Ratio Working Paper No. 106

Inequality and Trust in Sweden: Some Inequalities are More Harmful than Others

Magnus Gustavsson
Henrik Jordahl

RATIO Näringslivets forskningsinstitut
ratio.se
Box 3203
103 64 Stockholm
Besöksadress:
Sveavägen 59, 4tr

Inequality and Trust in Sweden:

Some Inequalities are More Harmful than Others*

October 18, 2006

Magnus Gustavsson§ and Henrik Jordahl#

Abstract

We present new evidence on the influence of income inequality on generalized trust. Using individual panel data from Swedish counties together with an instrumental variable strategy, we find that differences in *disposable* income, and especially differences among people in the bottom half of the income distribution, are associated with lower trust. The relationship between income inequality and trust is particularly strong for people with a strong aversion against income differentials. We also find that the proportion of people born in a foreign country is negatively associated with trust.

Keywords: trust, social capital, inequality

JEL Classifications: C23, D31, Z13

1. Introduction

Differences between people seem to generate distrust. A number of empirical studies have established that income inequality and ethnic heterogeneity display a strong, negative correlation with the extent to which people trust each other (Knack and Keefer, 1997; Glaeser *et al*., 2000; Zak and Knack, 2001; Alesina and La Ferrara, 2002; Uslaner, 2002, 2003; Knack and Zak, 2003). Although these relationships are well-established, any casual interpretation

* We wish to thank Niclas Berggren, Mikael Carlsson, Charles Enis, Nils Gottfries, Panu Poutvaara, two anonymous referees, seminar participants at the Public Choice Meetings 2006 in New Orleans, at "Trust, Reciprocity and Social Capital: The 2006 Ratio Colloquium for Young Social Scientists", and at Uppsala University, Göteborg University, and Helsinki Center for Economic Research for valuable comments and suggestions. We gratefully acknowledge financial support from the Jan Wallander and Tom Hedelius Foundation.

§ Uppsala University, Department of Economics, P.O. Box 513, SE-751 20 Uppsala, Sweden; E-mail: magnus.gustavsson@nek.uu.se

Research Institute of Industrial Economics, P.O. Box 55665, SE-102 15 Stockholm, Sweden; and The Ratio Institute; E-mail: henrik.jordahl@riie.se

must be seen as tenuous. On the theoretical side, little is known about the social mechanisms that are supposed to be at work. On the empirical side, the present evidence is entirely based on cross-sectional data without any variation in the way that income inequality is defined or measured. The lack of credible strategies for empirical identification renders causal interpretations difficult.

An influential theoretical model can be found in Zak and Knack (2001), where trust between investors and brokers falls with the *distance* between them. Distance is greater for people who are "dissimilar" in the sense of being genetically or socially far from each other.[1] They derive the proposition that a mean preserving spread of the distribution of wages will reduce trust. Like some other studies their empirical investigation shows that trust is lower in countries where the Gini coefficient indicates a more unequal distribution of income. But according to their model, this relationship is not an effect of inequality as such. It arises as a net wage effect due to the supposition that people are more sensitive to income changes at lower wages. When studying individual level data, one should not expect to find this effect of income inequality if individual wages are controlled for.

Alesina and La Ferrara (2002) study individual level data from US localities and find that trust is lower among people who live in a racially mixed community or in a community with a high degree of income inequality. Within racially mixed communities, it is especially people who express strong feelings against racial integration who are less trusting. The results are interpreted as a genuine "aversion to heterogeneity", rather than as an effect of "local interaction" due to the fact that both blacks and the poor are less trusting.[2] For Australia, Leigh (2006) reports that trust is lower in ethnically and especially in linguistically heterogeneous neighborhoods, but he finds no relation between economic inequality and trust.

[1] For the genetic part, Zak and Knack (2001:299) invoke Hamilton's Rule from evolutionary biology, "which specifies the level of altruistic behaviour among family members (and, with in-breeding, neighbours) that maximizes the survival of one's genes, including those shared among relatives."

[2] A somewhat related literature links income inequality and ethnic heterogeneity to participation in associational activities (like religious groups, sport groups etc). Alesina and La Ferrara (2000) find that such participation is lower in localities with a more unequal income distribution and with higher racial or ethnic fragmentation. This is consistent with their theoretical model of group formation, especially if mixed groups are present. La Ferrara (2002) notes that the effect of inequality on participation can depend both on the access rule for group membership and on the part of the wealth distribution where the action is. Interesting as this may be, it is far from clear that associational activities generate trust (as Putnam, 1993, argues). There are a large number of studies that tests for but do not find such a link (see e.g. Claibourn and Martin, 2000; Wollebaek and Selle, 2002; Delhey and Newton, 2003; Hooghe and Stolle, 2003).

In view of the rather uncertain state of knowledge, we choose a broad and somewhat explorative empirical strategy. When our understanding is vague and imprecise, trying different alternatives can prove fruitful. To get a dataset suitable for this undertaking, we combine panel data on trust from the Swedish Election Studies with register based income measures from the longitudinal data base LINDA. In addition to having access to panel data and high quality measures of individual income, we also improve upon the existing empirical literature by taking opinions on income inequality into account and by tackling the problem of causality by using international demand as an instrument for income inequality.

Looking at different definitions of both income and inequality, we find that inequalities in disposable (rather than gross) income are negatively related to trust, and that differences among people in the bottom half of the income distribution appear to have a particularly strong effect on trust. These results are reinforced by our use of international demand as an exogenous source of identifying variation.

Inspired by Alesina and La Ferrara (2002), who take feelings against racial integration into account, we recognize that people also have very different opinions on income inequality, and that such differences may mean that, within a given distribution of income, some people will be more trusting than others. Our results confirm that when it comes to trusting people in general, people with a strong aversion against income differences are much more sensitive to income inequality. This result is hardly surprising, but it could be of great importance when interpreting findings both from cross country studies and from studies of single countries. Like Alesina and La Ferrara (2002), we also find the proportion foreign born within a region to be negatively associated with trust.

There are good reasons to care about trust. The advantages of living in a trusting society are countless and most valuable. Of particular economic significance is the finding that trust promotes economic growth (Knack and Keefer, 1997; Zak and Knack 2001). Understanding the determinants of growth is of obvious importance. As a concrete example, underscoring the relevance of our study, trust may be a missing link in the literature that connects economic inequality and growth (see e.g. Persson and Tabellini, 1994; Aghion *et al*., 1999).

2. Data and Empirical Strategy

We use individual level data on trust from the 1994 and 1998 Swedish Election Studies. The election studies are made in the form of a two-step panel in which each respondent is interviewed twice and one half of them are replaced in each study. Each respondent's trust in "people in general" is measured on a discrete scale ranging from 0 to 10.[3] Compared with the bulk of the empirical literature, where trust has been measured as a binary variable, this gives us additional information.[4] The sample of the Swedish Election Studies is drawn from a population of 18 to 80 year old Swedish citizens entitled to vote in the general election. Swedes living abroad are not included in the sample. The response rate was 80 percent in 1994 and 82 percent in 1998. The dominant reason for a non-response is that the selected citizen refused to be interviewed. In 1994, the Trust question was only given to one half of the sample. This effectively reduces the number of observations from 1998 that we can use in our panel, but not in our cross-sectional sample. We have 2,792 observations in our cross-sectional sample and 680 observations in our panel.

