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- Final Master Thesis Report -

(Historical) Income Inequality and Social Capital.

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ABSTRACT/SUMMARY

This master thesis examines whether – and, if so, how – income inequality has an impact on social capital looking from a historical and present perspective.

After a brief literature review and a detailed theoretical discussion, my empirical analysis uses municipality-level data and covers all 428 municipalities currently existing in Norway. It covers the period from 1993 to 2015, but also incorporates historical income inequality data from 1865. My main measure for social capital is financial donations to the annual *TV-aksjonen*.

I implemented several empirical models, ranging from pooled OLS regressions and fixed effects panel regressions on the complete set of data, to IV regression models on pooled and municipality-averaged datasets. The latter approach was particularly important since there was no over-time variation in the instrument available to deal with potential endogeneity concerns in the relation between inequality and social capital.

My main conclusion from using the sample of 428 municipalities is that an increase in income inequality over time within a given municipality has little to no effect/relation on how much people donate (Social Capital).

ACKNOWLEDGEMENTS

I have been challenged in many ways throughout writing this thesis, which without doubt has provided me with valuable knowledge and experience.

I would like to express my gratitude to my classmates for valuable contributions throughout the entire master program. After five years at BI, I leave school with more knowledge and experience than I could ever hope.

Most gratitude to my supervisor Benny Geys. He kindly provided me guidance throughout the thesis process. I am most grateful for his input; without his advice this paper would surely suffer.

I also extend my gratitude to Rune Sørensen and Ibolya Schindele for their input in the thesis.

Lastly, I would like to thank my partner **Jon-Arild Siljuberg** for all the support he has given me throughout the writing process; it was not easy and I very much appreciate it.

1. INTRODUCTION TO AREA OF STUDY

According to Robert Putnam's (1993) definition, social capital refers to "features of social organizations, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions" (p. 167; see also Kawachi et al. 1997). Generalized trust is typically considered a key component of social capital, and refers to the features of social life "that enable participants to act together more effectively to pursue shared objectives" (Putnam 1995: 664-665). This "generalized trust" does not refer to how much someone trusts his or her personal friends or family members. Rather, the variable refers to how much a person trusts unspecified persons (i.e. a more generalized other).

Other scholars have in their definition of social capital put more stress on the norms and networks that enable people to act collectively (Stolle and Rochon 1998; Woolcock &Narayan 2000). Several authors thereby point out that not all networks and not all relationships bring social capital. Only those characterized by trust and reciprocity among sets of individuals (Beard 2007; Cassar, Crowley and Wydick 2007). Paxton (2002, 2007) also suggests that one should differentiate between associations with high or low levels of "organizational embeddedness" (measured via members' multiple memberships; see also Coffé and Geys 2008; Geys and Murdoch 2010).

The concept of social capital has attracted increasing attention in academic work as well as among public policy-makers (and the media). From an economic perspective, this interest is due to social capital's importance for economic outcomes (Knack & Keefer 1997; Zak and Knack 2001; Guiso et al. 2014; for a critical discussion, see Berggren et al. 2008). Clearly, when social capital matters so much for economic outcomes, it becomes important to understand where it comes from and how it can be developed (Burt 1997). Both the increasing attention to social capital and its role for economic outcomes has played a great role in motivating me to find the relationship between income inequality and social capital.

In the remainder of this master thesis, I will first bring forward the exact research question to be analysed. Then, I will discuss the concept of social capital in the Scandinavian (and more general) context, and provide a detailed literature review

on previous work into the relation between income inequality and social capital. Afterwards, I present the data, empirical methodology and main findings. Finally, I present a concluding discussion.

Keywords: Social capital, trust, Inequality and Economic growth.

2. RESEARCH QUESTION

In my master thesis, I seek to explore the relationship between social capital and income inequality, and focus on the effect inequality has on the development of social capital. The main research question will be:

"Does income inequality affect social capital?"

In addressing this research question, I will present how income inequality and social capital have developed historically, and how these developments relate to each other. My empirical focus will be on Norwegian municipalities. There are several reasons why Scandinavian countries offer an interesting testing ground for research on social capital. It is, for instance, argued that the observed high levels of social capital in the Scandinavian countries can be explained by their high degree of equality, low level corruption and predominance of universal non-discriminating welfare systems (Rothstein & Stolle 2003). My analysis aims to look deeper into one these assumed driving forces: i.e. the role of income (in)equality.

3. SOCIAL CAPITAL: A LOOK INTO SCANDINAVIAN COUNTRIES

Robert Putnam (2000) argues that social capital has been in steady decline in recent decades in the United States. Among the factors he employed to measure this are reducing trust levels among US citizens, falling memberships in voluntary associations and declining volunteerism. However, his work does not appear to be supported in the Scandinavian situation. Scandinavia continues to perform well with regard to many aspects of social capital, such as the level of generalized trust

and the density of membership in associations. Contrary to developments in the United States, therefore, there is little evidence of a decline in social capital in Scandinavia over the past years (Rothstein 2001; Delhey and Newton 2005). Nonetheless, using interview data Wollebaek and Selle (2002) highlight that there are few indications of a "long civic generation" in the Norwegian setting. Many individuals have predominantly passive affiliations in volunteering organisations (i.e. without face-to-face interactions), and such passive affiliations appear to be of less importance to the development of social trust than active ones.

The theory of social capital quickly got attention in the Scandinavian debate among politicians and public intellectuals as well as among social scientists such as Bo Rothstein in Sweden (e.g., Rothstein 1995), Per Selle and Dag Wollebæk in Norway (e.g., Wollebaek & Selle 2003, 2012), and Christian Bjørnskov in Denmark (e.g., Bjørnskov 2003). One important reason for this is the universal welfare state in Scandinavian countries. The Scandinavian welfare state model has been designed to serve the whole population's demand for many different types of social insurance and social services. Schools, health care and care for the elderly have been considered a responsibility of the combined efforts of local and central government (Esping-Andersen 1990). This often led to strong debates about the role of such an encompassing welfare state for social capital.

Theoretically, the relation between welfare states and civic engagement can go both ways. On the one hand, strong welfare states have been argued to 'crowd out' social capital because it works to reduce the value of, and need for, families, communities, and social networks (van Oorschot and Arts 2005). On the other hand, the universal welfare state may well be a result of a society with traditionally strong norms of social trust and mutual reciprocity (Rothstein 1998). Scholars in the latter tradition have argued that "a well-developed welfare state creates the structural and cultural conditions for a thriving and pluralist civil society" because it sets "examples of taking responsibility for the good of others, and of behaving solidaristically and impartially" (Van Oorschot and Arts 2005, p. 6). Despite this theoretical ambiguity, only few studies have attempted to address the issue empirically (exceptions include Kumlin and Rothstein 2005; Van Oorschot and Arts 2005; Kääriäinen and Lehtonen 2006). Moreover, most of these studies also limit themselves to measures of overall civic engagement and

do not differentiate types of civic engagement (for a partial exception, see Kääriäinen and Lehtonen 2006).

An additional reason for the interest in the theory of social capital in the Scandinavian countries was its close connection to another political concept, namely 'civil society'. A few years before the publication of Robert Putnam's *Making Democracy Work* in 1993, an intense debate about the development of Swedish and Norwegian civil society started. The argument made was that the Scandinavian countries were characterized by an unusually close collaboration between the state and major interest organizations in the planning, preparation and implementation of public policies (Rothstein & Stolle 2013). Political scientists know this as "corporatism" and it ensures proper planning and redistribution of resources to minimize inequalities as much as possible. In addition, trust in others rests on a foundation of economic equality. When resources are distributed inequitably, people at the top and the bottom will not see each other as facing a shared fate. Therefore, they will have less reason to trust people of different backgrounds (Rothstein & Uslaner 2005).

When looking at a cross-section of countries, trust levels are generally found to be high in Scandinavia. Norway thereby often comes out on top. Similarly, voluntary association membership figures also do well in Scandinavia in comparison to the rest of the Western world. This has lead to increased attention to factors related to such social capital. Figure 1 below – taken from Rothstein & Uslainer (2005) – documents the relationship between trust (as an indicator of social capital) and income inequality. It shows the connection between trust and the Gini coefficient measure of economic inequality aggregated to the country level for 43 countries in the 1990s. It also displays the strength of the correlation between both variables as reflected in the slope (and predictive power; or R^2) of a simple linear regression equation. The strong negative relation is a common result in the literature as research has repeatedly shown that income equality is positively correlated to social capital, particularly social participation and trust (Verba et al. 1978; see also next section). This finding also aligns with my writings above, whereby the countries that score highest on social trust also rank highest on economic equality – such as the Scandinavian countries.

