income inequality, ethnic diversity and belonging to post-communist societies decrease trust among individuals, while Protestantism and Monarchy increase the tendency in trusting each other. Gustavsson and Jordahl (2006) find that social capital is affected negatively by income inequality and being immigrant, analysing 21 Swedish Counties for the period 1994-1998 using the Swedish Election Studies data. In particular, they find that the negative relation between income inequality and generalized trust is mainly explained by the inequality at the bottom of income distribution, as low-income people have stronger aversion against income differentials. Leigh (2006) distinguishes trust in generalized trust and local trust; the first one refers to the degree of trust at national level, the second one is trust at local level, i.e. neighborhood level. He find that generalized trust in Australia is negatively affected by the amount of time spent commuting and positively by individual education level; localised trust depends positively by the population density and negatively by ethnic and linguistic heterogeneity of communities. Sabatini (2005) studies empirically the causal relation between social capital and the economic development in Italy and in particular he study how social capital affects economic performance. He distinguishes three dimensions of social capital: bonding (strong family ties), bridging (weak ties connecting friends and acquaintances) and linking social capital (more formal ties among members of voluntary organizations). Sabatini finds that: strong family ties and bridging ties among friends and acquaintances affect negatively human development and the economic performance, while linking social capital connecting members of voluntary organizations affects positively economic performance.

# 3 Methodology, data and empirical evidence

## 3.1 Hypotheses on the Networks-Inequality relation

Alesina and La Ferrara (2000) analyze how individual and community - income and ethnic heterogeneity - characteristics affect generalized trust. Following their scheme, we try to study social network as function of two main factors: individual features and characteristics of the society. Hence, we find that social network, i.e. social relationship among individuals, depends

on both individual peculiarities and society's characteristics, in particular income inequality.

Social network has a wide meaning and it occurs among several kinds of agent inside the society. For example, social ties occurs among employees, relatives, friends, neighbours, members of associations and so on. Moreover, Sabatini (2005) defines three main social capital dimensions: bonding, bridging and linking social capital[6]. For these reasons, we identify and focus on three different levels of social network:

- First, we consider a narrow definition of social network that is interpersonal closed relationships among neighbours. In this case, social narrows are informal and occurs among well-know individuals that are tied from neighborhood relations.

- Second, we consider a wide definition of social network that is social contacts among friends. The informal ties are based on several kind of friendship relations: long standing friendship, school friends, colleagues et cetera.

- Third, we take an anonymous social network definition that is potential formal relationships among members of some associations. Several previous papers analysed social network as participation in club distinguishing between several kind of associations. We focus on anonymous social network as participation in club regardless of its typology. We believe that individuals belonging to a general association are more induced to create social relationship than a non-member ones.

We study each one of the three levels of social network separately and we analyse if and how individuals features and characteristics of the society measured by income inequality affect the three levels of social network.

Since people tend to make some kind of relationships with similar individuals, social networks occur essentially among people with same race or similar age or they happen more probably among individuals that belong to the same gender. For these reasons, we consider that in general social network is affected by the following individual characteristics: individual income, age, gender, marital status, occupation status, personal health, level of education, immigrant status.

We refer to characteristics of society as income inequality. The community income heterogeneity affects the behaviour of individuals in many

[6]The first one is related to the strong family ties that is the intensity and strength of the relationships among family members and other relatives; bridging social capital is the weak informal network among friends, neighbours and general acquaintances; linking social capital refers to weak formal ties created by people belonging to narrowing voluntary organizations.

ways (Barro, 2000). Firstly, income inequality affects the saving and investment decisions of the individuals (Piketty, 1998); secondly, income disparities affects political economy choices especially redistribution policies through the median voter (Barro, 2000; Alesina and Rodrick, 1994; Persson and Tabellini, 1994). Thirdly, higher income inequality raises socio-political disorders that in turn lead up to disruptive activity like crimes, violence, corruption. Finally, income inequality affects social relationships among people and the benefits in investing in social network.

In particular, what matter in this context is how income disparities affect the formation and the strength of social network. The negative relation between income inequality and social capital is already tested. While people tend to form social ties with similar, increasing inequality reduces the probability of creating social network among more unequal individuals.

Moreover, income heterogeneity could induce two opposite effects on the human behaviour, the emulation and the envy that in turn affect investment in social network. Indeed, an increase in income inequality drives poorer to emulate the behaviour of richer ones by constructing social network with them. On the other hand, since relative income is a measure for the envy, increasing income inequality causes a decrease in social network just through the envy[7].

The paper also explores how income inequality due to the differences in education affects formation of social network. The changing in education premia explain the pattern of income inequality that in turn affects the formation of social relationships among individuals. In particular, an increasing in income inequality among individuals with different levels of education could raise an incentive in investing in social network through the desire of emulation of the poorer towards the richer, but at the same time, increased inequality among individuals with the same level of education could deters the construction of social ties among themselves.

### 3.2 Social network: the role of individual features and characteristics of society

We analyse social networking formation as function of individual features and characteristics of society. We consider as individual features the following ones: individual income, age, gender, marital status, occupation status, perceived health, level of education, leisure satisfaction, immigrant status. Individual income has a non linear positive effect on social network in general, because more income implies more tendency to make social network ceteris paribus, but this effect is not linear and it differs along income distribution[8]. Increasing leisure time with age should determine that older people

[7] See Bowles and Yongjin (2005) for a theory of emulation behaviour and Chandhuri (1986) and Fischer and Torgler (2007) for envy mechanism evaluation.

[8] So we use logarithmic transformation in our estimates.

are more probably inclined to make social relationships.

Gender should affect social network in different ways. If we consider that on the average women spend their time between job and work at-home, they have less time than men to invest in social relationships. In particular, women commit themselves to make social relation with neighbours while men are more prone to participate in club especially if we refer to trade-union or political organizations. Personal perception of health should affect social network positively because oneself health perception represents a sort of degree of wellness and happiness. Marital status could affect social network participation in many different ways[9]. Being employed affect social network negatively because it means that individuals detract time to the formation of relationships. More educated individuals should have more incentives to networking, as their higher cultural level causes an highest need for social networks as well it's an incentive for joining similar people. Migration condition should affect social network negatively because of discrimination towards foreigners.