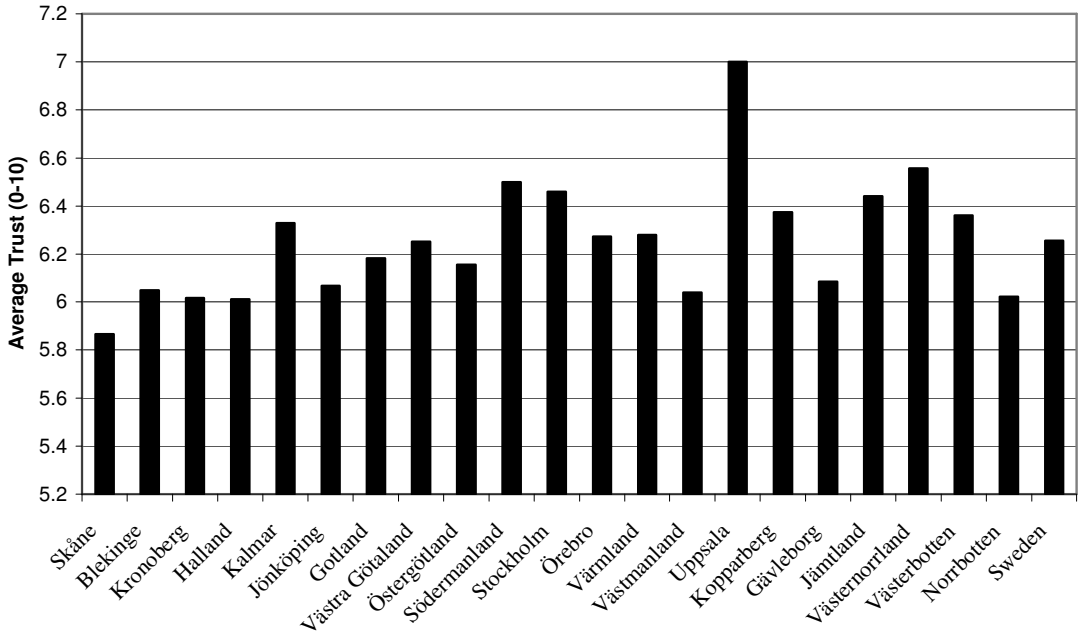
The Swedish Election Studies contain data on the county in which each respondent lives.[5] There are 21 counties in Sweden. Three of them – Stockholm, Skåne, and Västra Götaland – have more than one million inhabitants. A majority of the other counties have between 200,000 and 300,000 inhabitants. According to the Swedish Election Studies, the most trusting people live in the county of Uppsala. Averaged over 1994 and 1998, people in the county of Skåne were the most distrustful although trust was even lower in Kronoberg in 1994 and in Halland in 1998. Starting from the south and going northwards, Figure 1 presents the average person's self-reported level of trust in Sweden's 21 counties. Trust increased during our period of study. For the average Swede, our measure increased from 5.79 in 1994 to 6.54 in 1998. Trust increased in all counties except Gotland, which saw a negligible decline. The largest increase took place in Kalmar, closely followed by Kronoberg. For each county, Figure 2 displays how the average person's trust has changed from 1994 to 1998.

[3] The wording of the question: "On a scale from 0 to 10, where would you place people in general when it comes to whether people cannot or can be trusted?" (Our own translation.)

[4] There is always the risk that survey data contain systematic measurement error. To the extent that such self-reported errors are constant for each respondent over time, we avoid this problem by using within-respondents variation. A particular problem, reported in Zak (2005), is that answers from a small group of people with particular personality traits may not be informative about their corresponding behavior (set also Glaeser et al., 2000). Since our survey does not include questions that capture personality traits and cannot be linked to observed behavior, we have to stick to a literal interpretation of our trust question.

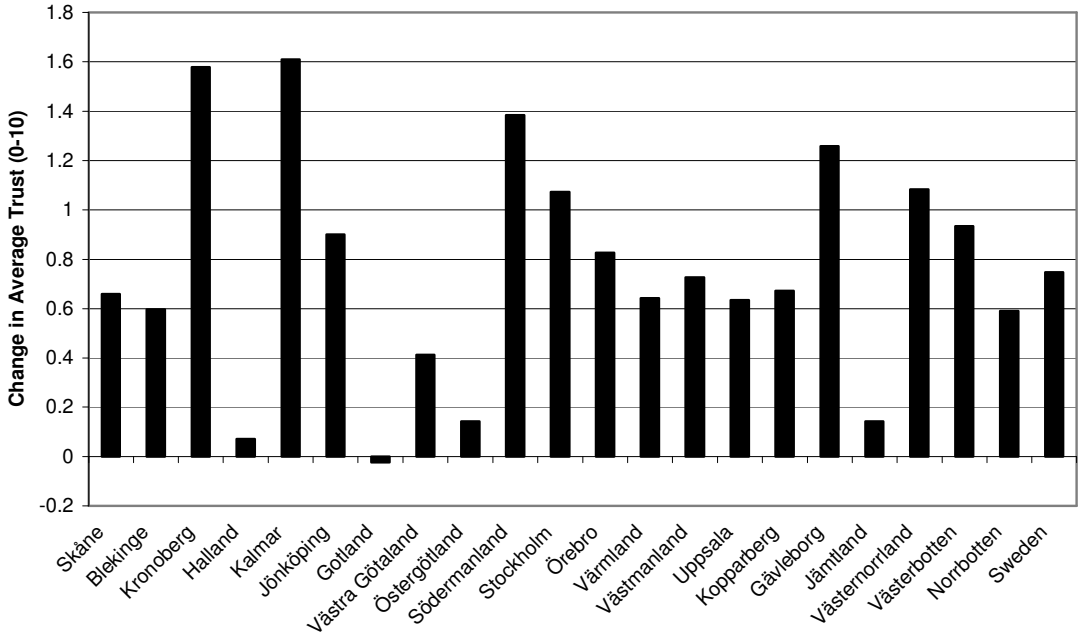
[5] A county is an administrative district between the state and the municipalities.

Figure 1. Average trust in Sweden's counties 1994–1998



Notes: For each county we first take the average across respondents in 1994 and in 1998. Then, for each county, we take the average over those two averages. The counties are ordered from the south (starting with Skåne) to the north.

Figure 2. Change in average trust in Sweden's counties 1994–1998



Note: The counties are ordered from the south to the north.

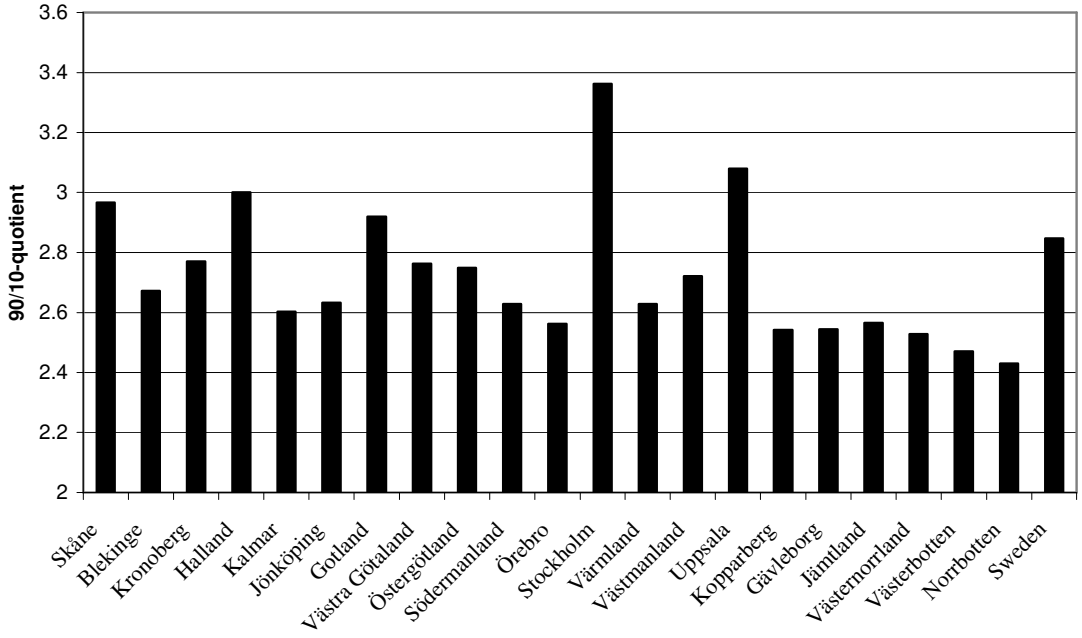
To calculate various measures of county specific income inequality and ethnic heterogeneity, we use the register-based longitudinal database LINDA, constructed to be cross-sectionally representative of the Swedish population.[6] The dataset is large; each year, it contains 3.35 percent of the Swedish population corresponding to over 300,000 individuals. An attractive feature of the database is that attrition from the sample is only due to death or to emigration. Information about individuals' incomes comes from tax reports, so the income variable is free from the measurement errors that are common in survey data such as recall errors, rounding errors, and top-coding.[7] Our calculations are based on people who are between 20 and 64 years old, and who are not students.