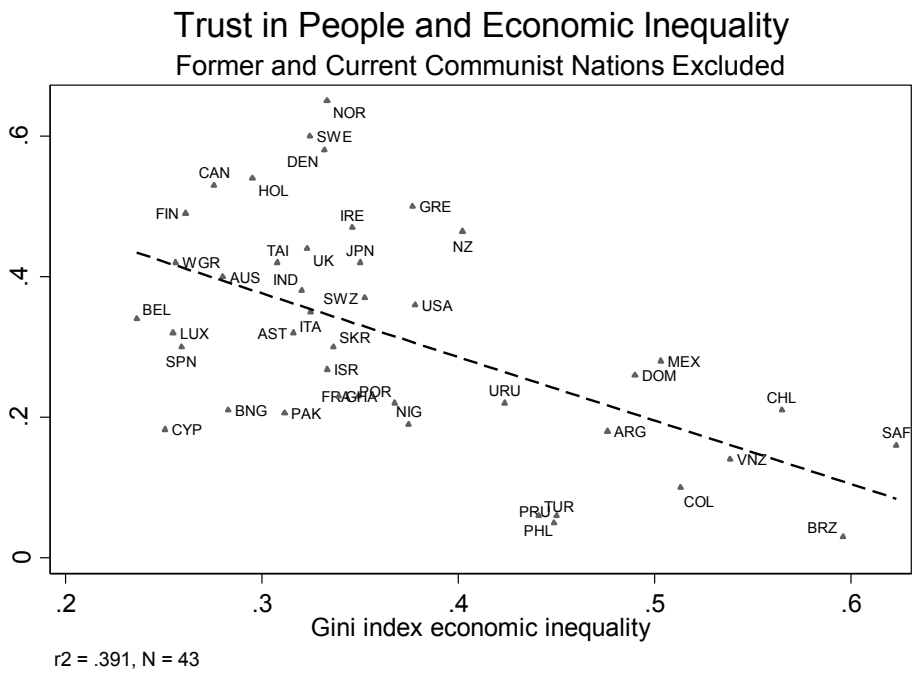
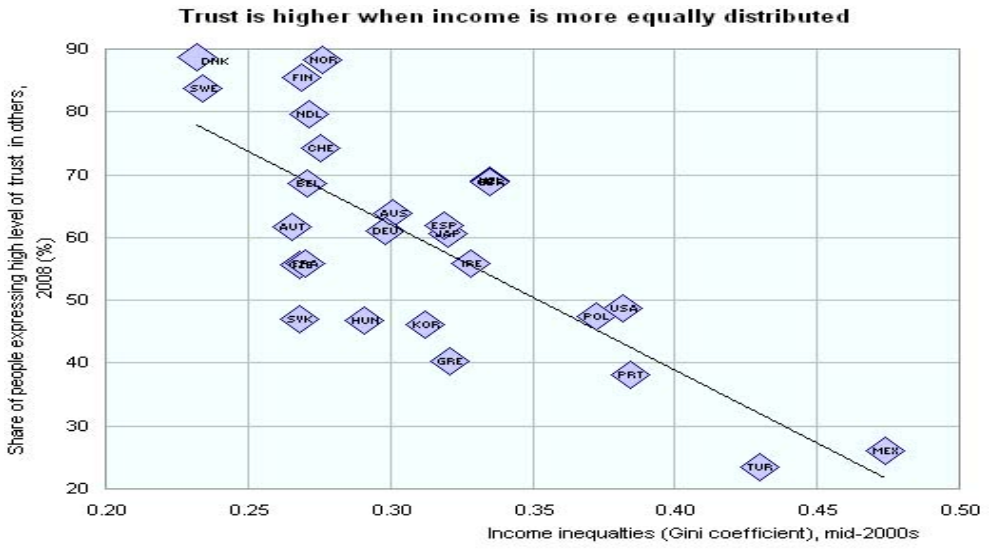


Figure 1

Figure 2 – taken from the social capital blog at wordpress.com[1] – shows a similar pattern when using also the Gini coefficient as a measure of income inequality and the share of trusting individuals as an indicator of social capital. The figure shows that Norway has a high level of trust and low-income inequality. Again, this is suggestive of the relation I intend to investigate in this master thesis.



[1] *https://socialcapital.wordpress.com/tag/income-inequality/*: Access date 09.12.2016.

[2] This is – particularly by sociologists – often linked to the so-called 'homophily principle', which is the tendency of individuals to form interpersonal relations for the most part with individuals having similar social characteristics (Blau 1977; McPherson et al. 2001).

[3] Many of the studies that examine the negative socio-economic implications of income inequality

Figure 2

Importantly, while suggestive about the relation between social capital and income inequality, neither figure is able to say much about the direction of causality. They merely illustrate the correlation between both variables in a cross-section of countries. Whether social capital causes lower income inequality or income inequality causes lower social capital cannot be ascertained from these simple plots (i.e. there is potential for reverse causality). I will return to this important causality issue more extensively in future sections.

4. LITERATURE REVIEW

In this section, I will discuss some of the contributions from academic researchers on the relation between social capital and income inequality in general. I will employ this review of the previous literature to derive my main research hypothesis, and develop the central theoretical arguments underlying this hypothesis.

When analysing the relationship between social capital and inequality, scholars generally refer to the fact that the accumulation of social capital results in higher levels of economic growth (Knack and Keefer 1997; Zak and Knack 2001; Bjørnskov 2003). Alesina and Ferrara (2002, p. 207-208) specifically argue that "when people trust each other, transaction costs in economic activities are reduced, large organizations function better, governments are more efficient, financial development is faster: more trust may spur economic success". In similar vein, Gould and Hijzen (2016) maintain that trust facilitates economic interactions in the private sphere by reducing transaction costs and by mitigating principal-agent problems. This stimulates economic growth. In other words, society benefits from the capacity of individuals to trust each other and cooperate together (Putnam 1993; Alesina and La Ferrara 2002; Beard 2007). Empirical evidence has been largely supportive of this trust-growth relationship (for a critical discussion, see Berggren et al. 2008), which makes it important to understand to what extent income inequality affects social capital. If inequality

decreases social capital, it would present an (indirect) way through which inequality impacts economic growth and performance (Gould and Hijzen 2016).

From a theoretical perspective, income inequality can affect social capital for a number of reasons. First, and most commonly brought forward in the literature, income inequality is a source of socio-economic diversity in society (Rothstein and Uslaner 2005; Barone and Mocetti 2016; Gould and Hijzen 2016). This is important since people are generally assumed to have an aversion to heterogeneity in their social relations (Woolcock & Narayan 2000; Alesina and La Ferrera 2002).[2] Hence, higher economic inequality leads to more important 'social barriers' between population groups, which makes that individuals will feel less familiar with, and less likely to connect with, other people in their surroundings. This, in turn, makes it difficult to trust others, and undermines social capital more generally. The key reason why inequality reduces social capital according to this argument thus is that as differences between people are larger, uncertainty increases and social capital goes down (Alesina and La Ferrera 2002).

Second, economic differences in society may reduce a person's sense of fairness. Especially when income inequality is perceived as the result of personal connections or luck rather than merit, inequality may trigger a belief of unfair advantages for others (Barone and Mocetti 2016; Gould and Hijzen 2016). This belief, again, will work to undermine social capital. Finally, inequality among groups in the population (e.g. with respect to race, ethnicity, income, religion, language, local identity, and so on) may trigger conflicts about redistribution and the financing of public goods (Barone and Mocetti 2016; Holm 2016) as well as about (cultural or political) dominance. Those who have power and/or resources are afraid to loose these 'assets', while the others strive to attain them (Boix and Posner 1998). Such conflicts can weaken social ties and limit the formation of social capital (Delhey and Newton 2005; Coffé and Geys 2006).

All three sets of arguments lead to the same theoretical prediction:

[2] This is – particularly by sociologists – often linked to the so-called 'homophily principle', which is the tendency of individuals to form interpersonal relations for the most part with individuals having similar social characteristics (Blau 1977; McPherson et al. 2001).

Hypothesis: Increased income inequality reduces social capital.[3]

In the empirical literature addressing this hypothesis, most attention has been awarded to the relation between income inequality and generalised trust. Other indicators of social capital have only received very limited attention (note that one of the contributions of my thesis is that it looks at a different measure of social capital). The evidence is mixed. Some studies show a strong, negative relationship between trust and inequality. This is true for studies using cross-country data (Knack and Keefer 1997; Zak and Knack 2001; Rothstein and Uslaner 2005) as well as data covering regions in the US (Alesina and La Ferrera, 2002; Twenge et al., 2014; Tesei, 2015). However, Leigh (2006) finds no significant relation between income inequality and trust using data from Australia, while Coffé and Geys (2006) find no connection between income inequality and a more general measure of social capital in data from Flemish municipalities. Similarly, Steijn and Lancee (2011, p. 7) find "no significant effect of inequality on trust when taking into account national wealth" in a sample of Western industrialized countries, which they argue suggests that "in Western countries the amount of resources rather than its distribution explains trust".

Studies that rely on cross-sectional data may lead to inaccurate inferences and face the critical issue that causal interpretation of the obtained results is hard (Barone and Mocetti 2016). First, there is a substantial risk of biased inferences due to omitted variable bias, since it is nearly impossible in cross-sectional studies to control for all relevant cultural, social, institutional and other variables that may affect both inequality and social capital. Second, there is the possibility of reverse causality. Whether this leads to upward or downward biased coefficient estimates is unclear. On the one hand, high social capital might induce a redistribution of wealth by supporting the expansion of the welfare state (Bergh and Bjørnskov 2013; Daniele and Geys 2015; see also the discussion in the previous section), and thereby *reduce* inequality in societies. On the other hand, some studies maintain that the growth of social capital brings on *more* income inequality. Gould & Hijzen (2016), for instance, argue that variation in trust across areas promotes high economic growth in some places (i.e. those with high trust), but not in others

[3] Many of the studies that examine the negative socio-economic implications of income inequality likewise presume that the effects of income inequality are the result of its negative relation to social trust (Wilkinson and Pickett 2009).