Formation of social network is also influenced by the characteristics of the society, in particular income inequality. Polarization in income distribution, caused by increasing income inequality, affects negatively social network building. To be more precise, higher inequality could mean the shift of the individuals toward the tails of income distribution. It can result in two opposite ways: on one hand, difference between richer and poorer give the individuals back to be more reluctant to form some kind of network since poor tend to envy the rich. On the other hand, inside the tails individuals are more prone to join social ties with their similar and form what we call clustered networks that is rich among rich and poor among poor.

Income disparities affect the three level of social network (narrow, wide and anonymous) in different ways. More exactly, the effect of general income inequality on social network is negative for wide and anonymous social network, while it is positive for narrow social network. That happens because relationships among neighbours could be consider a stronger type of social ties than the wide and anonymous social network. Increase in income inequality drives richer neighbours to help poorer one, in order to guarantee a good neighborhood relationships and for future reciprocal advantages.

We also tested if and how income inequality due to differences in level of education affects formation of social capital. To do this, we decompose the total income inequality in within and between component, where the first one suggest the part of income inequality due to the income variability among individuals belonging to the same group in terms of education. Between component represents the part of inequality due to the different level of education.

[9]We could think at married people as having more needs to keep in touch with the communities, but also they could have less time to spent in networking activities.

We believe that higher inequality among individuals with the same level of education - within income inequality - causes envy among them that in turn obstructs formation of social network. Instead, increase in income inequality among individuals with different level of education - between income inequality - affects positively social network building because it induces the lower educated individuals to emulate the most educated.

### 3.3 ECHP survey and data sample

We use individual level data from European Community Household Panel (ECHP) for the years 1994-2001. The ECHP allow us to exploit three important dimensions in our analysis: the multidimensional coverage, the cross national comparability and the longitudinal or panel design. Firstly, ECHP is a multidimensional survey and provides microdata on a wide range of topics both at individual and household level: income, social life, housing condition, health, education, employment, training, et cetera. Moreover, it is an harmonised and comparable dataset across countries thanks to the use of harmonised questionnaire and definition between countries. Finally, ECHP provides information on relationships and transitions over time at micro level.

ECHP interviews individuals and households every year from a nationally representative sample. In the first wave (1994) we have a sample of some 60,500 households and approximately 130,000 adults aged 16 years and over across twelve member states: Belgium, Denmark, Germany, Greece, Spain, France, Italy, Ireland, Luxembourg, The Netherlands, Portugal, the United-Kingdom. In the second wave also Austria joins to the ECHP; then Finland enters in wave 3 (1996) and finally from the fourth wave (1997) also Sweden joins the Survey.

We are aware about the fact that ECHP is not so specific and detailed on social aspects as could be other Social Surveys like European Social Survey (ESS) or World Value Survey (WVS). On the other hand, because our purpose is analysing the relation between social network and income inequality over time, we think that ECHP provides a wider and more detailed information on income and it covers a longer period than ESS. In particular, WVS and ESS collect information about income only by categorical variables and at households level.

### 3.4 Description of social network indicators

Dependent variable - i.e. social network - is measured at three level: narrow social network, wide social network and anonymous social network. For each one we use distinct proxies. Narrow social network is measured by the frequency in speaking with neighbours. In particular, we take from the ECHP the following question: "How often do you talk to any of your

neighbours?". In order to preserve the detailed information on the frequency, we keep the values of the original answers and modifying only its scale. We construct our first discrete variable called "neighbours" that ranges from a minimum value of 1 to a maximum of 5[10].

The wide definition of social capital is measured by another proxy that is frequency in meeting friends and it came from the following question: "how often do you meet friends or relatives not living with you, whether here at home or elsewhere?". This variable, called "friends", is the same of neighbours in its value and meaning[11], apart from that it measures the intensity and strength of relationships with friends and relatives.

Finally, anonymous social network is measured by a third proxy that is participation in club. The question in this case is the following: "are you member of any club, such as sport or entertainment club, a local or neighbourhood group, a party et cetera?". Our variable is a dummy taking the value 0 if the individual does not participate in a club, 1 if she is a member of a club. One important facet of our work is that variable club refers to any kind of associations, what matter is only if individuals take part in almost one club.

Figure 1 shows the average level of narrow social network (neighbours) at the beginning (1994) and at the end of period (2001) for each country, with the exception of Germany and Sweden for which data are not available. Comparing countries, French has the lower level of narrow social network in both first and last year, while the higher level is achieved by Greece. Italy is in the middle. We calculate the variation for variable neighbours during the relevant period for each country. Even if the variation has no importance in each country, we stress the fact that Belgium and Portugal present steady level of narrow social network; Denmark, Ireland, Austria and Finland have a slight decrease while the rest of countries have just a small increase.

Figure 2 displays the average level of wide social network measured by meeting friends frequency in 1994 and in 2001 for each country. Germany, Austria and France present the lowest level of relationships among friends for both the first and the last year while the highest level is shown by Ireland and Portugal. The variation calculated in the relevant period shows that all countries measured a slight increase in the friends relation building, with the exception of UK and Denmark. We also stress that relationships among friends increased considerably in Italy compared with the others.

Also anonymous social network, as measured by club variable, shows

[10]This range represents the frequency of speaking with neighbours and in particular a value of 1 means that the respondent never speaks with neighbours; 2 stands for speaking less often than once a month; 3 means speaking once or twice a month; 4 means speaking once or twice a week; 5 means that respondent speaks on most days with his neighbours. Hence, our narrow social capital is low if the variable neighbours values 1, 2, 3, while its level is high if it take the value of 4 or 5.

[11]See the precedent note for the scale description.

a general increase between 1994-2001 (see Figure 3). In particular, The Netherlands, France and Finland had a small increase in the intensity of participation in club; the increase is more important for Denmark, Belgium, Ireland, Italy, Portugal, Austria and Sweden while Greece, Spain and UK had a slight decrease.

### 3.5 Independent variables

Our regressions include some control variables about the individual features that could affect the formation of social network: individual income, age, gender, marital status, occupation status, perceived health, level of education, immigrant status. As individual income, we take the logarithm of the real net income (total year prior to the survey) in PPP. Variable age is classified in three categories: age measures 1 if individuals is thirty years old or less, 2 if individual is more than thirty years old and less or equal than fifty while 3 if individual is older than fifty. Gender is a dummy variables taking the value 0 for female and 1 for male; marital status is a dummy variable with value 0 for not married and 1 for married; occupation status values 0 for not employed and 1 for employed; perceived health is the perception of own health in general and it values 0 for "bad health" and 1 for "good health". Level of education is the highest level of general or higher education completed and we classify it in three broad categories: 1 ("low skilled") for base education, 2 ("medium skilled") for highschool and 3 ("high skilled") graduate education[12]. Finally, immigrant status values 0 if the respondent is not an immigrant and 1 otherwise.