Though Sweden is a country with fairly low levels of income inequality, there are distinct differences across counties. Figure 3a and 3b present for each county the 1994–1998 averages of the 90/10-percentile quotient and the Gini coefficient for disposable income. Both measures display a similar pattern, with Stockholm as the county with highest inequality, while the northern counties, such as Norrbotten and Västerbotten, display markedly lower levels.

Statistical tests support systematic inequality differences across subcategories of counties. Mean inequality in the 6 most northern counties – which together make up more than half of Sweden's area – is significantly smaller than the mean for the other 15 counties. Further, mean inequality is significantly larger in urban than in rural counties, if urban counties are defined as the counties that contain Sweden's three major cities, i.e. the counties of Stockholm, Skåne, and Västra Götaland.

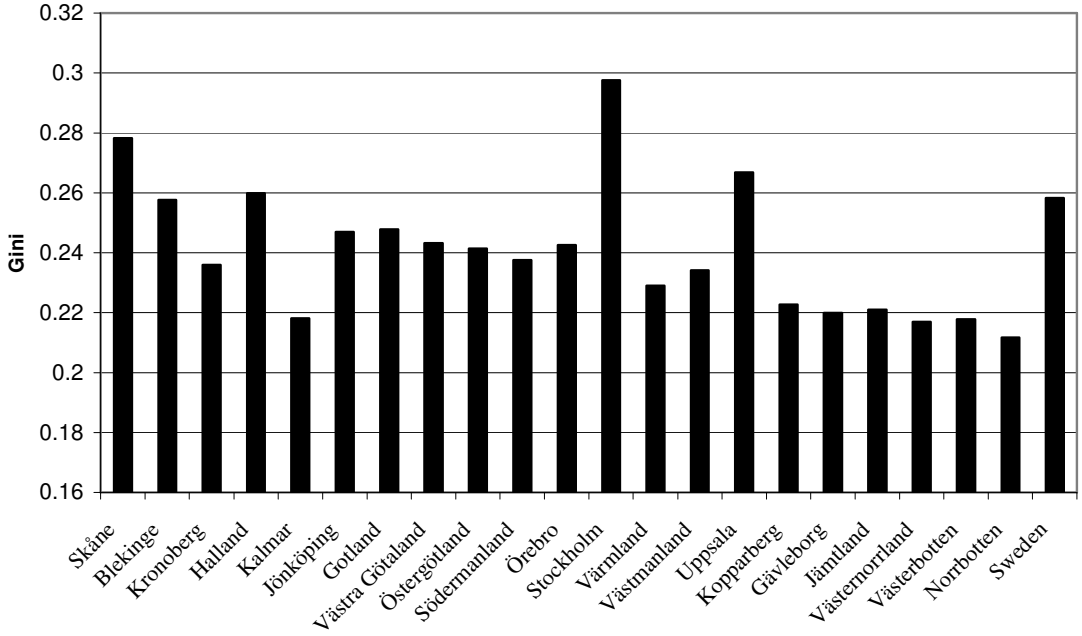
[6] The registers are maintained by Statistics Sweden; see Edin and Fredriksson (2000) for details.
[7] The individual income variable from the Swedish Election Studies that we use in our regressions is also register based. It should be noted that mean income is about the same in the Swedish Election Studies and in LINDA, our two main data sources. In LINDA (the much larger data base) mean income is 3 percent higher in 1994 and 2 percent higher in 1998 compared to the Swedish Election Studies.

Figure 3a. The average 90/10-quotient for disposable income 1994–1998



Notes: We calculate the 90/10-quiotien for each county in 1994 and 1998, and then take the mean over these two years. The counties are ordered from the south to the north.

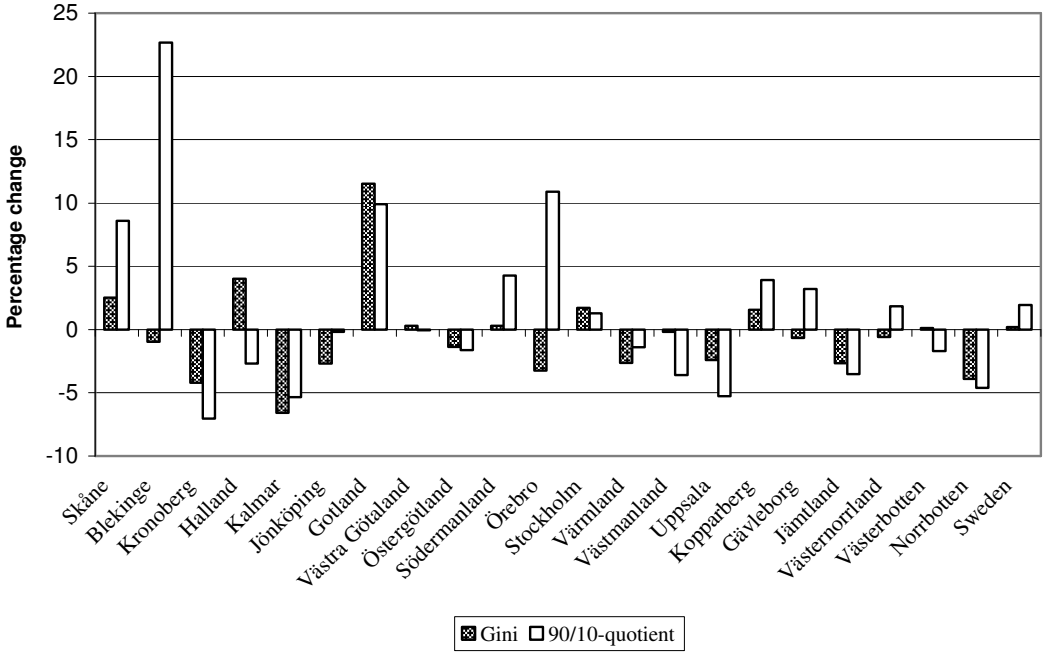
Figure 3b. The average Gini coefficient for disposable income 1994–1998



Notes: We calculate the 90/10-quiotient for each county in 1994 and 1998, and then take the mean over these two years. The counties are ordered from the south to the north.

Since we will employ county or individual fixed effects in the estimations, it is informative to have a closer look at changes in inequality across counties. Figure 4 displays county specific changes in the Gini coefficient and the 90/10-quotient between 1994 and 1998. Different measures provide different pictures of how inequality changes. The county of Blekinge, for instance, has a substantial increase in the 90/10-quotient but a small decrease in the Gini coefficient. Since the Gini coefficient is most sensitive to income differences around the middle (or more precisely, the mode) of the income distribution, this implies that the gap between those with low (10^{th} percentile) and high incomes (90^{th} percentile) has increased markedly in Blekinge, whereas slightly negative changes in inequality have occurred between the income levels where the majority of the population are located. For Sweden as a whole (the last bar), there is a small increase in the 90/10-quoitient but no change in the Gini coefficient.

Figure 4. Percentage change in 90/10-quotient and the Gini coefficient between 1994 and 1998, based on disposable income



Note: The counties are ordered from the south to the north.

By looking at different measures of income and income inequality, we hope to extend the existing literature. In view of the tentative and uncertain causal mechanisms, findings from an

exploratory empirical investigation could be of considerable value. We consider the following measures of inequality (calculations are based on data from LINDA):

- *Gini*, a measure that is sensitive to changes at the mode of the income distribution;
- *P90-10*, a measure of the ratio of high to low income earners (the 90th to the 10th percentile) that is not sensitive to extreme values at the tails of the income distribution;
- *P90-50* and *P50-10*, to look at changes in the upper and lower parts of the income distribution.[8]

Using data from LINDA, we also work with two measures of ethnic heterogeneity; the proportion of people who are born in a foreign country (*Proportion Foreign*), and an index of ethnic fragmentation (*Ethnic Index*). The index, which increases in heterogeneity, is defined as:

$$Ethnic\ Index = 1 - \sum_{n} S_{n,c}^{2} \qquad (1)$$

where $S_{n,c}$ stands for the share of ethnic group n in county c. Based on peoples' country of origin we include the following (disjoint) ethnic groups: (i) Sweden; (ii) Nordic countries; (iii) EU15; (iv) Europe; (v) Australia; (vi) North America; (vii) Asia; (viii) Middle East; (ix) Africa; (x) Latin America. Both Proportion Foreign and Ethnic Index produce a ranking similar to the one for income inequality, with Stockholm at the top and the northern counties at the bottom.