(i.e. those with low trust). This contributed according to these authors to the increasing income inequality across the US states.

Consistent with this, one of the examples in Putnam (1993) points out that savings banks located in high-social capital areas (Italy) distribute more of their profits as gifts to their local communities. Østergaard et al. (2015) likewise find that savings banks located in the areas with the highest level of social capital raise 25 per cent more deposits locally and donate 27 per cent more compared to banks in the poorest social capital areas. This can be interpreted as an example where social capital widens out inequality. A similar interpretation can be taken from a 2014 Forbes article on wealthy Americans and charity, which explained that the richest class of Americans only donates 5% of their income (Savchuk 2014). Moreover, these donations go predominantly into servicing their own particular communities, and thus continue (or even strengthen) the uneven development in the overall society. Again, this would suggest that social capital contributes to high inequalities.

The first study attempting to tackle these endogeneity concerns is Gustavsson & Jordahl (2008). They use Swedish individual-level panel data covering the 1994-1998 period from the Swedish Election Studies, and match this to county-level information on income inequality. Identification of causal effects derives from an IV estimation strategy with county (or individual) fixed effects, and including a measure of international demand as the exogenous instrument (this is argued to affect Swedish counties differently depending on their industrial structure). They conclude that income inequality brings about a reduction in trust – especially when looking at inequality in disposable income (rather than market income) and for inequality at the bottom end of the distribution.

Bergh & Bjørnskov (2013) instead employ a structural equations model on a sample of 104 countries. The instruments used for income inequality in their analysis are GDP (and its squared term)[4], the degree of democracy (and its squared term), dummies for religiosity and dummy for common law countries. The findings show that trust facilitates welfare state policies that reduce net income inequality. Yet, in contrast to Gustavsson & Jordahl (2008), net inequality

[4] These instruments are inspired by the Kuznets curve linking economic growth to inequality.

bears no significant relation to trust in this cross-section of countries. Still, the point estimates are consistently negative (as expected), and do reach statistical significance at conventional levels when regarding inequality in market income rather than net, disposable income.

Barone & Mocetti (2016) build on WVS data for the period 1980-2006, which is aggregated to the country level and merged with income inequality measures obtained from the World Bank. In similar vein to Gustavsson & Jordahl (2008), they instrument income inequality with a measure of country-specific exposure to technological change. The findings suggest that income inequality reduces trust only in developed countries and at the top end of the income distribution.

Finally, Gould & Hijzen (2016) employ individual-level data from the American National Election Studies (1980-2010) and European Social Surveys (2002-2012). These are matched with inequality data at the state level from the US Census (for the US dataset) and at the country level from the OECD (for the European dataset). No clear identification strategy is presented beyond the inclusion of numerous individual- and country-level control variables. The results are largely consistent with Gustavsson & Jordahl (2008), and suggest a significant negative relation between income inequality and trust at the bottom end of the income distribution.

5. EMPIRICAL ANALYSIS

While most previous studies of the relation between economic inequality and social capital analyse country- or regional-level data, my analysis will use municipality-level data and cover all 428 municipalities currently existing in Norway.[5] To the best of my knowledge, only one other study has previously investigated my research question with data at this level of government (Coffé and Geys 2006). In relation to that study, I use a different measure of social capital, study a different institutional setting and employ an IV approach to tackle

[5] Note that this implies that while downloading the data from Statistisk Sentralbyrå and NSD *Kommunedatabasen*, I imposed a 'base' (or *omregnisår*) of 2013. This accounts for all changes in municipality structures over the period of analysis by recalculating the data as if the 2013 municipality structure existed throughout my entire period. At the time of collecting the data, 2013 was the latest available year with a fixed number of municipalities.

the endogeneity of income inequality. In this section, I will first consider the operationalization of the key variables of interest (i.e. social capital and income inequality), which will also involve a presentation and description of the main elements of my dataset. Then, I will turn to discussing my empirical analysis and key findings.

5.1 Key Variables of interest

This section provides an in-depth description of the dependent and independent variables. I will include the reason for the intuition of using the particular variable.

5.1.1 Dependent variable

To measure social capital, I will use information about the level of donations to the annual "*TV-aksjonen*" within each municipality. This annual nation-wide action aims to collect donations for a specific cause (which differs every year) since 1974. Donations to good causes have previously been brought forward as an indicator of social capital by, for instance, Sobel (2002) and Uslaner and Brown (2005). As a measure of philanthropy and social altruism, it is close in spirit to the use of (per capita) blood donations as an indicator of social capital by, for instance, Putnam (2000), Guiso et al. (2004), Buonanno et al. (2009) and Nannicini et al. (2013). Conceptually, charitable donations of blood or money are likewise related to donations of time when people are engaged in voluntary associations. Giving to charity and volunteering time thus can be seen as closely related aspects of people's civic engagement or social capital. This makes it a valid measure for the purpose of my study (I will return to this in my concluding discussion).

Data about the level of charitable donations for the annual *TV-Aksjonen* aggregated to the municipality level are available since 1987 from NSD's *Kommunedatabasen* (though my analysis uses only the period since 1993 due to restrictions in the availability of other variables; see below). In this period, donations ranged from 125 to 225 million NOK (in 2008 prices). Figure 3 shows how real donations in per capita terms (i.e. *TV-Aksjonen* donations adjusted for inflation using the CPI) have been changing over the years – averaged across all Norwegian municipalities. The figure shows that there have been large variations

in the level of donations on a year-by-year basis. This can be due to changes in the economic situation in general, since people are probably willing to donate more when their economic situation is better. The time period in my analysis (1993-2015) includes almost two full business cycles. Norway witnessed steadily increasing growth rates between 1993 (1.5% GDP growth) and 2000 (4.2%), followed by slower growth in the early 2000s (1.3% and 1.7% in 2001 and 2002, respectively). Then economic growth improved again until the recession in 2009 (-1.6% GDP growth), with a subsequent recovery until the end of my period of analysis (all growth rates taken from OECD).[6] These economic trends are important because donations have been argued to follow a strong economic pattern (Bakija and Heim 2011). However, another explanation of the observed variation in donations over time can be that most Norwegians tend to donate based on what the 'good cause' is that underlies the *TV-aksjonen* in a given year. From this perspective, it may be interesting to point out that the theme in 1997 was HIV, while the theme in 2001 was women's rights (although 2001 was of course also the year that the internet bubble burst). In 2015, the drop in the oil price created a significant shock to the Norwegian economy, which might have caused lower donations in that year. Clearly, these economic and theme-specific determinants of donations have to be taken into account when interpreting it as a measure of social capital. I return to this below.

[6] https://data.oecd.org/gdp/real-gdp-forecast.htm

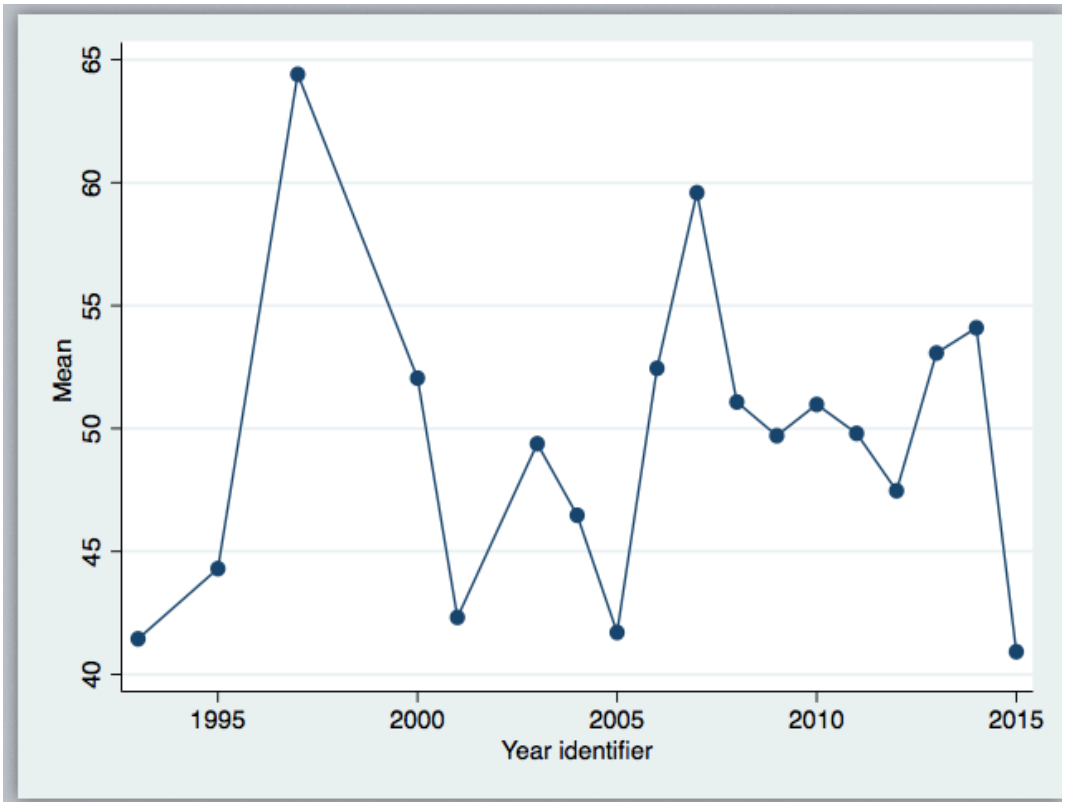


Figure 3: Showing the changes in TV Akjonen (on the Y-axis) over the years

Figure 4 displays the variation of per capita donations across the municipalities in Norway in real terms (using 2008 prices). I thereby display the average level of donations in a given municipality over the entire period of observation (i.e. 1993 to 2015). Such average values over time take out fluctuations due to economic and other circumstances, and therefore are more likely to capture differences in the underlying tendency to donate across municipalities – which at least in part will reflect variations in social capital and altruism.