The characteristics of society refers to income inequality existing inside the community. We measure it with different inequality indexes in order to analyse how the changes in different part of income distribution affect social network.

We try to capture income heterogeneity in several ways. Therefore, we use the following inequality index separately: the Gini Index, the percentile ratios and the General Entropy Index. These indexes differ in their sensitiveness to income disparities in distinct parts of the distribution. The Gini Index captures the income differences around the middle (and precisely the mode) of income distribution. The percentile ratios permits to look alternatively at the different parts of income distribution[13]. The General Entropy Indexes depend their sensitiveness to the parameter $\alpha$ and could be exactly

[12]More in detail, low-skilled refer to the 0-2 ISCED codes (pre-primary; primary or first stage of basic education; lower secondary or second stage of basic education), the medium skilled to the 3 ISCED code (upper secondary education), the high skilled to the 4-6 ISCED codes (post secondary non tertiary; first stage of tertiary; second stage of tertiary).

[13]We calculate several percentile ratios: P90/P10, P75/P25, P90/P50, P75/P50, P50/P25 and P50/P10.

decomposed into between and within components[14].

Table 1 shows initial and final income inequality measures for all countries, comparing the Gini Index and some percentile ratio. We note that inequality decrease slightly in all countries expect for Finland, and Sweden but it is important to explain that not all the Index show a one-way path. These happens because of the different sensitiveness of the Indexes. In particular, we note that in some cases the three indexes have different direction. In Germany, the percentile ratio P90/P10 shows a slightly increase in income inequality while the Gini Index shows a decrease and this means that German sample become less unequal especially for the middle class of the income distribution. On the contrary, the middle class in Finland knows a small increase in income disparities as shown by the Gini Index, but the distance between the richer and the poorer decreased as shown by P90/P10.

By comparing countries and looking at P90/P10, the starting level of income inequality is high in Ireland, Germany and Spain. During this period, income disparities decrease slightly in almost all countries especially in Ireland and Italy, while they increase in Sweden and Denmark. Despite the decrease, at the end of the period income inequality is still relatively high in Spain, Ireland and France. The reduction of income inequality is mainly driven by the decrease of disparities in the bottom part of income distribution, as measured by P10/P50 while differences in the bottom one remain roughly stable.

# 4 Econometric evidence and results

Some previous studies on social capital consider it as a unique human phenomenon. Hence, analyses on social capital, different from generalized trust, use often the Principal Component Analysis in order to obtain a synthetic index as proxie of social capital.

In our case, we retain to exclude the possibility of adopting this statistical method for several reasons. Firstly, we refer to social network as social relationships among individuals that has three different typology and intensity in its formation process (narrow, wide and anonymous social network). Second, we think that the underlying economic relation - i.e. how income inequality affects social network building - is not unique and depends on the kind of the social network level we analyse. Finally, even if this theoretical considerations are not strong and convincing, we could not proceed with the

[14]The General Entropy Indexes are a particular class of inequality index and its main feature consists of the variability of parameter $\alpha$, according to which changes the sensitivity to income differences along the distribution. Indeed, more positive is such parameter, the more sensitive index is to income disparities at the top of distribution, while the lower $\alpha$, the more sensitive such index is to differences at the bottom of income distribution. We use GE(1), GE(2).

PCA because one of the first condition, correlation among interested variables, is not respected. In particular, we control correlation condition and we find that club participation is not correlated with speaking with neighbours and meeting friends; naturally, correlation exists between neighbours and friend, but that is clear and using the PCA for these only two variables has not statistically and economically sense.

For these reasons we decide to estimate three single equations where dependent variables are respectively: club, friends and neighbours. Our econometric strategy is based on probit estimation for the three single equations concerning the relation between income inequality and the three different level of social network: narrow, wide and anonymous. In particular, each equation tests how the individual features and income inequality affect the probability that the three different level of social network occur, controlling for countries and years. Hence, the estimated equations look like:

$$Prob(Y_{i,c,t}) = \beta \cdot x_{i,c,t} + \iota \cdot z_{c,t} + \delta_c + \gamma_t + \epsilon_{i,c,t}$$

where $\beta$ coefficients refer to the individual features while $\iota$ to the community features (the various inequality measures), $\delta$ and $\gamma$ represent country and time dummies respectively.

Anonymous social network, as measured by proxy "club participation", is a dummy variable and for this reason we use the standard probit estimation with marginal effect at means. Wide social network (frequency in meeting with friends) and narrow social network (frequency in speaking with neighbours) are multinomial categorical ordered variables that require the ordered probit estimation (with reported marginal effects at means for the higher category).

In order to exploit the temporal dimension of our sample, estimations are based on the panel pooled method. Actually, a Wald test is required for the choice of panel pooled method instead of panel with fixed or random effect. Hence, we test the dynamic completeness condition, that implies that the scores are serially temporally uncorrelated. To test this condition concretely we use the Wald statistic on the null hypothesis under which the error term is not serial correlated and in this way it does not affect the distribution of dependent variable. The acceptance of the null hypothesis about the validity of the dynamic completeness condition suggest us that we can use the panel pooled estimation.

### 4.1 Individual features

Our single regressions analyse also how individual features affect the formation of social relations, level by level. Hence, because of their heterogeneity,

we report results for the effects of individual characteristics on anonymous, narrow and wide social network individually[15]. We consider the following individual features: gender, age, marital status, education level, occupation status, immigrant status, perceived health, leisure time satisfaction and individual income.

Gender affects the three dimensions of social network differently: men are more prone to participate in association and to meet friends frequently than women, because the last one are narrow by the time-constraint. On the contrary, women are more prone to talk with their neighbours relatively to men, thanks to more time spent at home.

Probability of club participating and probability of speaking frequently with neighbours increase with age at an increasing rate, because rising age implies more stability inside the family, especially in terms of child care, hence the possibility for people to have more time to spend in club participating and knowing own neighbours. Otherwise, relationship between increasing age and friendship is negative.

Being married has a positive effect on relationships with neighbours and on club participating, while it decreases the probability of forming friends relations because married people are more constraint than no-married ones, in terms of the less leisure-time and single are more interested and prone to improve their friendship ties.