Our regressions include control variables that are related to trust according to previous studies. *Income* (measured in 100,000 SEK) and *Schooling* raise trust according to Alesina and La Ferrara (2002), and a number of cross-country studies (e.g. Zak and Knack, 2001). In their theoretical model, Zak and Knack (2001) give an explanation that is based on the opportunity cost of working. For someone who earns a lot of money, it is more attractive to work and trust than to spend time verifying the actions of others. The relationship between education and trust could be a causal one of learning or socialization, or it could be that education proxies wages and discount rates that affect trust.[9] *Age* is also controlled for since

[8] We have also looked at the standard deviation of logs, a measure that is sensitive to changes at the tails of the income distribution. In general, this measure does not display a statistically significant relationship with Trust and the estimated coefficients of the other variables are largely unaffected if it is included.
[9] But note that Coleman (1988) and Bjørnskov (2005) argue that the causality goes from social to human capital.

Putnam (2000) and others have found that old people tend to be more trusting than young ones. However, working with Swedish data, we also note that Rothstein and Stolle (2002, 2003) find the reverse pattern in this country. We include the dummy variable *Immigrant* for people who are not born as Swedish citizens. Another dummy variable, *City*, is included since residents in big cities are often considered to be less trusting than people living in small towns. *Cohab* and *Kids* are "personal" dummy variables for people who are married or live together with a partner, and who have children living at home. Any difference between the sexes is captured by the dummy variable *Female*. We also include variables that measure labor market status. Those hopefully self explanatory variables are: *Unemployed*, *Retired*, *Early Retired*, *Housework*, and *Student*. As an attempt to control for county specific factors that may affect Trust, we include *Mean Income* (measured in 1,000 SEK), (the log of) *Population*, and the number of reported crimes per 100 inhabitants in each county (*Crime*), as well as county and year dummies.[10] In Appendix A, we report definitions, summary statistics, and sources for the variables that are used throughout this paper.

In the main text, we report estimates from linear regressions on our cross-sectional and panel sample. In Appendix B, we report estimates from an ordered logit and from the fixed effecs ordered logit developed in Ferrer-i-Carbonell and Frijters (2004) and described in Appendix C. The linear estimates are much easier to interpret and are very similar to their non-linear counterparts in the sense that a small change in inequality, when evaluated at the means of all variables, gives rise to nearly the same change in *Trust* as predicted in the linear regressions. We have already noted that the panel sample is much smaller than the cross-sectional sample, and because of this, we cannot be certain that the panel sample is representative. But if the estimated coefficients in the panel sample are of the expected signs and remain the same when we include individual fixed effects, at least we have an indication that individual fixed effects do not bias the cross-sectional estimates.[11]

[10] We do not control for unemployment at the county level because of its high correlation with income inequality. Including unemployment does not change the main conclusions, but in some regressions it leads to strange results for the unemployment variable, likely due to the high correlation.

[11] We only include individuals who do not move to another county in our panel sample. Apart from possibly being determined endogenously, moving often changes the observed income inequality quite dramatically (for the individual); and at the same time, it can have a direct effect on trust. There are only 23 movers in our panel sample, and they actually appear to be about as trusting as others.

3. Results

3.1 Individual Determinants of Trust

We first investigate how individual characteristics are related to trust. Table 1 contains such linear regressions for our cross-sectional and panel samples. Column 1 shows that statistically significant relationships are found for *Income*, *Schooling*, and *Cohab*[12] (positive) and for *Immigrant* (negative), but only *Schooling* and *Immigrant* are of substantial significance in the sense of having a large effect on *Trust*. The labor market variables display a striking picture. It does not seem to matter why they are not working, but people who do not are substantially less trusting, especially if they do house work. *Housework* is also the only statistically significant variable in the panel sample when we include fixed effects, but again we do not want to overemphasize estimates from the small and potentially unrepresentative panel sample.[13] The variables *Kids*, *City*, *Age*, and *Female* all display statistically insignificant coefficients of negligible size.[14]

Since trust is defined and measured as interpersonal trust in people in general, it is not surprising to find that people who do not work are less trusting. To increase the level of trust people must interact with each other, and for instance housework does not require much interaction with people outside of the family.

[12] Of course marriage, divorce, and cohabitation may be endogenous to trust.
[13] Note also that the amount of variation in the labor market variables is limited, especially when we control for individual fixed effects.
[14] This finding does not change if we also include the square of the variable *Age*.

Table 1. Individual characteristics and trust

	Cross-section	Panel sample without fixed effects	Panel sample with fixed effects
Income	0.133	0.1909	0.083
	(0.024)***	(0.0666)***	(0.146)
Schooling	0.1446	0.1033	-0.1144
	(0.0177)***	(0.0425)**	(0.0676)
Cohab	0.1468	0.0993	0.5686
	(0.0737)*	(0.2442)	(0.4142)
Kids	0.0594	0.2587	-0.3554
	(0.0966)	(0.2647)	(0.3989)
City	0.0443	0.0704	-0.0332
	(0.0687)	(0.2236)	(0.3188)
Unemployed	-0.5503	-0.2003	-0.0404
	(0.1289)***	(0.2619)	(0.5821)
Retired	-0.4126	-0.3467	-0.6145
	(0.1325)***	(0.4869)	(0.5490)
Early Retired	-0.7891	-0.7286	-0.0203
	(0.1845)***	(0.6072)	(0.3078)
Housework	-0.9671	-0.0273	-2.0309
	(0.2734)***	(0.7852)	(0.5120)***
Student	-0.3860	-0.2233	-0.2522
	(0.1837)**	(0.2385)	(0.3211)
Age	0.0030	0.0030	
	(0.0042)	(0.0111)	
Female	0.0318	-0.1376	
	(0.0510)	(0.2406)	
Immigrant	-0.7246	-1.0307	
	(0.1449)***	(0.5614)*	
Time dummies	Yes	Yes	Yes
County fixed effects	Yes	Yes	No
Individual fixed effects	No	No	Yes
R-squared	0.11	0.14	0.14
Observations	2,792	680	680

Notes: Results from linear regressions on Trust, ranging from 0 to 10. Standard errors clustered on counties in parentheses. Results with individual fixed effects are based on 340 individuals who are observed in both 1994 and 1998 and who lived in the same county during these two years. * significant at 10%; ** significant at 5%; *** significant at 1%.

3.2 Income Inequality and Ethnic Heterogeneity

Next, we investigate if different measures of income inequality produce different results. As can be seen in Table 2, no measure of inequality based on gross income attains standard levels of statistical significance, except the 50/10-quotient which is significant at the 10 percent level. The same results hold true for a measure of gross income that includes capital income.