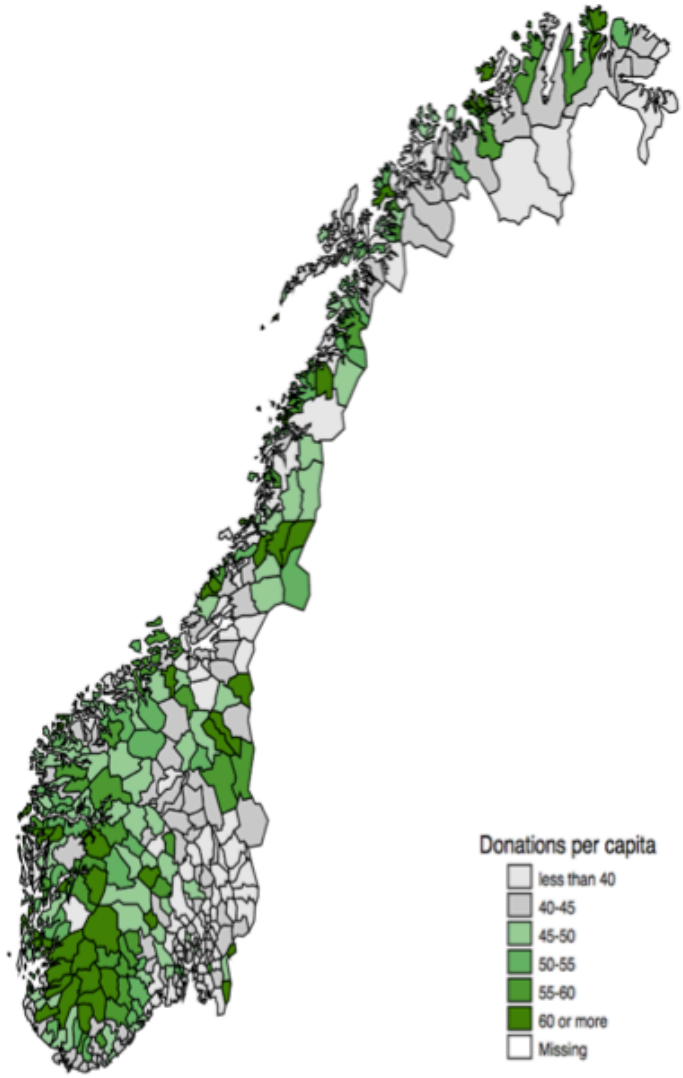


FIGURE 4: Map showing distribution of donations per capita across municipalities in Norway.

The figure clearly illustrates that there is substantial variation in the level of per capita contributions across the Norwegian municipalities: e.g., looking at Fyresdal (61NOK per capita) or Ullensvang (51NOK per capita) in comparison to Giske (32NOK per capita) or Agdenes (36NOK per capita). In general, the south-western part of the country seems to donate most. It is this varying extent to which people in different municipalities donate to the *TV-aksjonen* that will be employed as an indicator for differences in social capital across municipalities in my analysis. I thereby test whether it is directly dependent on the level of (historical) income inequality in the municipality.

5.1.2 Key Independent Variable

Income inequality is measured using the Herfindahl-Hirschman index (HHI).[7] This index of concentration in the distribution of a variable is calculated by taking the sum of the squared values of the share of each group (e.g., income levels) in the population. Formally, $\sum_{i=1}^{n} p_i^2$, where p_i is the share of people in the municipal population earning a certain income level and n is the number of income groups looked at in the analysis. The HHI varies between 0 and 1, with higher values indicating more income concentration – and thus higher inequality – in that municipality.

Note that with a fixed number of income groups (n) across the municipalities for which I calculate the HHI, I can also use the HHI index to infer the coefficient of variation within a dataset. Indeed, as shown by Davies (1979, 1980), the HHI can be rewritten as:

$$HHI = (1 + cv^2) / Number\ of\ income\ groups$$

Where cv equals the coefficient of variation. This coefficient of variation is another measure of inequality. It is calculated as the standard deviation within a group of observations divided by the mean value within that group of observations. It thus reflects a 'normalised' measure of dispersion that indicates how much variation there is around the mean value of the distribution. From the equation above, it is clear that knowing both the value of HHI and the number of income groups, we can easily calculate the coefficient of variation. I will use both HHI and cv in the analysis below.

I collected information about both current income inequality and historical income inequality in the Norwegian municipalities. To measure current income inequality, I rely on data provided by Statistics Norway on the number of individuals aged 17 and older in a given municipality whose income before taxes and transfers reached a specific level (collected in six categories ranging from '0-99.999NOK' to 'more than 500.000NOK'). This information is available at the municipality level since 1993, and allows constructing the pre-redistribution

[7] The index was developed independently by the economists A.O. Hirschman (in 1945) and O.C. Herfindahl (in 1950). Hirschman first presented the index in his book, *National Power and the Structure of Foreign Trade* (Berkeley: University of California Press, 1945).

income distribution within each municipality. As such, I can employ it to calculate several measures of income inequality such as the HHI and (given the fixed number of income groups provided in the raw dataset) the coefficient of variation.

To calculate historical income inequality, I gained access to historical data from 1865 in NSD's *Kommunedatabasen* indicating the number of men aged 25 and older in a given municipality whose income before taxes and transfers reached a specific level (collected in five income categories).[8] Historical income inequality can be employed as an instrument for current income inequality to tackle the endogeneity problem referred to at the end of the previous section (more details below). First, it is likely to be strongly correlated with current income inequality since there often exist persistent effects of socio-economic settings from the past. Historical data thus remain linked to current outcomes (Tabellini 2010). At the same time, historical income inequality cannot reasonably be expected to directly determine social capital today and certainly cannot be affected by today's level of social capital.

Figures 5a and 5b display the distribution of current income inequality and historical income inequality, respectively, over the Norwegian municipalities (using the coefficient of variation as a measure of income dispersion). This first of all shows substantial variation in income inequality across Norwegian municipalities – both in the current data and the historical data. More importantly, there is also substantial overlap in both figures. In both figures, inequality appears higher in parts of central and Northern Norway. To better illustrate this overlap, I calculated the Pearson correlation coefficient between current and historical income inequality. This equals $r = 0.23$ ($p<0.01$), which indicates statistically significant positive correlation between both variables.

[8] While the current income inequality measure is based on all individuals (both male and female), the historical data only refer to men. This is due to the historical fact that at the end of the 19th century men were generally the main (if not only) breadwinners in a family.