Higher and medium educated individuals participate more probably in club relatively to lower educated ones, while the same relation is negative for probability of speaking frequently with neighbours. Probability in meeting friends and relatives are lower for individuals with high level of education than lower educated ones. We think that level of education are highly linked with level of income and so we support the idea that people with low level of education and therefore with lower personal income are more prone to establish social relation with their friends, thanks to leisure time to invest in such relationships.

Being employed rather than unemployed affects positively probability of club participation, while it affects negatively probability of speaking with neighbours and probability of meeting friends frequently and that happens because of the time constraint busy at work.

Being an immigrant affects negatively probability in club participating, probability of speaking frequently with neighbours and probability of meeting frequently friends and relatives, because of racial discrimination[16].

[15]The coefficients for the individuals features do not change if we consider the estimation with the Gini Index or with Percentile Ratios or if we consider within and between components for all the three dimensions of social networks. We stress that all coefficients of the individual features are statistically significant at one percent level, with the exceptions for the relation between medium skilled and friends that is not statistically significant (both with Gini Index and Percentile ratios).

[16]The negative link between ethnic heterogeneity and social capital has already been

Feeling good (physically and psychologically) with own general health increases the probability of club participation, the probability of improving friendship and the probability of speaking with neighbours.

Leisure time satisfaction is linked positively to all of three dimensions of social network, thanks to more disposal time for investing in social networking.

The individual income affects positively the probability of participating in associations, because being economically successful implies an increase in personal income that allow them to satisfy their hobbies and in general other interests different from the satisfaction of prime needs, that earlier cannot satisfy. On the other hand, individual income affects negatively wide and narrow social network, because high income implies more time spent in working and less leisure time to invest in friendship. In addition, forming and preserving strong ties with friends or relatives and neighbourhood relationships is unnecessarily linked with individual income and often this kind of relations are created for moral reasons and not for economic ones.

### 4.2 Total Income inequality and Social Network

In this section we focus on the different role of the total income inequality on the three levels of social networks and in particular we show how the use of several inequality measures produce different results.

Our results are consistent with previous ones according to which total income inequality affects negatively social network formation[17]. That means, decreasing total income inequality raises the probability of joining social ties among individuals while increasing total income disparities discourage people to form social relationships with others. In particular, looking at the results of our estimations, the general trend shows a negative relationship between total income inequality and social network, but there are also some differences if we consider the three distinct level of social network and if we consider that results for each level of social network is also influenced by changes in different class of income distribution (different percentile ratios). Moreover, total income inequality affects social networking formation through two main channels, as we discuss in paragraph 3.2: emulation and envy. The first one plays a positive role in influencing social network among individuals because poorer tend to imitate the behaviour of richer and thus to join links with them, while envy explains why increasing income inequality tend to discourage people to form social network. In particular, our results show that higher income inequality affects negatively wide and anonymous social network - friends and club participation - while it affects positively narrow social network, that is speaking with neighbours. That could hap-

tested empirically. For detailed evidences see also: Alesina and La Ferrara (2000), Gustavsson and Jordhal (2006), Bjornskov (2007)

[17]See Sabatini (2005) and the previous note for some references.

pen if we think that relationships among neighbours are more stronger (like family ties) than links among club members and among friends or relatives.

In order to evaluate the impact of changes in income inequality on the formation of social network, we use the Gini Index and some Percentile Ratios. Table 2 shows results for the relation between total income inequality, as captured by the Gini Index, and the three level of social network. In general, increasing income inequality decreases the probability of form social ties among individuals, especially among rich and poor because of the envy mechanism. Indeed, the Gini Index displays a negative coefficient and statistically significant at the one percent level for club participation, that is increasing income differences - and hence the tendency of the income distribution to the polarization - decreases the probability of participating in clubs. Result are similar for the probability of meeting friends and relatives: the Gini Index shows a negative coefficient but it is statistically insignificant. On the other hand, coefficient for Neighbours is positive and statistically significant at the one percent level, that means increasing income disparities raise the probability of speaking frequently with neighbours. The different result for speaking with neighbours could be explain by the fact that increasing in income inequality between richer neighbours and poorer ones could drive the last ones to emulate the behaviour of the richer.

Results for the relation between total income inequality - as measured by Percentile Ratios - and the three level of social network are shown in Table 3. We use six Percentile Ratios: P90P10 and P75P25, that measure changes in income inequality between richer and poorer; P50P25 and P50P10, that represent changes in income inequality at the bottom of income distribution (exactly, between the middle class and the poorer); P75P50 and P90P50, that indicate the distance in terms of income of the richer relative to the middle class.

Hence, looking at P90P10 and P75P25, results show that polarization of income distribution generally increases the probability of joining social network. In particular, P90P10 shows a positive coefficient statistically significant at one percent level for probability of club participation and a positive but statistically insignificant coefficient for probability of meeting frequently friends, while P90P10 is negative and statistically significant at one percent level for probability of speaking frequently with neighbours. P75P25 coefficient is positive and statistically significant at the one percent level for all of the three levels of social network[18].

Looking at the income disparities between the middle class and the bottom of income distribution, increasing income inequality (P50P25 and P50P10) generally decreases the probability of making social networking. Indeed, P50P25 shows negative coefficients and all statistically significant

[18]The small different result between P90P10 and P75P25 could be due to the more sensitiveness of P90P10 to the outliers in the tails of income distribution.

at one percent level for each of the three level of social network - club participation, speaking with neighbours and meeting friends. P50P10 is negative and statistically significant at one percent level for probability of club participation, that means increasing income inequality between the 50th percentile and the 10th ones decreases the probability of club participation. P50P10 is also negative but statistically insignificant for the probability of meeting frequently friends and relatives. P50P10 displays a positive and statistically significant at one percent level only for speaking frequently with neighbours.

Finally, increasing income distance between the richer and the middle class implies generally a decrease in social network. Indeed, P75P50 shows all negative coefficients and all statistically significant at one percent level for each of the three level of social network. P90P50 coefficient is negative and statistically significant for probability of club participation, while it is positive for probability of speaking with neighbours and meeting frequently friends.