Table 2. Trust and different measures of income inequality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Gini (gross)	-14.7661									
	(14.3698)									
P90-10 (gross)		-0.6042								
		(0.4799)								
P90-50 (gross)			-1.5403		1.9543					
			(2.7962)		(3.3513)					
P50-10 (gross)				-2.0500	-2.5873					
				(1.1814)*	(1.3514)*					
Gini (disp.)						-9.8235				
						(12.9598)				
P90-10 (disp.)							-2.1500			
							(0.9552)**			
P90-50 (disp.)								1.2748		1.3375
								(2.7492)		(3.0877)
P50-10 (disp.)									-5.9870	-5.9927
									(2.3881)**	(2.3974)**
Mean Income (gross)	0.0788	0.0412	0.0325	0.0459	0.0436					
	(0.0644)	(0.0260)	(0.0264)	(0.0263)*	(0.0263)					
Mean Income (disp.)						0.0760	0.0325	0.0213	0.0262	0.0236
						(0.0842)	(0.0309)	(0.0307)	(0.0289)	(0.0296)
Crime	0.0195	0.0548	0.0774	0.0349	0.0347	0.0609	0.0573	0.1099	0.0266	0.0293
	(0.1587)	(0.1277)	(0.1271)	(0.1302)	(0.1277)	(0.1545)	(0.1217)	(0.1189)	(0.1176)	(0.1144)
Population	-5.9870	0.6355	-0.2286	0.5155	0.6356	1.8362	5.4482	2.0865	6.5948	6.3680
	(8.8880)	(5.4707)	(5.4740)	(5.1493)	(4.9280)	(4.5034)	(4.4915)	(4.2475)	(3.9176)	(3.6450)*
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	No	No	No	No	No	No	No	No	No	No
R-squared	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12
Observations	2,792	2,792	2,792	2,792	2,792	2,792	2,792	2,792	2,792	2,792

Notes: Results from linear regressions on Trust, ranging from 0 to 10. Standard errors clustered on counties in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

For disposable income, the 90/10-quiotent displays a negative and statistically significant relationship with Trust at the ten percent level. This seems to be driven by inequality in the lower half of the distribution as the 90/50-quotient is positive and statistically insignificant whereas the 50/10-quotient is negative and statistically significant at the five percent level. Interestingly, including both the 90/50- and the 50/10-quotient results in very similar estimates as when these measures are included separately.

Changes in the 50/10-quotient can have a substantial impact on *Trust*. According to the estimates for disposable income, *Trust* is predicted to decrease by 1.4 units on its 0−10 scale if *P50-10* would increase from its mean of 1.82 to its maximum of 2.05 (in Stockholm). When we use gross income, the impact of *P50-10* is less than half as large. For the Gini coefficient, the impact is much smaller; here an increase from mean to max would reduce *Trust* with 0.5 units, when we use disposable income. Using gross income doubles the impact of *Gini*, but it is still markedly lower than that of *P50-10*.

The results in Table 2 indicate that it is inequality in disposable income that matters the most, suggesting an importance of inequality in consumption opportunities rather than in earnings capacity. It also means that trust could be influenced by means of income redistribution. Not all kind of inequality in disposable income matters though; it is primarily differences between those with low income versus those with median income that affect trust. The Gini coefficient, the measure used exclusively in previous studies, is more weakly related to *Trust* in our sample.

Having investigated different measures of income inequality, we turn to another kind of dissimilarity: ethnic heterogeneity. Previous studies that describe ethnic heterogeneity as a strong determinant of trust have already been mentioned. Note that ethnic heterogeneity is positively correlated with income inequality. In our sample, *P50-10* has a correlation of 0.80 with *Proportion Foreign* and a correlation of 0.87 with *Ethnic Index*.

Table 3 includes six different empirical specifications. Starting with the cross-sectional estimates, we see that *Proportion Foreign* appears to be negatively related to *Trust*, whereas *Ethnic Index* is not, statistically speaking. According to the estimates, an increase in *Proportion Foreign* from the sample mean of 0.13 to the maximum of 0.23 (Stockholm) would reduce *Trust* by about 2.5 units on its 0−10 scale. The same increase in *Ethnic Index*

would only produce a reduction half as big. When we include *Proportion Foreign*, *P90-10* is no longer statistically significant, whereas *P50-10* retains statistical significance only at the ten percent level. The sizes of the cross-sectional inequality coefficients are very similar to the estimates in Table 2.[15] The fact that the estimated coefficients in the panel sample are of the expected signs and do not change much when we include individual fixed effects suggests that unobservable individual characteristics do not bias the cross-sectional estimates.

[15] Table B1 in Appendix B contains corresponding ordered logit estimates. They are fully in line with the estimates in Table 3.

Table 3. Estimates from different specifications of inequality and ethnic heterogeneity

	Estimates for the included ethnic heterogeneity and inequality variables	*Cross-section*	*Panel sample without fixed effects*	*Panel sample with fixed effects*
Specification 1	Proportion Foreign	-30.1969 (13.9554)**	-25.8997 (18.8960)	-22.6797 (21.8570)
Specification 2	Ethnic Index	-16.0610 (10.0746)	-14.3981 (13.7980)	-12.9296 (15.0202)
Specification 3	P90-10	-1.6468 (1.1717)	-1.9324 (2.2536)	-1.4601 (2.5432)
	Proportion Foreign	-27.3073 (14.6229)*	-22.0152 (20.3387)	-19.7778 (22.9697)
Specification 4	P90-50	1.8118 (2.7653)	7.9934 (3.2576)**	10.4324 (3.8603)**
	Proportion Foreign	-30.5372 (13.4539)**	-27.4286 (17.2804)	-24.8632 (19.3059)
Specification 5	P50-10	-5.0166 (2.5949)*	-10.1420 (4.4804)**	-10.5352 (4.6596)**
	Proportion Foreign	-25.1489 (12.8932)*	-14.0450 (17.4223)	-10.7412 (20.9065)
Specification 6	P50-10	-5.0111 (2.6024)*	-9.9029 (4.5059)**	-10.2728 (4.7562)**
	P90-50	1.7755 (3.1925)	7.4196 (2.7746)**	9.9394 (3.4808)***
	Proportion Foreign	-25.4878 (12.3571)*	-15.7437 (16.1076)	-13.1189 (18.8109)
Control variables in each specification	County characteristics	Yes	Yes	Yes
	Individual characteristics	Yes	Yes	Yes
	Time dummies	Yes	Yes	Yes
	County dummies	Yes	Yes	No
	Individual fixed effects	No	No	Yes
	Observations	2,792	680	680
	R-squared	0.11–0.12	0.15	0.16–0.17

Notes: The reported results for measures of ethnic heterogeneity and disposable income inequality in each specification are from linear regressions on Trust which also includes a large set of control variables, as stated in the bottom section of the Table. The column denoted "Cross-Section" displays results based on the full pooled 1994 and 1998 samples, the column denoted "Panel Sample Without Fixed Effects" are results for the 1994–1998 panel without controls for individual fixed effects, and the last column are results for the panel sample when individual fixed effects are controlled for. For instance, Specification 1 and the column "Cross-Section" is a regression on Trust on Proportion Foreign, the county specific variables displayed in Table 2, the individual specific variables displayed in Table 1, plus time and county dummies. Specification 2 for the same column displays the results from the same regression but where Ethnic Heterogeneity is included instead of Proportion Foreign, and so forth. Standard errors allowing for clustering on counties are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

3.3 The Heterogeneity of Trust Formation

Are the trust reducing effects of income inequality and Proportion Foreign stronger for certain people? Alesina and La Ferrara (2002) find an increase in racial heterogeneity to be more trust reducing for people with aversion against inter-racial contacts. Here we ask whether individuals with aversion against inequality are affected differently by increases in income dispersion.

The analysis is based on a question in the Swedish Election Studies where the respondents were asked to give their opinion on income inequality. The answers were given on a 1 to 5 scale, with 1 denoting strong aversion against inequality. In the panel sample, we use aversion against income inequality expressed in 1994 to avoid that attitudes are influenced by income changes between 1994 and 1998. We have tried dividing the 1 to 5 scale in various ways and the striking pattern, reported in Table 4, is that *P50-10* only affects *Trust* for people with a strong aversion against income differentials. Surprisingly, *P90-50* displays a positive and sometimes statistically significant relationship with *Trust* among people without a strong aversion against income differentials.[16]

[16] We have also investigated if the effects under study are different for people who are negative to a "multicultural society". People who are not sympathetic to such a society do not seem to react much to income inequality, instead the estimated effect of *Proportion Foreign* is strong and statistically significant at the ten percent level in all regressions. However, since this difference reverses when we use our panel, it is hard to reach a conclusion. Similarly we have compared people who oppose and do not oppose admitting more refugees to Sweden. Here, there are no clear differences between the groups. The results are available upon request.