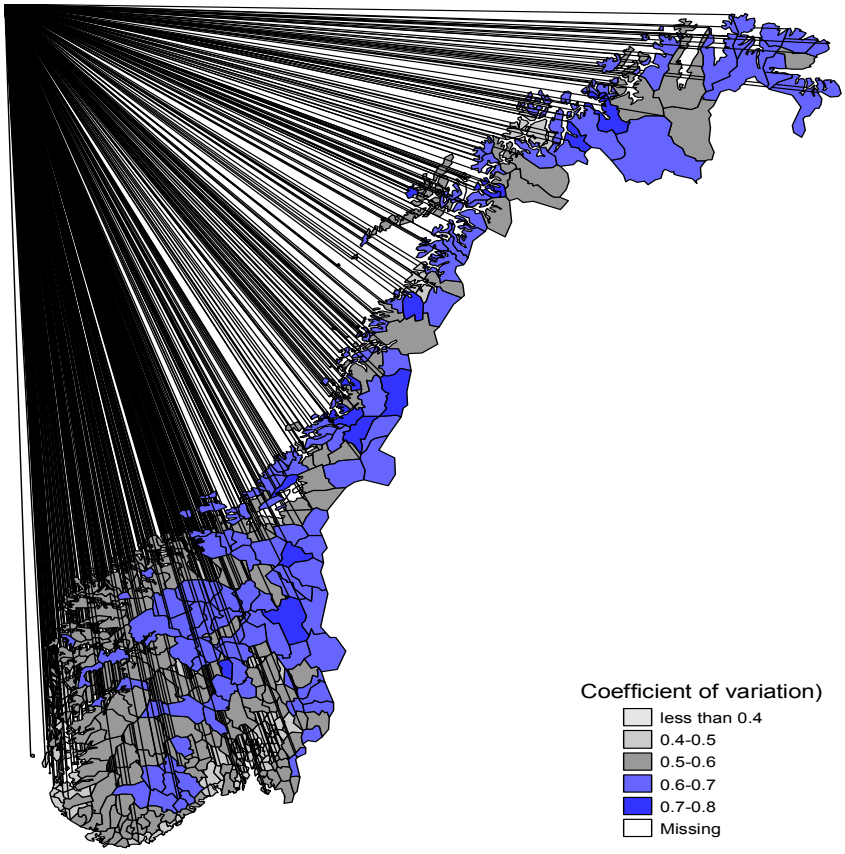


Figure 5a. Current income inequality

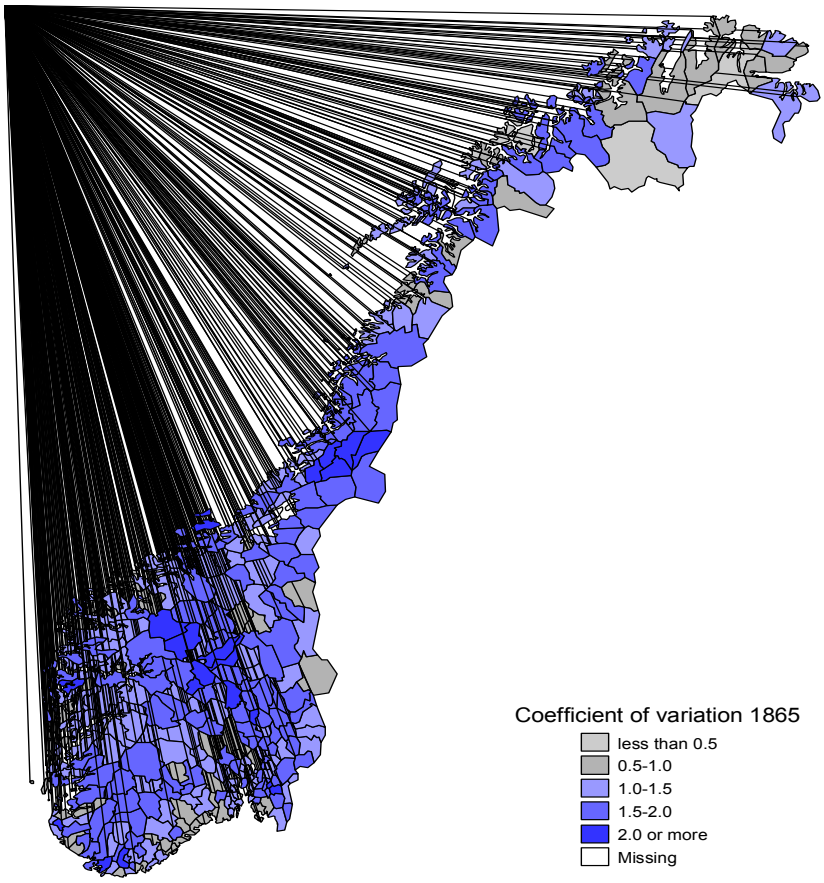


Figure 5b. Historical income inequality in 1865

FIGURE 5: Maps showing distribution of income inequality across Norwegian municipalities.

5.1.3 Control variables

Since donations to *TV-aksjonen* will also be influenced by other factors – such as the wealth of the municipality (see above) and its population composition – I also collected information for a number of control variables. This may be important for avoiding bias in my analysis below. I specifically look at the following control variables:

- Wealth: This is important because many municipalities are located in resourceful areas (i.e. along the coast or in oil-rich areas). Wealth is measured by the real median income level among the population of a municipality (corrected for inflation by the CPI using base year 2008).
- Population: There are many municipalities with a small number of inhabitants and a few very large municipalities in Norway. Consideration of this variable is first of all necessary to control for the fact that municipalities might appear to have higher levels of donations due to a larger or smaller number of inhabitants. I do this by transforming all variables into per capita measures. Moreover, large and small municipalities might have particular unobserved characteristics that make their population donate more (or less). Not considering this might give the wrong outcome in the end.
- Age: Older people are often found to be more generous. Callen (1994), for instance, shows that there is a positive relationship between age and donations (not necessarily money but also time). As such, it might be important to control for the share of older individuals in a municipality.
- Unemployment: Municipalities hit with widespread unemployment (e.g., oil cities like Stavanger during 2008-2012) are likely to show a sharp decline in donations during that time. The reason is that unemployed individuals are less likely to donate the money they need for themselves during their unemployment spell. This would have nothing to do with social capital or income inequality, but the economic condition at that time. Hence, I will control for unemployment when analysing the relationship of income inequality to donations.

There are other variables such as education that might be considered as an additional control, and has been occasionally used in the previous literature. I

abstained from this since it is generally closely related to income levels, which I do control for in the analysis.

5.1.4. Summary statistics and description of data

Table 1 shows summary statistics for all the variables that are of importance and will be used in my empirical analysis. These are *TVaksjonen* (in real terms and per capita), HHI and coefficient of variation (cv; as explained above), population (number of inhabitants), elderly (inhabitants over 65 years as a share of total population), women and unemployment (as a share of total population), and median income level (in real terms and per capita). Given that I have multiple observations for the same municipality over a number of years (1993-2015), I provide both the overall summary statistics, as well as summary statistics for variation *between* municipalities and *within* municipalities over time.

Variable		Mean	Std. Dev.	Min	Max	Observations
TVaks_~l	overall	49.51362	22.35821	2.216458	386.2818	N = 7651
	between		19.18149	30.29309	262.4913	n = 428
	within		11.45464	-84.43572	183.0833	T-bar = 17.8762
HHI	overall	.2313259	.0536297	.1672993	.4090348	N = 9340
	between		.0167815	.1735458	.2821835	n = 428
	within		.0511346	.1284675	.3732142	T = 21.8224
cv	overall	.5638442	.2646555	.0616108	1.205906	N = 9340
	between		.0814054	.2014424	.7846948	n = 428
	within		.2532028	-.020499	1.087605	T = 21.8224
pop	overall	10789.42	31464.05	209	634463	N = 9416
	between		31376.72	220.3182	536334.3	n = 428
	within		2771.976	-52090.85	108918.2	T = 22
elderly	overall	.1652686	.0356677	.0662476	.2976783	N = 9416
	between		.0340564	.0814015	.2639574	n = 428
	within		.0107207	.1164382	.251426	T = 22
women	overall	.4963012	.010505	.431709	.5357143	N = 9416
	between		.0093867	.4483412	.5199903	n = 428
	within		.0047374	.4420431	.5174889	T = 22
unempl~t	overall	.0239145	.012397	.0029441	.1293588	N = 8558
	between		.0083447	.0086985	.0667423	n = 428
	within		.0091756	-.0063808	.1024643	T = 19.9953
Real_I~d	overall	251692.2	53807.51	135437.5	415679.8	N = 9340
	between		24979.79	195938.9	339853.1	n = 428
	within		48002.78	153354.6	361711.5	T = 21.8224

Table 1: Summary statistics of key variables

In the description of the variables in Table 1, the dependent variable *TV-aksjonen* has a mean value of almost 50NOK per capita, ranging from 2NOK (in Eidsberg in 1995) to 386 NOK (in Utsira in 1993). The variation between municipalities (19NOK) thereby appears larger than that within municipalities over time (11 NOK). This implies that the level of donations within a given municipality over time is relatively more stable than the level of donations from one municipality to another. This can be seen as good news for my analysis, because it supports the idea that this measure can capture municipalities' underlying variation in the level of social capital.

Income inequality in the Norwegian municipalities is relatively limited. The Herfindahl-Hirschman index (HHI) has a mean value is 0.23, which is fairly low given that maximum value is 1. It ranges between 0.167 (in Karasjok in 2012) and 0.409 (in Kåfjord in 1993), which reflects rather substantial variation. Variation between different municipalities (0.017) is lower than within municipalities over time (0.051). This is a clear reflection of the steep and continuous decline in income inequality in Norway over the past 20 years. While the average HHI was 0.33 in 1993, it had fallen to 0.18 in 2014. Given its close relation to the HHI (see above), the same patterns are by definition also reflected in the coefficient of variation (cv).

Looking into the control variables, Table 1 shows that population size in Norway spans from over 634.463 inhabitants in Oslo to 209 inhabitants in Utsira (as per 2015). The wide range is also reflected in the substantial standard deviation between municipalities. The average municipality has 16% elderly in the population (ranging from 7% to 30%) and almost exactly 50% women (ranging from 43% to 54%). In terms of unemployment, 2.3% of the population is registered as unemployed in the average municipality (with a standard deviation of 1.2%). Finally, the median income level is 251.692NOK.

5.1.5. Multicollinearity

Farrar and Glauber (1967) explain that when trying to find how well each independent variable can be utilized to predict or understand the dependent variable in a statistical model, multicollinearity can lead to skewed or misleading results. Multicollinearity refers to a situation where a number of independent

variables in a multiple regression model are closely correlated to one another. Hence, to assess whether this might become a problem in my analysis below, Table 2 shows the correlation matrix between the key variable in my analysis.