Our results confirm the idea that total income inequality could have two opposite effects on social network through the envy and emulation: the first one is a negative effect while the second one is positive. The positive relationship between inequality and social network could also be explained by altruism, reciprocity and possibility of ex-post favours[19]. Finally, on the other hand, the negative relationship between inequality and social network could also be explained by the popular English catchphrase of "Keeping up with the Joneses", that represents a situation in which individuals use the comparative benchmarks of social caste or the accumulation of material good[20]. Keeping up with the Joneses means that people compare their individual economic and social position with the position of the reference group and this affects their wellbeing. Hence, in this context, heterogeneity in income distribution makes poorer unable to keep up with the Joneses and generates frustration, unhappiness, resignation and deprivation, that in turn decrease tendency of joining social network among individuals.

### 4.3 How between and within income inequality affect social network formation

In this section we concentrate on the results with reference to the two channels highlighted in the initial section. Let us recall that mechanism: we expected that inequality could impact on social network through two different dimensions. When the overall inequality is decomposed into two components, between and within inequalities - with respect to groups of similar individuals - we can answer if higher inequality between different individuals boosts the formation of clustered networks and if higher inequality within similar individuals impacts negatively on social networks.

[19]See Branas-Garza and Espinosa (2005) for a discussion of the altruism mechanism.
[20]See Fisher and Togler (2007) for detailed explanations.

The idea of "clustered networks" can be clearly understood explaining the inequality decomposition. We use the four General Entropy Indexes in order to exactly decompose the total income inequality in between and within components based on the individual level of education. We can distinguish individuals through education and classify them into three groups which are the base for the inequality measures (GE($\alpha$)) decomposition. The four measures of inequality account for differences along the income distribution according to the $\alpha$ sensitivity parameter: the higher $\alpha$ , the more sensitive is the index to the inequalities at the top of income distribution.

In the previous section we showed that overall inequality has a negative impact on networks when we look at club participation while has a positive impact on neighborhood relations. Furthermore, the negative effect on club participation is mainly attributable to differentials between the middle class and tails of income distribution while higher differentials between the richest and the poorest result in higher club participation. With respect to neighbours, we found ambiguous results, depending on the percentiles we choose to represent the income distribution tails. Friends networks are boosted by higher inequality between the richest ones and the others while are reduced by higher differentials between the middle incomes and lower ones.

Differences between similar grouped individuals impact positively - as we expected - on networks when we look at friends relationships, the wide definition of social network we used. With respect to this dimension of inequality, we found also a positive impact on club membership, although it is not significant. Neighbours relationships are halted by higher between inequality: in this case we can think at a kind of envy that diminishes the probability of speaking with people perceived more and more differently.

Within inequalities have a negative effect on the probability of joining club, in line with our expectations. Similar individuals who earn very different incomes have less incentive to join group for this reason. Within inequalities impact negatively also on neighbours relationships, but only when we measure inequality by the half the squared Coefficient of Variation. Friendship networks instead are boosted by higher within inequalities: similar individuals with higher unequal incomes respond with major long-term relationships like school friends and with relationships among similar individuals like colleagues.

# 5 Conclusions

We analysed the relation between income inequality and social networking formation in fourteen European Countries during the period 1994-2001, using data from ECHP Survey, that allowed us to construct our inequality indexes and their decomposition.

We identify three levels of social network, according to the three prox-

ies used in the estimations: anonymous social network (probability of club participation), narrow social network (probability of speaking frequently with neighbours) and wide social network (probability of meeting frequently friends).

We analyse how social behaviour is affected by two main determinants: individual features and income heterogeneity. In particular, we focus on two dimensions of income inequality: first, we investigate how changes in income inequality affect social networks among individuals; second, we analyse how the within and between components of inequality based on grouped "similar" individuals - with the same level of education - affect social ties among them. Total income inequality plays its role through emulation and envy, while between and within components of inequality explain the idea of "clustered networks".

Results about total income inequality show that social networking formation is mainly affected by two channels: income heterogeneity could causes two opposite behaviour - the emulation and the envy - that in turn affect social network strength. Indeed, an increase in income inequality drives poorer to emulate the behaviour of richer ones by joining social network with them. On the other hand, increasing income inequality causes a decrease in social network just through the envy. In particular, our results show that higher income inequality affects negatively wide and anonymous social network - friends and club participation - while it affects positively narrow social network, that is speaking with neighbours. Results for total inequality are different also according to the inequality measures used, the Gini index or some percentiles ratios.

We decompose total income inequality in between and within components by using the General Entropy Indexes, based on the different individual level of education. Results confirm our idea of "clustered networks". Indeed, increasing income inequality between different educated individuals raises the formation of social networks, while higher inequality within similar educated individuals halts the social networks.

Our results confirm a strong relationship between income inequality and social networks and they could suggest some policy implications: policies aimed to reduce income heterogeneity - and so limiting the envy mechanism - could stimulate individuals to join social ties with others, improving the community social capital, with obvious consequences for growth (Temple and Johnson, 1998; Knack and Keefer, 1997).

Further research on the inequality-social network relation could analyse how social disparities (in terms of wellbeing, happiness, deprivation, resignation, et cetera) affect social networks and which of the two components - social and income inequalities - is more important for the formation of social networks.