Table 4. Determinants of trust among people with and without a strong aversion against income differentials

		Cross-section		*Panel sample without fixed effects*		*Panel sample with fixed effects*	
	Estimates for the included ethnic heterogeneity and inequality variables	*Strong aversion*	*Not strong aversion*	*Strong aversion in 1994*	*Not strong aversion in 1994*	*Strong aversion in 1994*	*Not strong aversion in 1994*
Specification 1	P90-10	-7.4411	1.7340	-5.4968	3.1740	-6.7497	3.7381
		(2.0232)***	(1.6369)	(5.2506)	(2.3028)	(4.8939)	(2.4502)
	Proportion Foreign	-19.6464	-26.9849	36.0747	-57.5622	18.6887	-56.1050
		(24.2547)	(18.0371)	(50.4904)	(14.6598)***	(46.4452)	(17.3234)***
Specification 2	P90-50	-9.7362	5.5370	5.2296	10.7423	0.6923	13.5769
		(6.9273)	(4.2535)	(10.2644)	(4.6454)**	(10.8646)	(5.3370)**
	Proportion Foreign	-30.0234	-24.7203	31.9429	-51.5128	18.6499	-48.3708
		(28.0113)	(15.8397)	(49.1906)	(11.2315)***	(45.2081)	(14.6493)***
Specification 3	P50-10	-14.3103	1.0319	-17.1156	0.2725	-18.3071	-0.1219
		(3.5592)***	(3.5748)	(9.8125)*	(4.2109)	(7.9552)**	(3.8707)
	Proportion Foreign	-19.4498	-24.9239	34.6849	-49.8622	13.5737	-46.6293
		(23.2405)	(18.9706)	(49.3728)	(14.9940)***	(45.9482)	(19.1602)**
Specification 4	P50-10	-13.9256	1.2179	-17.6868	1.2024	-18.6121	0.8363
		(3.6545)***	(3.4948)	(9.6738)*	(4.3924)	(7.8415)**	(4.1481)
	P90-50	-7.8766	5.6248	8.2602	10.8964	4.1322	13.6678
		(7.1740)	(4.1286)	(10.4930)	(4.8329)**	(9.5774)	(5.4815)**
	Proportion Foreign	-17.7545	-26.0524	32.4172	-53.3705	12.2755	-49.6934
		(23.1058)	(17.5937)	(48.6256)	(14.1577)***	(45.1974)	(16.0080)***
Control variables in each specification	County characteristics	Yes	Yes	Yes	Yes	Yes	Yes
	Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
	Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
	County dummies	Yes	Yes	Yes	Yes	No	No
	Individual fixed effects	No	No	No	No	Yes	Yes
	Observations	786	1,955	172	488	172	488
	R-squared	0.15	0.12	0.33–0.34	0.16	0.19–0.23	0.20–0.21

Notes: The reported results for measures of ethnic heterogeneity and disposable income inequality in each specification are from linear regressions on Trust which also includes a large set of control variables, as stated in the bottom section of the table. The columns denoted "Cross-Section" displays results based on the pooled 1994 and 1998 samples, the columns denoted "Panel Sample Without Fixed Effects" are results for the 1994–1998 panel without controls for individual fixed effects, and the last two columns are results for the panel sample when individual fixed effects are controlled for. Results with individual fixed effects are based on 117 and 223 individuals, respectively, observed in both 1994 and 1998 and living in the same county during these two years. Standard errors clustered on counties are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

3.4 Causality

A serious concern in our investigation is the risk of reverse causality or simultaneity between income inequality and trust. In fact, one reason for the large interest in trust is that trusting societies appear to do well in almost any dimension. Several studies interpret such relationships as causal effects of trust. In line with this, Alesina and La Ferrara (2002) warn us of the possibility that trusting communities may offer better opportunities for the poor. As an explanation, they mention that risk sharing and informal credit transactions may be more common if people trust each other.

As a first tentative check of this, we estimate quantile income regressions where we include aggregate and individual trust as explanatory variables. The results, which are reported in Table B2 in Appendix B, do not indicate any problems of the kind mentioned above. Neither at the 10^{th} nor at the 90^{th} percentile do people have higher income in counties with higher average trust.

As a more thorough check of potential bias in our inequality estimates, we next turn to two stage least squares where we treat inequality and mean income as endogenous variables. Our empirical strategy is to take advantage of the fact that international demand for Swedish manufacturing goods in 1994 and 1998 affected counties differently depending on their industrial structure. International demand qualifies as an instrument as it is clearly exogenous and is not expected to have a direct effect on trust.[17]

It is clear that international demand may affect individual disposable income through wages, employment, and potentially through changes in local taxes and welfare policies. It is also likely that these effects differ across individuals which in turn will alter the income distribution. For instance, if individuals with low levels of education, and thus with lower income, are overrepresented in export industries, increases in international demand will increase wages and employment the most among the low educated and thus reduce income inequality.

[17] A potential objection to using this instrument is that international demand is related to globalization, and globalization may have a positive effect on trust through the emergence of a network society. However, as far as a network society resembles participation in associational activities, there is little reason to expect an effect on trust (see footnote 2).

In order to capture the heterogeneous effects on income in the best possible way, in a first step, we use our rich micro data from the LINDA-database (which we used to construct our original inequality measures) and estimate equations where an individual's income relative to the income at the 10^{th} and 50^{th} percentile, respectively, constitute the dependent variables. The regressors in these regressions are the individual and county characteristics present in our trust equation, plus interaction-terms between the individual characteristics and our measures of international demand. The estimated equations are then used to predict percentiles quotients. To obtain county mean income, we use the same right hand side variables, but use individual income as dependent variable. In the second step of this 2SLS procedure, we use the obtained exogenous measures of income inequality and mean income in our trust equations.

In detail, in a first step our instruments are derived from

$$(2) \qquad \ln D_{j,t} = \sum_{m} \omega_{j,m} \ln V_{j,m,t} ,$$

where $\omega_{j,m}$ is industry j's (manufacturing industries, $j = 31, 32, ..., 38$, SNI69 industry classification) average share of export going to country m 1994–1998, and $V_{j,m,t}$ is real value added for industry j in country m (i.e. a measure of domestic demand in country m) in $t = 1994, 1998$, obtained from the OECD industrial database STAN, where the m countries are Sweden's 13 main trading partners; see Carlsson *et al.* (2006) for further details on how (2) is constructed.[18] [19]

In a second step we construct the variables *ID31*, *ID32*, … , *ID38* by, for each industry and year separately, multiplying (2) by the share of individuals in each county working in the corresponding industry. That is, for the variable *ID31*

[18] We are grateful to Mikael Carlsson for providing these measures. Sweden's 13 main trading partners are Germany, France, Italy, the Netherlands, Belgium, UK, Denmark, USA, Canada, Japan, Norway, Finland and Austria; these countries absorb around 80 percent of Sweden's exports.

[19] Note that even though $V_{j,m,t}$ is an approximation for domestic demand within county m – as it may also be affected by country m's exports – it is still exogenous for Swedish counties since these are too small to be able to induce a change in $V_{j,m,t}$. Indeed, even the whole of Sweden is a small open economy, usually considered to have no effect on international trade in terms of quantities and prices.

(3) $$ID31_{c,t} = \eta_{c,31} \ln D_{31,t},$$

where $\eta_{c,31}$ is the share of individuals in county *c* working in industry 31 in 1990. The other seven instruments are constructed in the corresponding way. The employment shares for each county correspond to the year 1990 and are obtained from LINDA.[20]

The dependent variable in our first stage regression is constructed as

(4) $$YP10_{i,t,c} = \frac{Y_{i,t,c}}{Y_{P10,t,c}},$$

where $Y_{i,t,c}$ is disposable income for individual *i* living in county *c* in year *t* (1994 or 1998), $Y_{P10,t,c}$ is disposable income at the 10th percentile in county *c* in year *t*, and $YP10_{i,t,c}$ is hence individual income relative to the 10th percentile, for individual *i* living in county *c* in year *t*.