The highest correlations are observed between HHI (and CV) and unemployment ($r > 0.50$), HHI (and CV) and median income ($r > 0.90$), and unemployment and median income ($r = 0.50$). The latter simply implies that a higher share of unemployed in the municipal population will imply more people with low or no income, which generates a lower median income level. The former, however, could be problematic. Taking into account Farrar and Glauber (1967), including HHI, unemployment and income in one model may create important multicollinearity problems. Nonetheless, the strong negative correlation between income inequality and median income comes at least in part from the time dimension of my dataset. While income inequality has dropped strongly over the period 1993-2015, median income levels have increased strongly. The same is true for the strong positive correlation between income inequality and unemployment, since both variables have fallen strongly over time. This suggests that it will be important in my analysis to account for these trends over time. I will do this by including year dummies for every year in the dataset as well as replicating the analysis using only one average value per municipality (see also below).

Note that Table 2 also gives a first indication of the bivariate relation between social capital (measured via *TV-aksjonen*) and income inequality (measured via HHI or cv). This correlation between donations and Herfindahl index turns out to be negative ($r = -0.0001$) as proposed by my main research hypothesis. Yet, it is very small and statistically insignificant ($p>0.10$).

	TVaks_~l	HHI	cv	pop	elderly	women	unempl~t
TVaks_cap_~l	1.0000						
HHI	-0.0001	1.0000					
cv	0.0075	0.9782	1.0000				
pop	-0.1362	-0.1036	-0.1170	1.0000			
elderly	0.2207	0.2627	0.2701	-0.2092	1.0000		
women	-0.2388	-0.0383	-0.0271	0.2173	-0.0316	1.0000	
unemployment	-0.1660	0.5227	0.5011	0.0328	0.0115	-0.0632	1.0000
Real_Inc_med	-0.0220	-0.9095	-0.9357	0.1660	-0.3656	0.0466	-0.5049

Table 2: Correlation matrix between all variables in my analysis

5.2 Methodology

My empirical analysis will proceed in a number of steps. First, as an initial analysis, I will run simple pooled OLS regressions linking *TV-aksjonen* donations as the dependent variable to (current) income inequality as the main independent variable. This essentially looks at the correlation between both variables, as has been done in the majority of the foregoing literature. The estimation model takes the following form:

$$\textbf{Donations}_{i,t} = \boldsymbol{a} + \boldsymbol{\beta_1}\, \boldsymbol{cv}_{i,t} + \boldsymbol{d}\, \boldsymbol{Controls}_{i,t} + \boldsymbol{e}_{i,t}$$

Still, pooled OLS ignores the specific nature of my dataset, which is panel data. Panel data consist of both a time-series and cross-section dimension. This makes it possible to examine how the relationship between variables changes over time (Brooks 2008). There are important advantages of using panel data. For instance, Hsiano (2007) emphasises that panel data can help control the impact of omitted variables: "panel data contain information on both inter-temporal dynamics and the individuality of the entities may allow one to control the effects of missing or unobserved variables" (Hsiano 2007 pg. 5; see also Baltagi 2008). Therefore, as a second step, I will exploit the time-series cross-sectional dimensions available in the dataset to run fixed effects panel regressions (Gustavsson & Jordahl 2008; Gould & Hijzen 2016). These allow for stronger inferences since they control for any unobserved heterogeneity across municipalities that is fixed over time. I use a fixed – rather than random – effects model because "a fixed effects model is more plausible when the entities in the sample effectively constitute the entire population" (Brooks 2008 pg. 500). I can do this procedure with any number of years of data, provided there are at least two observations per municipality (which is the case here). The estimation model now takes the following form:

$$\textbf{Donations}_{i,t} = \boldsymbol{a_i} + \boldsymbol{\beta_1}\, \boldsymbol{cv}_{i,t} + \boldsymbol{d}\, \boldsymbol{Controls}_{i,t} + \boldsymbol{d_t} + \boldsymbol{e}_{i,t}$$

Where a_i is a set of municipality-specific intercepts and d_t is a full set of year effects that control for common changes in *TV-aksjonen* donations over time.

This fixed effects panel model still does not account for the potential endogeneity problem that exists. That is, it is possible that income inequality affects social capital while social capital also impacts income inequality (Barone and Mocetti

2016; Gould and Hijzen 2016). To some extent income disparities might be undermining social capital. At the same time, Alesina and La Ferrara (2002, p. 207-208) specifically argue that "when people trust each other, transaction costs in economic activities are reduced, large organizations function better, governments are more efficient, financial development is faster". This is an explanation showing that social capital has effects on income inequality.

The third step in my analysis tries to address the causality problem by using an Instrumental Variable method (see also Gustavsson & Jordahl 2008; Barone & Mocetti 2016). I thereby use historical income inequality in 1865 as an instrument for current income inequality. Since the historical data are only available for one year, this requires returning to a cross-sectional analysis. In this part of the analysis, I will therefore work with both the pooled dataset as well as a dataset where I employ average values per municipality. The reason for the second analysis – i.e. collapsing the data into one observation per municipality – is that I have only one observation for historical income inequality (in 1865). This lack of time variation implies that the instrument can only provide assistance in terms of the cross-sectional dimension of the data. As such, it seems reasonable to restrict the analysis to this cross-sectional dimension. The two-stage IV estimation model takes the following form (in the model with data collapsed into one observation per municipality):

$$\mathbf{cv}_i = \boldsymbol{a} + \boldsymbol{\beta_1}\, \boldsymbol{cv\_1865}_i + \boldsymbol{d}\, \boldsymbol{Controls}_i + \boldsymbol{e}_i$$

$$\mathbf{Donations}_i = \boldsymbol{a} + \boldsymbol{\lambda_1}\, \widehat{\boldsymbol{cv}}_{i,t} + \boldsymbol{d}\, \boldsymbol{Controls}_i + \boldsymbol{e}_i$$

The first-stage regression connects current and historical income inequality, which allows predicting the part of current income inequality that is due to historical income inequality. This is the arguably exogenous part of current income inequality (or, at least, unrelated to other current determinants of income inequality), because it derives from historical sources of income inequality. The second-stage regression then includes the predicted level of income inequality ($\widehat{cv}$) as the key independent variable in a model with *TV-aksjonen* donations as the dependent variable.

6. RESULTS

In this section, I will present the results of the series of regression analyses described above to arrive to my conclusions. These are:

- Pooled OLS regression (regression model 1)
- Fixed effects panel regression (regression model 2)
- IV regression on pooled and averaged datasets (regression model 3)

6.1: Pooled OLS regression.

I start the first step of my empirical analysis by looking at the bivariate correlation between inequality and social capital (measured by charitable contributions to *TV-Aksjonen*). Figure 6 displays these results through a binned scattered plot. The vertical axis presents the level of donations per capita, while income inequality is given on the horizontal axis. Each dot represents the average level of donations of all municipalities with a specific level of income inequality. The figure indicates that donations to *TV-Aksjonen* are negatively correlated with income inequality. The slope of the line depicted in Figure 6 – which reflects a simple linear regression line through the underlying data – suggests that an increase in inequality by 0.05 percentage points (which is the standard deviation of inequality within municipalities over time) is linked to a decrease in the level of donation by approximately 1 NOK per capita.

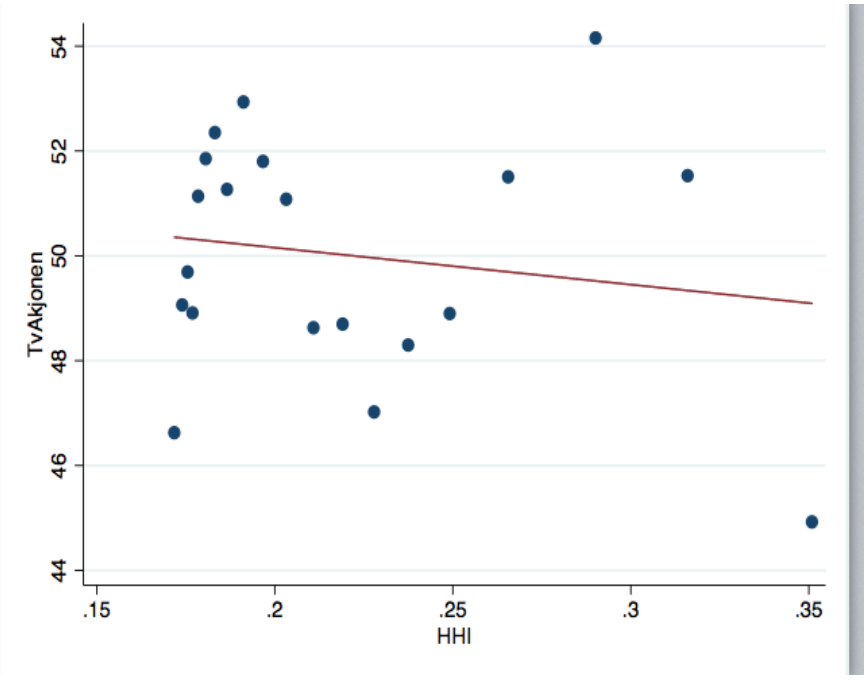


Figure 6: Relationship between Income inequality and TV-Aksjonen

The same results can be observed by running a simple bivariate pooled OLS regression to estimate the relationship between the two key variables: Income inequality (now measured via the coefficient of variation; cv) and TV-Aksjonen. Table 3 reports the result from such a regression. This shows that a unit increase in the coefficient of variation is associated with a decrease of 0.896 NOK in TV-aksjonen donations per capita. However, this relation is not statistically significant since P > | t | is 0.39 (which is clearly larger than 0.05). The same information is reflected in the fact that the 95% confidence interval at the end of table 3 includes 0, which implies that the point estimate of cv does not significantly differ from 0.