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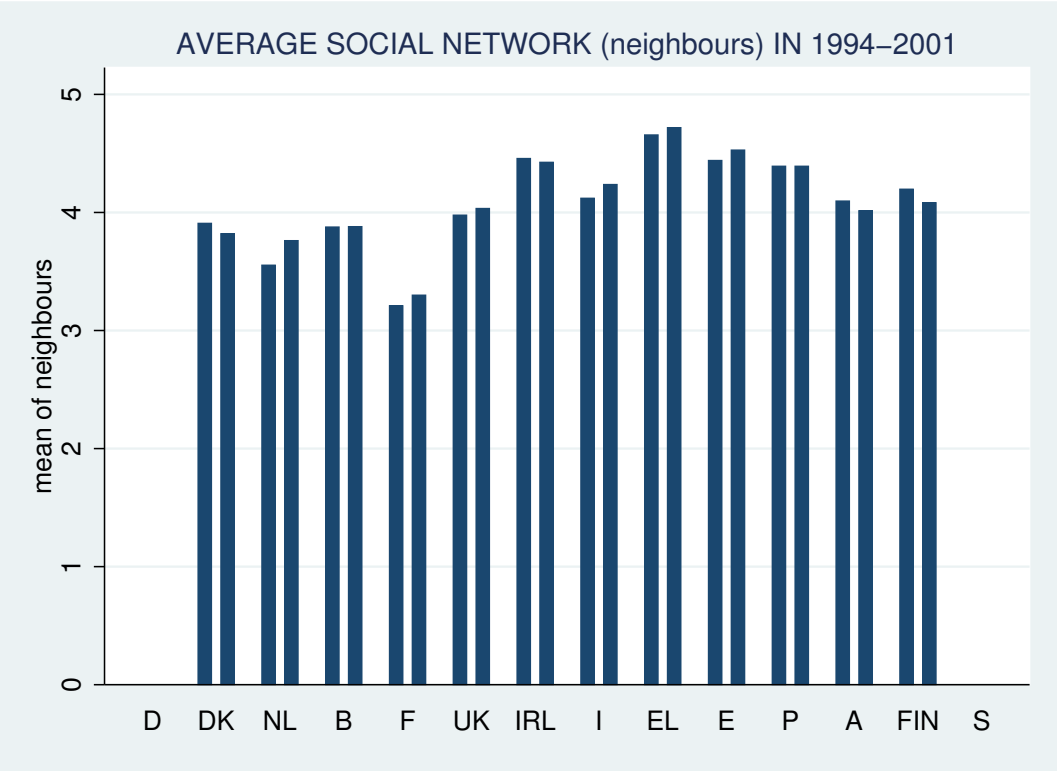
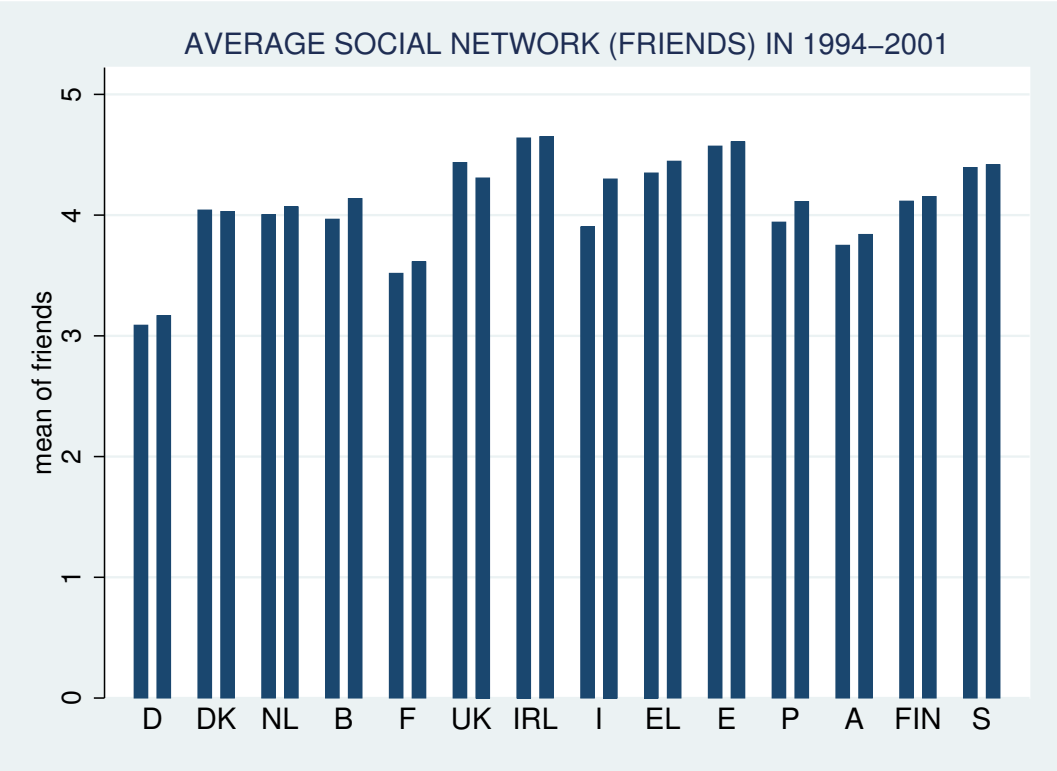
Figure 1:




Source: ECHP

Note: Some Countries have different period span, Austria starts from 1995 Finland from 1996 and United Kingdom ends in 1999. Germany and Sweden do not have data on neighbours.

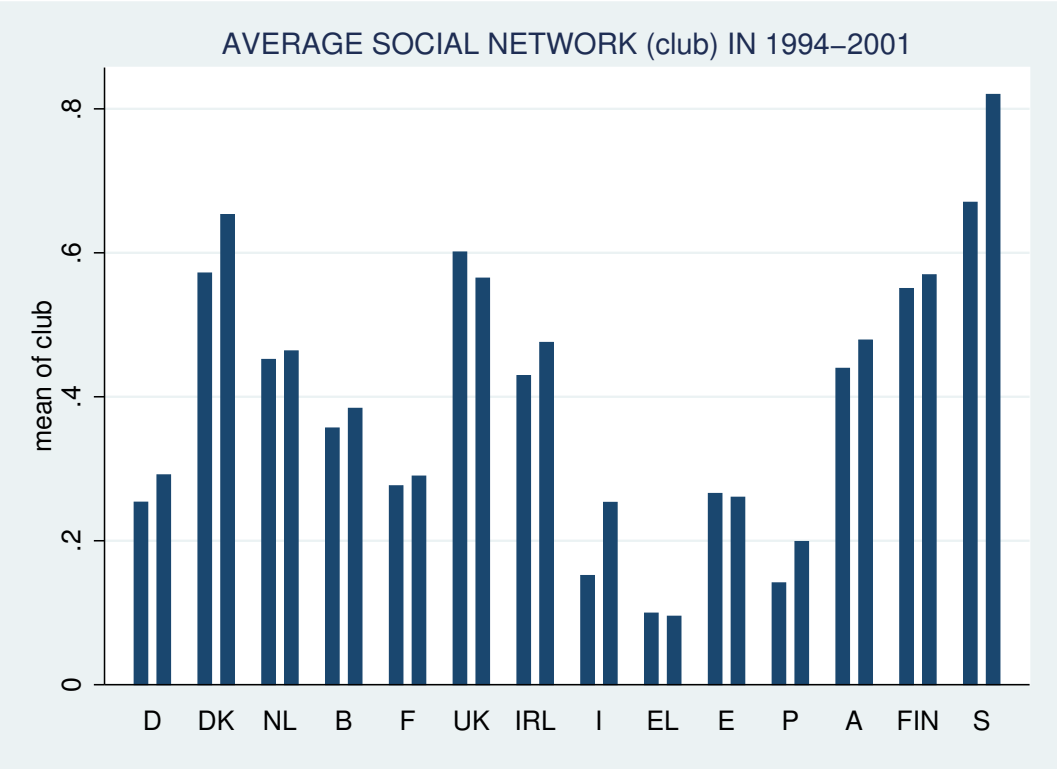
Figure 2:




Source: ECHP

Note: Some Countries have different period span, Austria starts from 1995 Finland from 1996 Sweden from 1997 and Germany ends in 1999.