Based on micro data from LINDA, the first stage regression is

(5) $$\begin{aligned} YP10_{i,t,c} &= \boldsymbol{\beta}'\mathbf{X}_{i,t,c} + \boldsymbol{\gamma}_1'(ID31_{c,t} \cdot \mathbf{X}_{i,t,c}) + \boldsymbol{\gamma}_2'(ID32_{c,t} \cdot \mathbf{X}_{i,t,c}) + ... + \boldsymbol{\gamma}_8'(ID38_{c,t} \cdot \mathbf{X}_{i,t,c}) \\ &+ \boldsymbol{\eta}'\mathbf{ID} + \boldsymbol{\theta}'\mathbf{W}_{c,t} + \boldsymbol{\delta}'\mathbf{Z}_c + \tau_t + \nu_{i,t,c} \end{aligned},$$

where the vector $\mathbf{X}$ contains a quartic in age, five education attainment dummies, dummies for kids, females, immigrants, cohabitants, and labor market status (in the same way as in our trust equations).[21] The vectors $ID31_{c,t} \cdot \mathbf{X}_{i,t,c}$, $ID32_{c,t} \cdot \mathbf{X}_{i,t,c}$, and so forth, capture heterogeneous effects from international demand and contain interactions between the instruments and the controls for individual characteristics. For instance, these interactions will allow international demand to affect the connection between disposable income and education differently across counties depending on the share of individuals working in each export

[20] Employment shares corresponding to SNI69 are only available up to 1992. We use shares for 1990 rather than for 1991 or 1992 as the deep economic crisis in Sweden during these years punctured domestic demand.

[21] There is no information in LINDA on whether an individual lives in a city or not. However, the variable *City* is always far from being significant in our trust equations. As a robustness check we have also estimated our trust equations without *City* and found that this does not matter for any of our results, indicating that our county dummies captures all constant regional effects that matters. Hence, leaving *City* out of equation (5) is very unlikely to matter for our results.

industry. The vector **ID** contains our measures of international demand ($ID31_{c,t}$, $ID32_{c,t}$ etc). The vector **W** contains the time-varying county-variables for crime rates, proportion foreign born, and the log of the population in the county, corresponding to the variables in our trust equations. The vector **Z** contains county dummies, and τ_t is a year dummy.

Based on the estimates from equation (5), we predict $YP10_{i,t,c}$ for all included individuals. The predicted value located at the 50th and 90th percentile in each county is used as our exogenous measure of the 50/10- and 90/10-quotients, respectively. To obtain the 90/50-quotient, we use the same procedure but replace the denominator in equation (4) with the income corresponding to the 50th percentile and then estimate (5) with this measure as the dependent variable.[22] To obtain an exogenous measure of mean county income, we use disposable income as the dependent variable in (5) and then calculate mean income based on the predicted values.[23]

In the second stage, the obtained exogenous measures of county inequality and mean income are used as regressors in our trust equations. In this stage, the OLS standard errors are inappropriate as they do not take account of the additional uncertainty introduced by the first stage estimation of equation (5). However, suitable standard errors can be obtained through bootstrapping (see Efron and Tibshirani, 1993, for instance).[24]

To obtain bootstrapped standard errors, we generate a new sample for equation (5) of the same size by randomly drawing individuals with replacement from the original LINDA-sample. This is a bootstrap-sample where some of the individuals may appear more than once, and some may be absent. Based on the bootstrap-sample, we re-construct our dependent variables according to equation (4), re-estimate the different versions of equation (5), and predict the inequality measures and mean income as described above. The resulting predictions together with our variables from the Election Studies make up a sample for our trust equations. We generate 200 samples this way, the suitable number of bootstrap-replications according to Efron and Tibshirani (1993). For each of these 200 samples, we

[22] Note that international demand has different impacts on inequality across counties due to its interaction with individual characteristics in equation (5).
[23] Note that we do not use the log of income since we then would have to perform a non-linear transformation to obtain mean income which would cause our trust-estimates to be biased, see Cameron and Trivedi (2005) for instance.
[24] Also see Knaap (2005) for a similar application.

generate 200 new bootstrap-samples by randomly drawing with replacement. Estimating a trust equation on the resulting data produce 40,000 parameter estimates for each variable, from which the standard error of the regressors can be directly observed.[25]

Our sample for the first stage estimation, i.e. equation (5), invokes 310,443 individuals and 127 variables. Due to the large set of estimates, these results are available on request. An F-test strongly rejects the hypothesis that the variables for international demand are all equal to zero. R-squared for equation (5) is around 0.04.

Table 5 contains the resulting estimates for our instrumented measures of income inequality and mean income together with the bootstrapped standard errors. The estimates of interest are very close to the OLS estimates in Table 3. The coefficient of *P50-10* is actually more negative in the 2SLS specification, although the level of statistical significance is about the same due to the larger bootstrapped standard error. The statistically insignificant *P90-10* coefficient is remarkably close to its counterpart in Table 3 (and neither of them is statistically significant), whereas the (positive) *P90-50* coefficient is twice as large as in Table 3, but still statistically insignificant since its standard error has increased by an even larger factor. Our conclusion is that the 2SLS estimates confirm our previous findings on the relationship between inequality and trust.

[25] As it turns out, bootstrapped standard errors for our instrumented variables are near 1.5 times the (invalid) OLS standard errors, indicating that the additional uncertainty introduced by equation (5) is reasonably small. We report only bootstrap-standard errors.

Table 5. Determinants of trust: 2SLS estimates

	(1)	(2)	(3)
P50-10	-7.6062		
	(4.5200)*		
P90-10		-1.6480	
		(3.7630)	
P90-50			3.5734
			(8.4333)
Proportion Foreign	-21.6167	-31.1142	-31.7462
	(18.7819)	(18.3048)*	(17.3484)*
Mean Income	0.1348	0.0618	0.0336
	(0.0727)*	(.0634)	(0.0688)
Crime	-0.0594	0.0566	0.0773
	(0.1758)	(0.1609)	(0.1494)
Population	8.3550	6.8347	4.6900
	(5.5204)	(5.9656)	(4.2696)
Observations	2,792	2,792	2,792

Notes: The dependent variable is Trust. The inequality measures P50-10, P90-10, P90-50, and mean income have been instrumented. Bootstrapped standard errors based on 200x200 replications in parentheses; see the text for details. * significant at 10%; ** significant at 5%; *** significant at 1%.

4. Discussion and Concluding Remarks

To sum up our empirical results, we find that *P50-10* and *Proportion Foreign* display sizeable negative relationships with *Trust*. It is also worth noting that the point estimates of *P90-50* are in contrast generally positive, but closer to zero and statistically insignificant. The widely used Gini coefficient is more weakly related to *Trust*. Its estimated effect on *Trust* is smaller than that of *P50-10*, and it is not statistically significant. Moreover, the effect of income inequality is primarily found among people with strong aversion against income differentials. The choice of measures clearly appears to matter.

In light of Sweden's fairly low level of economic inequality, our investigation can be seen as a tough test of the relationship between inequality and trust. For this reason, our results are probably generalizable, and can perhaps even be stronger in countries with higher economic inequality, such as the United States. On the other hand, the finding that income inequality brings about a stronger reduction in trust among people who would like to see a more even distribution of income should not be discarded as self-evident. Compared with many other countries, Sweden has not only quite low economic inequality, but also an undeniably egalitarian political tradition. Thus Sweden's high level of trust could decline substantially

should the lower half of the income distribution become more unequal.[26] Compared with Sweden, only half as many people in the U.S. believe that most people can be trusted (Inglehart *et al*., 2004). Given the lesser political saliency of income inequality in the U.S., it is not fully convincing to argue that the difference in trust is simply due to greater income inequality in this country.[27]

This "absolute" interpretation is however not the only possibility. By further studying other countries, and perhaps especially the U.S., we can figure out if behavioral differences between people of conflicting opinions are "absolute" and thus more pronounced in some countries, or more "relative" and thus prevalent in most or all countries. The answer is crucial when evaluating results from cross-country regressions, which have so far been relatively common in the trust literature, as well as when conducting studies on single countries.

In any case, one should note that most of the 1970–1990 action in the U.S. wage distribution has occurred at the lower half (Katz and Autor, 1999; Cahuc and Zylberberg, 2004). As shown by for instance Juhn *et al*. (1991), males in the lower half of the wage distribution continuously received lower real wages in this period, whereas those in the upper half had about constant real wages. Thus, changes in the Gini have mostly been driven by changes in the lower half of the U.S. income distribution, and this could explain Alesina and La Ferrara's (2002) finding that income inequality is negatively related to trust. At the same time, their use of the Gini coefficient instead of the 50/10-quotient could explain why they get statistically insignificant results for this variable when they add racial heterogeneity to their model. Future research should use U.S. data to investigate if the 50/10-quotient outperforms the Gini coefficient in this regard.