Linear regression

Number of obs	=	7,197			
F(1, 7195)	=	0.73			
Prob > F	=	0.3932			
R-squared	=	0.0001			
Root MSE	=	22.442			

TVaks_cap_~l	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cv	-.8955532	1.048844	-0.85	0.393	-2.951596	1.160489
_cons	50.46793	.5821755	86.69	0.000	49.3267	51.60917

Table 3: Bivariate Regression analysis

Clearly, the bivariate regression model in Table 3 (or the binned scatterplot in Figure 6) does not control for other variables that may affect donations. As mentioned section 5.1.3 above, charitable donations are likely to be affected by a number of other variables, which should be controlled for in the analysis. Moreover, section 5.1.5 also indicated that the development of my main variables over time should be taken into account. Hence, I run a multiple linear regression as seen in table 4 below, which includes all control variables discussed above plus a full set of time dummies (not reported in the table).

Controlling for population, elderly, women, unemployment and real income and the year of observation is clearly important. The results from the multiple regression analysis show that a unit increase in CV is now associated with an average decrease of 8.33NOK per capita in *TV-aksjonen* donations. Clearly, a one-unit decrease in CV is highly unlikely. From table 1, we know that the

standard deviation in CV is 0.26. Hence, a one standard deviation change in CV is associated with a decrease of just over 2.17NOK per capita in TV-aksjonen donations. This is meaningful since it represents about 10% of the standard deviation of TV-aksjonen donations (22.36, see Table 1). While this association is not statistically significant at 5% level, it is significant at the 10% level (P > | t | is 0.055).[9]

Linear regression

Number of obs	=	6,339			
F(20, 6318)	=	77.27			
Prob > F	=	0.0000			
R-squared	=	0.2108			
Root MSE	=	19.198			

TVaks_cap_~l	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cv	-8.331855	4.345314	-1.92	0.055	-16.85015	.1864367
pop	-.0000385	7.91e-06	-4.87	0.000	-.000054	-.000023
elderly	197.5064	17.67665	11.17	0.000	162.8542	232.1587
women	-561.4173	63.86201	-8.79	0.000	-686.6085	-436.2261
unemployment	-200.0602	30.46374	-6.57	0.000	-259.7795	-140.3409
Real_Inc_med	.0001122	.0000297	3.78	0.000	.000054	.0001703

Table 4: Multiple Regressions

Although I am primarily interested in observing the results from the main income inequality variable, it is also interesting to check whether the control variables follow the expected directions. Population (pop) shows a negative relation with the level of donations, which implies that bigger towns donate less per capita than smaller towns. Adding a squared term suggests that this relation may be non-linear: i.e. first decreasing with population size and then increasing again (not reported in the table). The share of elderly in the municipal population shows a positive relationship. Given the coding of this variable, a 1% larger share of elderly (coded as 0.01) is associated with an increase in the amount of *TV-Aksjonen* donations by just under 2 NOK per capita. Higher donations thus take place in municipalities that have more older inhabitants (see also Callen 1994). The share of women shows the opposite relation: i.e. 1% more women is linked to

[9] This is not because of the lower number of observations in Table 4, which follows from missing observations from the control variables. When I re-estimate the model in Table 3 with only the observations for which I have data for all control variables, I still find an insignificant relation between income inequality and *TV-aksjonen*. This means that the difference between the results in Tables 3 and 4 is really due to the inclusion of the control variables.

a decrease in donations with more than 3 NOK per capita. Finally, the two economic variables behave as expected. Higher unemployment by 1% (coded again as 0.01) is associated with a decrease in donations by 1.77 NOK per capita, while an increase in median income is linked to significantly higher levels of charitable donations.

6.2 Fixed effects panel regression

The pooled OLS model in the previous section does not really account for the panel nature of the dataset, and also ignores that there may be unobserved characteristics of municipalities that drive my findings. In this section, I therefore turn to the fixed effects panel regression model. The fixed effects model allows the unobserved individual effects for municipalities to be correlated with the included variables (Greene 2008). It effectively means that I am no longer looking at a combination of over-time and between-municipalities variation (as in the pooled OLS model), but focus exclusively on variation in my variables within a given municipality over time. The fixed effects model is employed very often in a range of economic disciplines. Applications include Groot and van den Brink (2003), who studied training levels of employees with firm effects, as well as Winkelmann (2003), who examined subjective measures of well-being with individual and family fixed effects. In my fixed effects model, I again include all six independent variables plus a full set of year dummies. The results are reported in Table 5.

Looking first at my central independent variable, I find that CV has a weak positive effect. A one-unit increase in income inequality within a municipality over time (which is an extremely large change given the standard deviation of 0.05) is linked to an increase in donations of about 3 NOK per capita. Since P > | t | is 0.45, this is not statistically significantly different from 0. Interestingly, compared to the analysis in the Tables 3 and 4, the sign of CV has changed. What does this mean? It strongly suggests that the negative coefficient estimates observed before are most likely driven by the cross-sectional variation within my dataset. In other words, increasing inequality over time within a municipality appears to be weakly positive for donations (controlling for increasing income levels!), while higher inequality in one municipality compared to another one is

weakly negative for donations (controlling for income differences between these municipalities!). I will return to this purely cross-sectional dimension of the relation between inequality and donations later.

The results for the control variables remain largely unchanged from before, although the share of women in the municipal population no longer has a significant effect. An increase in population size by one thousand inhabitants is linked to an increase in donations by approximately 0.20 NOK per capita. This statistically significant. As before, we also observe that having a 1% larger share of elderly is associated with a statistically significant increase in the amount of *TV-Aksjonen* donations by 0.97 NOK per capita. Finally, the economic control variables also retain their sign and significance. An increase in employment by one unit is linked to a decrease of donations by just over 1 NOK per capita, while a real income increase with 1000 NOK is associated with a rise in donations by 0.152NOK per capita. This is again statistically significant.

```
Fixed-effects (within) regression               Number of obs      =       6,339
Group variable: knr                             Number of groups   =         427

R-sq:                                           Obs per group:
     within  = 0.3165                                         min =           1
     between = 0.0039                                         avg =        14.8
     overall = 0.0228                                         max =          15

                                                F(20,426)          =      192.05
corr(u_i, Xb)  = -0.3021                        Prob > F           =      0.0000

                                 (Std. Err. adjusted for 427 clusters in knr)
```

TVaks_cap_~l	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cv	3.159895	4.15969	0.76	0.448	-5.016177	11.33597
pop	.0001958	.0000392	4.99	0.000	.0001187	.0002728
elderly	97.34647	31.24278	3.12	0.002	35.93728	158.7557
women	-46.86505	62.01456	-0.76	0.450	-168.7577	75.02756
unemployment	-102.4538	34.44825	-2.97	0.003	-170.1635	-34.74413
Real_Inc_med	.000152	.0000585	2.60	0.010	.0000371	.000267

Table 5: Fixed effect

6.3 IV regression on pooled and averaged datasets:

This section takes the third and final step of my analysis, which attempts to control for the likely endogeneity of current inequality. I thereby use the influence of historical income inequality on current income inequality to instrument current inequality. As mentioned, given that I only have one observation for historical

income inequality, I will be running the Instrumental Variable regressions in this section on both the pooled dataset and a dataset averaged at the municipality level.

6.3.1 IV regression on pooled data set.

I first run the two-stage Instrumental Variables model on the dataset including all available observations, thus exploiting both between-municipality and over-time variation (in the current variables, though *not* the historical ones). The first stage of the regression model is shown in Table 6(a), which indicates that historical income inequality is significantly positively related to current income inequality. This means that municipalities with high inequality in 1865 are likely to still have high levels of income inequality today. The size of the coefficient estimate indicates that a one standard deviation change in historical income inequality is linked to a change in current income inequality of 0.412*0.02=0.00823. This reflects approximately 10% of the standard deviation in current income inequality. As such, there is a fairly strong correlation between both variables, which implies that historical inequality is not a weak instrument. This is further confirmed in Table 6(b), which reports the result of an F-Test to check the validity/strength of the instrument (i.e. the extent to which historical cv is related to current cv). The p-value is zero, meaning that there is a strong relation between the two variables.

cv	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cv_1865	.022264	.0020103	11.08	0.000	.0183232	.0262048
pop	-1.77e-07	2.78e-08	-6.35	0.000	-2.31e-07	-1.22e-07
children	.3072434	.1061666	2.89	0.004	.0991208	.5153661
young	-.5995392	.0750218	-7.99	0.000	-.7466075	-.4524709
elderly	.7974975	.0448903	17.77	0.000	.7094973	.8854978
women	-.7822304	.0819924	-9.54	0.000	-.9429632	-.6214975
unemployment	1.166803	.0930455	12.54	0.000	.9844027	1.349204
Real_Inc_med	-1.78e-06	5.28e-08	-33.68	0.000	-1.88e-06	-1.67e-06