Figure 3:




Source: ECHP

Note: Some Countries have different period span, Austria starts from 1995 Finland from 1996 Sweden from 1997 and Germany and United Kingdom end in 1999.

Table 1: Income Inequality measures

| | *GINI* | | *P75 P25* | | *P50 P25* | | *P75 P50* | |
|---|---|---|---|---|---|---|---|---|
| **COUNTRY** | **1994** | **2001** | **1994** | **2001** | **1994** | **2001** | **1994** | **2001** |
| Germany | 0,429 | 0,378 | 3,340 | 2,622 | 2,211 | 1,769 | 1,511 | 1,482 |
| Denmark | 0,305 | 0,292 | 2,017 | 1,968 | 1,523 | 1,517 | 1,324 | 1,297 |
| The Netherlands | 0,393 | 0,380 | 3,012 | 2,695 | 1,945 | 1,809 | 1,549 | 1,490 |
| Belgium | 0,400 | 0,386 | 2,556 | 2,225 | 1,755 | 1,580 | 1,456 | 1,409 |
| France | 0,472 | 0,406 | 3,228 | 2,797 | 2,070 | 1,835 | 1,559 | 1,524 |
| United Kingdom | 0,424 | 0,401 | 3,267 | 2,772 | 1,985 | 1,791 | 1,646 | 1,548 |
| Ireland | 0,496 | 0,457 | 3,523 | 3,395 | 1,865 | 1,940 | 1,889 | 1,750 |
| Italy | 0,390 | 0,351 | 2,923 | 2,361 | 2,059 | 1,756 | 1,420 | 1,344 |
| Greece | 0,472 | 0,430 | 4,989 | 3,739 | 2,992 | 2,208 | 1,668 | 1,693 |
| Spain | 0,445 | 0,432 | 3,103 | 2,775 | 1,804 | 1,710 | 1,720 | 1,623 |
| Portugal | 0,473 | 0,424 | 3,324 | 2,963 | 1,891 | 1,861 | 1,758 | 1,592 |
| Austria | 0,417 | 0,383 | 2,903 | 2,629 | 1,928 | 1,835 | 1,506 | 1,432 |
| Finland | 0,394 | 0,413 | 2,703 | 2,826 | 1,822 | 1,864 | 1,484 | 1,516 |
| Sweden | 0,277 | 0,298 | 1,830 | 1,824 | 1,420 | 1,406 | 1,289 | 1,297 |

Source: ECHP

Note: Finland starts from 1995, Sweden from 1996.

Table 2: Estimates on Gini Index

| | **CLUB** | **NEIGHBOURS** | **FRIENDS** |
|---|---|---|---|
| Male | 0,1169308*** | -0,0200374*** | 0,0261706*** |
| | (0,0012976) | (0,00125) | (0,0012) |
| Aged 31-50 | 0,0207213*** | 0,0617479*** | -0,1268538*** |
| | (0,0019178) | (0,00178) | (0,00171) |
| Aged > 50 | 0,0272487*** | 0,110698*** | -0,1629355*** |
| | (0,0020803) | (0,00193) | (0,00183) |
| Married | 0,029409*** | 0,0741726*** | -0,0131477*** |
| | (0,0014275) | (0,00134) | (0,0013) |
| Medium Skilled | 0,1046547*** | -0,0468236*** | 0,001722 |
| | (0,0016632) | (0,0015) | (0,00147) |
| High Skilled | 0,1919475*** | -0,0933522*** | -0,028668*** |
| | (0,002098) | (0,00173) | (0,00172) |
| Employed or Self-Employed | 0,0070417*** | -0,0305711*** | -0,0046482*** |
| | (0,0016883) | (0,00162) | (0,00154) |
| Immigrant | -0,0757798*** | -0,0492014*** | -0,0160207*** |
| | (0,0028088) | (0,0029) | (0,00283) |
| Good Health | 0,081693*** | 0,0750228*** | 0,0809438*** |
| | (0,0020689) | (0,00204) | (0,00182) |
| Leisure Satisfaction | 0,0349046*** | 0,0621493*** | 0,0650642*** |
| | (0,0014107) | (0,00134) | (0,00127) |
| Income | 0,0145532*** | -0,0151955*** | -0,0116361*** |
| | (0,000652) | (0,00063) | (0,00061) |
| **Gini** | -0,847002*** | 0,242717*** | -0,0837121 |
| | (0,0770145) | (0,07469) | (0,07296) |
| Obs. number | 575.483 | 589.084 | 589.459 |
| Pseudo $R^2$ | 0,1268 | 0,0954 | 0,0910 |

Source: ECHP

Note: significance *** = 1% ** = 5% * = 10% ; marginal effects at means, standard errors in brackets

Table 3: Estimates on Percentiles Ratios

| | **CLUB** | **NEIGHBOURS** | **FRIENDS** |
|---|---|---|---|
| Male | 0,1169759*** | -0,0201913*** | 0,0260561*** |
| | (0,0012977) | (0,00125) | (0,0012) |
| Aged 31-50 | 0,0205537*** | 0,0613044*** | -0,1274865*** |
| | (0,0019179) | (0,00178) | (0,00171) |
| Aged > 50 | 0,0270535*** | 0,1101177*** | -0,1637027*** |
| | (0,0020804) | (0,00193) | (0,00183) |
| Married | 0,0294721*** | 0,0743347*** | -0,0129659*** |
| | (0,0014274) | (0,00134) | (0,0013) |
| Medium Skilled | 0,1040679*** | -0,0469314*** | 0,0016791 |
| | (0,0016625) | (0,0015) | (0,00147) |
| High Skilled | 0,1918425*** | -0,093534*** | -0,0286266*** |
| | (0,0020986) | (0,00173) | (0,00172) |
| Employed or Self-Employed | 0,0073193*** | -0,0306659*** | -0,0042832*** |
| | (0,0016882) | (0,00162) | (0,00154) |
| Immigrant | -0,0759313*** | -0,0490384*** | -0,0159121*** |
| | (0,0028068) | (0,0029) | (0,00283) |
| Good Health | 0,0820169*** | 0,0750133*** | 0,0813674*** |
| | (0,0020672) | (0,00204) | (0,00182) |
| Leisure Satisfaction | 0,0350822*** | 0,0624697*** | 0,0655083*** |
| | (0,001411) | (0,00134) | (0,00127) |
| Income | 0,0145257*** | -0,0149424*** | -0,0115459*** |
| | (0,0006522) | (0,00063) | (0,00061) |
| **P90P10** | 0,0176498*** | -0,0159034*** | 0,0018664 |
| | (0,0018737) | (0,00184) | (0,0018) |
| **P75P25** | 0,8045754*** | 0,500776*** | 1,19869*** |
| | (0,0626933) | (0,0591) | (0,05445) |
| **P50P25** | -1,286008*** | -0,9149806*** | -2,029134*** |
| | (0,1018317) | (0,0962) | (0,08904) |
| **P50P10** | -0,0482561*** | 0,0438996*** | -0,0065932 |
| | (0,0048629) | (0,00477) | (0,00464) |
| **P75P50** | -1,344203*** | -1,436869*** | -2,345044*** |
| | (0,1247882) | (0,11759) | (0,11044) |
| **P90P50** | -0,2190857*** | 0,4203537*** | 0,071613*** |
| | (0,0326304) | (0,02914) | (0,02785) |
| Obs. number | 575.483 | 589.084 | 589.459 |
| Pseudo $R^2$ | 0,1273 | 0,0956 | 0,0916 |

Source: ECHP

Note: significance *** = 1% ** = 5% * = 10% ; marginal effects at means, standard errors in brackets

Table 4: Estimates on Between and Within Inequality

| Theil Index [Generalised Entropy Index with sensitivity parameter 1] | | | |
|---|---|---|---|
| | **CLUB** | **NEIGHBOURS** | **FRIENDS** |
| Male | 0,116883*** | -0,020030*** | 0,026161*** |
| | (0,001298) | (0,001250) | (0,001200) |
| Aged 31-50 | 0,020655*** | 0,061855*** | -0,126866*** |
| | (0,001918) | (0,001780) | (0,001710) |
| Aged > 50 | 0,027033*** | 0,110897*** | -0,162993*** |
| | (0,002081) | (0,001930) | (0,001830) |
| Married | 0,116883*** | 0,074192*** | -0,013128*** |
| | (0,001298) | (0,001340) | (0,001300) |
| Medium Skilled | 0,029416*** | -0,046168*** | 0,001470 |
| | (0,001428) | (0,001510) | (0,001480) |
| High Skilled | 0,103808*** | -0,093205*** | -0,028765*** |
| | (0,001666) | (0,001730) | (0,001720) |
| Employed or Self-Employed | 0,191609*** | -0,030576*** | -0,004664*** |
| | (0,002098) | (0,001620) | (0,001540) |
| Immigrant | 0,006912*** | -0,049047*** | -0,016103*** |
| | (0,001688) | (0,002900) | (0,002830) |
| Good Health | 0,081638*** | 0,075040*** | 0,080930*** |
| | (0,002069) | (0,002040) | (0,001820) |
| Leisure Satisfaction | 0,034910*** | 0,062105*** | 0,065051*** |
| | (0,001411) | (0,001340) | (0,001270) |
| Income | 0,014680*** | -0,015251*** | -0,011607*** |
| | (0,000652) | (0,000630) | (0,000610) |
| **Within Inequality GE(1)** | -0,117676*** | 0,037275 | 0,113242*** |
| | (0,023762) | (0,023740) | (0,023880) |
| **Between Inequality GE(1)** | 0,059812 | -0,402512*** | 0,198772* |
| | (0,114741) | (0,107110) | (0,103180) |
| Obs. number | 575.483 | 589.084 | 589.459 |
| Pseudo $R^2$ | 0,1267 | 0,0954 | 0,0910 |

Source: ECHP

Note: significance *** = 1% ** = 5% * = 10% ; marginal effects at means, standard errors in brackets

Table 5: Estimates on Between and Within Inequality

| half the squared Coefficient of Variation [Generalised Entropy Index with sensitivity parameter 2] | | | |
|---|---|---|---|
| | **CLUB** | **NEIGHBOURS** | **FRIENDS** |
| Male | 0,11687*** | -0,02002*** | 0,02617*** |
| | (0,00130) | (0,00125) | (0,00120) |
| Aged 31-50 | 0,02068*** | 0,06180*** | -0,12691*** |
| | (0,00192) | (0,00178) | (0,00171) |
| Aged > 50 | 0,02706*** | 0,11082*** | -0,16305*** |
| | (0,00208) | (0,00193) | (0,00183) |
| Married | 0,02944*** | 0,07416*** | -0,01314*** |
| | (0,00143) | (0,00134) | (0,00130) |
| Medium Skilled | 0,10380*** | -0,04638*** | 0,00136 |
| | (0,00166) | (0,00151) | (0,00147) |
| High Skilled | 0,19158*** | -0,09323*** | -0,02873*** |
| | (0,00210) | (0,00173) | (0,00172) |
| Employed or Self-Employed | 0,00690*** | -0,03057*** | -0,00462*** |
| | (0,00169) | (0,00162) | (0,00154) |
| Immigrant | -0,07593*** | -0,04910*** | -0,01611*** |
| | (0,00281) | (0,00290) | (0,00283) |
| Good Health | 0,08162*** | 0,07504*** | 0,08093*** |
| | (0,00207) | (0,00204) | (0,00182) |
| Leisure Satisfaction | 0,03489*** | 0,06212*** | 0,06511*** |
| | (0,00141) | (0,00134) | (0,00127) |
| Income | 0,01469*** | -0,01524*** | -0,01162*** |
| | (0,00065) | (0,00063) | (0,00061) |
| **Within Inequality GE(2)** | -0,00185 | -0,00332** | 0,00688*** |
| | (0,00134) | (0,00140) | (0,00148) |
| **Between Inequality GE(2)** | 0,09157 | -0,21694** | 0,26157*** |
| | (0,09920) | (0,09330) | (0,08922) |
| Obs. number | 575.483 | 589.084 | 589.459 |
| Pseudo $R^2$ | 0,1266 | 0,0954 | 0,0910 |

Source: ECHP

Note: significance *** = 1% ** = 5% * = 10% ; marginal effects at means, standard errors in brackets