Table 6(a): IV regression on pooled dataset.

```
F test of excluded instruments:
  F(  1,  6316) =   122.66
  Prob > F      =   0.0000
Sanderson-Windmeijer multivariate F test of excluded instruments:
  F(  1,  6316) =   122.66
  Prob > F      =   0.0000
```

Table 6(b):Testing of validity

The second stage of the instrumental variable estimation has the predicted values of the first stage included as the central independent variable. The results seem to align with the pooled cross-sectional results reported in tables 3 and 4. I find a negative relation between income inequality and social capital. Table 7 shows that an increase in income inequality causes a decrease in donations – in line with the negative relations expected by the theoretical discussion. Yet, this relation is once again not statistically significant at neither 5% nor 10% (P > | z | is 0.206). Note that all the control variables again remain consistent in terms of their sign compared to all earlier model estimations. It is important we note that this regression model is very close to the pooled OLS model except for the use of an instrument. Hence, it seems that using the instrument makes the significance observed in table 4 disappear. This is an important observation since it strongly suggests that *not* controlling for endogeneity (as in Table 4) gives you a biased significant result. Antonakis, Bendahan, Jacquart & Lalive (2014; pg. 6) explain that a coefficient may appear to adequately reflect the hypothesized relationship—for example, it is the right direction and the effect is highly significant—but in presence of endogeneity it will be inconsistent and will not reflect the true population parameter.

TVaks_cap_~l	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
cv	-34.44932	27.24499	-1.26	0.206	-87.84853	18.94989
pop	-.0000253	.0000102	-2.49	0.013	-.0000452	-5.35e-06
children	199.6151	32.76047	6.09	0.000	135.4057	263.8244
young	224.8968	28.20336	7.97	0.000	169.6192	280.1743
elderly	333.596	25.58464	13.04	0.000	283.4511	383.741
women	-546.2474	33.17599	-16.47	0.000	-611.2712	-481.2237
unemployment	-69.49899	38.79342	-1.79	0.073	-145.5327	6.534715
Real_Inc_med	.0000894	.0000522	1.71	0.087	-.0000129	.0001916

Table 7: IV (2SLS) estimation

6.3.2 OLS and IV regression on averaged data set (1obs per municipality).

As I have only one observation for historical income inequality in 1865, there is no time variation element in the instrument. That is, I can only use cross-sectional variation in the IV estimation. It therefore seems reasonable to focus more explicitly on this cross-sectional variation by replicating the analysis using only

one observation per municipality (i.e. the average of all observations in the dataset for a given municipality). The results from doing this and running the IV regression again on this collapsed dataset are in Tables 9 and 10.

The first stage of the regression model is shown in Table 9(a), which indicates that historical income inequality (inequality in 1865) has a positive relationship with current income inequality. The relationship is such that an increase in historical inequality by 1 leads to an increase in cv currently by 0.02. This means that municipalities with high inequality in 1865 are likely to still have high levels of income inequality today. The p-value indicates that the relation between historical and current income inequality is again statistically significant with more than 99% confidence, which implies that historical inequality is not a weak instrument.

Statistics robust to heteroskedasticity
Number of obs = 428

cv	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
cv_1865	.0145245	.005154	2.82	0.005	.0043937	.0246553
pop	-6.82e-08	4.62e-08	-1.48	0.141	-1.59e-07	2.26e-08
elderly	.5021282	.1272222	3.95	0.000	.2520585	.752198
women	-.5442	.2158463	-2.52	0.012	-.9684708	-.1199293
unemployment	.5907219	.3112833	1.90	0.058	-.0211412	1.202585
Real_Inc_med	-2.16e-06	2.47e-07	-8.73	0.000	-2.64e-06	-1.67e-06
_cons	1.259283	.1134742	11.10	0.000	1.036237	1.48233

Table (9a)Linear regression

```
F test of excluded instruments:
  F(  1,    421) =     7.94
  Prob > F       =   0.0051
Sanderson-Windmeijer multivariate F test of excluded instruments:
  F(  1,    421) =     7.94
  Prob > F       =   0.0051
```

Table (9b) F-Test

This is further confirmed in Table 9(b), which reports the result of an F-Test to check the validity/strength of the instrument; the extent to which historical inequality is related to current inequality. The p-value is 0.005, which is significant, meaning that there is a positive relation between the two variables.

				Number of obs =	428
				F(6, 421) =	12.16
				Prob > F =	0.0000
Total (centered) SS	=	157105.9203		Centered R2 =	0.1607
Total (uncentered) SS	=	1204919.371		Uncentered R2 =	0.8906
Residual SS	=	131853.2166		Root MSE =	17.55

TVaks_cap_~l	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
cv	-122.2196	175.3646	-0.70	0.486	-465.9278	221.4886
pop	-.0000287	.0000253	-1.13	0.257	-.0000784	.0000209
elderly	249.4181	128.1644	1.95	0.052	-1.779445	500.6157
women	-809.7642	347.3478	-2.33	0.020	-1490.553	-128.975
unemployment	-258.3893	127.9525	-2.02	0.043	-509.1716	-7.606999
Real_Inc_med	-.0001661	.0003483	-0.48	0.634	-.0008488	.0005166
_cons	527.1359	307.5099	1.71	0.086	-75.57244	1129.844

Table 10:IV 2SLS on collapsed data set.

The results of the second stage of the estimation seem to align with the pooled cross-sectional results reported in table 7. I find a negative relation between income inequality and social capital. More specifically, Table 10 shows that an increase in income inequality causes a decrease in donations – in line with the negative relation expected by the theoretical discussion. This relation is not statistically significant at neither 5% nor 10% since (P > | z | is 0.486). All control variables again also remain consistent in terms of their sign compared to all earlier model estimations. It is important we note that in this regression model the coefficient on cv is now larger than in table 8. The interpretation behind this can be due to the fact that table 10 only looks at cross-section variation, while Table 8 has over-time and cross-section variation. Hence, the bigger results here might stand as a suggestion that negative relation is driven by the cross-section variation. This is consistent with the fact that the fixed effects model in table 5 showed a positive correlation between inequality and social capital. As such, it appears that the cross-sectional correlation is negative while the inter-temporal correlation is more likely to be positive. Amihud (2000) also explained a similar concept in his paper; i.e. that the returns of stocks using the cross-section variation showed a larger positive effect in comparison to other papers that did the same study with a different approach.

7. Concluding Discussion.

A substantial literature has been accumulated regarding the relation between income inequality and social capital. However, not many studies were done at a municipal level and none specifically looked at historical inequality as an

instrument for current inequality when assessing its relation to social capital. The key purpose of my master thesis was to investigate whether income inequality has a negative impact on social capital at the municipal level. I thereby implemented several empirical models, ranging from pooled OLS regressions and fixed effects panel regressions to IV regression models on pooled and averaged datasets. In the preferred IV estimations – which attempt to account for possible endogeneity – is first link historical income inequality to current income inequality, and subsequently check how that inequality has effects on donations (social capital).

Summing up all findings of my research, there are several interesting outcomes. First, the first pooled OLS regressions suggested there was a negative relationship between social capital and inequality; meaning an increase in income inequality is associated with a decrease in social capital (donations). This finding aligns with previous studies such as Rothstein and Uslaner (2005), Barone and Mocetti (2016), Gould and Hijzen (2016), and Woolcock & Narayan (2000). It supports the conclusion that higher inequality leads to more important 'social barriers' between population groups, which makes that individuals will feel less familiar with – and are less likely to connect with – other people in their surroundings. This, in turn, makes it difficult to trust others, and **undermines** social capital more generally. Thus it is in line with the theoretical argument that as differences between people are larger, uncertainty increases and social capital goes down (Alesina and La Ferrera 2002).

Second, studies that rely on cross-sectional variation may lead to inaccurate inferences and face the critical issue that causal interpretation of the obtained results is hard (Barone and Mocetti 2016). From this perspective, it is important to observe that pooled OLS regression give same conclusion such as both IV regressions on pooled and averaged datasets – all of which rely mainly on cross-sectional variation in my dataset. However, the panel fixed effects models exploit variation over time and show a weak positive relation between inequality and social capital. This finding, however, remains statistically insignificant. This implies that an increase in income inequality over time within a given municipality has little to no effect/relation on how people donate (Social Capital) – a finding quite similar to Gustavsson & Jordahl (2008).

Clearly, all empirical studies are faced with limitations. One limitation of my study is that I only had one observation of historical income inequality. As such, there was no historical variation that could have been exploited to strengthen my analysis. With only one historical data-point, it is impossible to exploit within-municipality variation, for instance.

Another limitation was lack of variety in the measurement of social capital. I used charitable donations. While this variable – and closely related variables such as blood donations – are often employed in existing studies (e.g., Putnam 2000; Sobel 2002; Guiso et al. 2004; Uslaner and Brown 2005; Buonanno et al. 2009; Nannicini et al. 2013), money donations to good causes are affected by economic conditions and the topic of the donation round. This naturally creates some noise in my measure of social capital. It would be useful to replicate my analysis with other measures of social capital such as trust or participation in volunteering groups. Unfortunately, however, these data are not available at the municipality level in Norway.

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APPENDIX

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