We finally hope that our results will give rise to new and refined questions about the processes in which trust emerges. Much work remains to be done since the social mechanisms appear to be more involved than previous studies have been willing to assume. Not least, the different responses to inequality in the bottom and top half of the income distribution should merit consideration in future studies.

[26] This, of course, assumes that the distaste for inequality stays constant.
[27] When both Swedes and Americans in the 1990 World Values Survey were asked about their views on "We need larger income differences as incentives for individual effort" the answers were close although the levels of income inequality are clearly different. An extra four percentage points of Americans (62 against 58 per cent) strongly agreed with the quoted statement (Inglehart *et al*., 2004).

References

Aghion, P., E. Caroli, and C. García-Peñalosa (1999), "Inequality and Economic Growth: The Perspective of the New Growth Theories", *Journal of Economic Literature* 37(4), 1615–1660.

Alesina, A. and E. La Ferrara (2000), "Participation in Heterogeneous Communities", *Quarterly Journal of Economics* 115(3), 847–904.

Alesina, A. and E. La Ferrara (2002), "Who Trusts Others?", *Journal of Public Economics* 85(2), 207–234.

Bjørnskov, C. (2005), "Social Trust and the Growth of Schooling", chapter 2 in *Investigations in the Economics of Social Capital*, PhD Thesis, Aarhus School of Business.

Cameron, C. and P. Trivedi (2005), *Microeconometrics: Methods and Applications*, New York: Cambridge University Press.

Cahuc, P. and A. Zylberberg (2004), *Labor Economics*, Cambridge, MA: The MIT Press.

Carlsson, M., S. Eriksson, and N. Gottfries (2006), "Testing Theories of Job Creation: Does Supply Creates Its Own Demand?", Working Paper 2006:7, Department of Economics, Uppsala University.

Chamberlain, G. (1980), "Analysis of Covariance with Qualitative Data", *Review of Economic Studies* 47(1), 225–238.

Claibourn, M. and P. Martin (2002), "Trusting and Joining? An Empirical Test of the Reciprocal Nature of Social Capital", *Political Psychology* 22, 267–291.

Coleman, J. (1988), "Social Capital in the Creation of Human Capital", *American Journal of Sociology* 94, S95–S120.

Delhey, J. and K. Newton (2003), "Who Trusts? The Origins of Social Trust in Seven Societies", *European Societies* 5, 93–137.

Edin, P.-A. and P. Fredriksson (2000), "LINDA – Longitudinal Individual Data for Sweden", Working Paper 2000:19, Department of Economics, Uppsala University.

Efron, B. and R. Tibshirani (1993), *An Introduction to the Bootstrap*, Mongraphs on Statistics and Applied Probability, vol 57, New York and London: Chapman and Hall.

Ferrer-i-Carbonell, A. and P. Frijters, (2004), "How Important is Methodology for the Estimates of the Determinants of Happiness?", *Economic Journal* 114(497), 641–659.

Glaeser, E., D. Laibson, J. Sheinkman, and C. Soutter (2000), "Measuring Trust", *Quarterly Journal of Economics* 115(3), 811–846.

Hamermesh, D.S. (2001), "The Changing Distribution of Job Satisfaction", *Journal of Human Resources* 36(1), 1–30.

Hooghe, M. and D. Stolle (eds.) (2003), *Generating Social Capital: Civil Society and Institutions in Comparative Perspective*, New York, NY: Palgrave Macmillan.

Inglehart, R. M. Basañez, J. Diez-Medrano, L. Halman, and R. Luijkx (2004), *Human Beliefs and Values: A Cross-Cultural Sourcebook Based on the 1999-2002 Values Surveys*, Mexico City: Siglo XXI Editores.

Juhn, V., K. Murphy, and R. Topel (1991), "Why Has the Natural Rate of Unemployment Increased over Time?", *Brookings Papers of Economic Activity* 2, 75–126.

Knaap, T (2005), "Trade, Location, and Wages in the United States", Discussion Paper Series 05-30, Tjalling C.Koopmans Research Institute.

Katz, L. and D. Autor (1999), "Changes in the Wage Structure and Earnings Inequality", in O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics*, Vol. 3A, Amsterdam: North-Holland.

Knack, S. and P. Keefer (1997), "Does Social Capital Have an Economic Payoff? A Cross-country Investigation", *Quarterly Journal of Economics* 112(4), 1252–1288.

Knack, S. and P. Zak (2002), "Building Trust: Public Policy, Interpersonal Trust, and Economic Development", *Supreme Court Economic Review* 10, 91–107.

La Ferrara, E. (2002), "Inequality and Group Participation: Theory and Evidence from Rural Tanzania", *Journal of Public Economics* 85(2), 235–273.

Leigh, A. (2006), "Trust, Inequality and Ethnic Heterogeneity", *Economic Record* 82, 268–280.

Persson, T. and G. Tabellini (1994), "Is Inequality Harmful for Growth?", *American Economic Review* 84(3), 600–621.

Putnam, R. (1993), *Making Democracy Work*, Princeton: Princeton University Press.

Putnam, R. (2000), *Bowling Alone: The Collapse and Revival of American Community*, New York: Simon and Schuster.

Rothstein, B. and D. Stolle (2002), "How Political Institutions Create and Destroy Social Capital: An Institutional Theory of Generalized Trust", paper presented at the 98th meeting of the American Political Science Association in Boston, MA, August 29 – September 2.

Rothstein, B and D. Stolle (2003), "Social Capital and the Impartiality of the Welfare State: An Institutional Approach", In *Generating Social Capital: Civic Society and Institutions in Comparative Perspective*, edited by M. Hooghe and D. Stolle, New York: Palgrave Macmillan, 191–210.

Uslaner, E. (2002), *The Moral Foundations of Trust*, Cambridge: Cambridge University Press.

Uslaner, E. (2003), "Trust, Democracy and Governance: Can Government Policies Influence Generalized Trust?", In *Generating Social Capital: Civic Society and Institutions in Comparative Perspective*, edited by M. Hooghe and D. Stolle, New York: Palgrave Macmillan, 171−190.

Wooldridge, J.M. (2002), *Econometric Analysis of Cross Section and Panel Data*, Cambridge: The MIT Press.

Wollebaek, D. and P. Selle (2002), "Does Participation in Voluntary Associations Contribute to Social Capital? The Impact of Intensity, Scope, and Type", *Nonprofit and Voluntary Sector Quarterly* 31, 32–61.

Zak, P.J. (2005), "Trust: A Temporary Human Attachment Facilitated by Oxytocin", *Behavioral and Brain Sciences* 28(3), 368─369.

Zak, P.J. and S. Knack (2001), "Trust and Growth", *Economic Journal* 111(470), 291−321.

Appendix A. Variable Specifications and Descriptive Statistics

Variable	Definition	# obs	Mean	Std dev	Min	Max	Source
Trust	Individual trust in people in general (0-10)	2,792	6.26	2.20	0	10	SES
Gini	Gini index of the distribution of disposable income	2,792	0.25	0.03	0.21	0.30	LINDA
P90-10	Ratio of the 90^{th} over the 10^{th} percentile of disposable income	2,792	2.83	0.30	2.38	3.39	LINDA
P90-50	Ratio of the 90^{th} over the 50^{th} percentile of disposable income	2,792	1.56	0.07	1.46	1.70	LINDA
P50-10	Ratio of the 50^{th} over the 10^{th} percentile of disposable income	2,792	1.81	0.11	1.62	2.05	LINDA
Proportion Foreign	Share of people in the county who are born abroad	2,792	0.13	0.05	0.04	0.23	LINDA
Ethnic Index	Index of ethnic fragmentation	2,792	0.11	0.06	0.03	0.21	LINDA
Age	Age in years	2,792	45.75	16.70	18	80	SES
Income	Gross income (register-based) in 100,000 SEK	2,792	1.68	1.22	0	15.64	SES
Schooling	Years of education	2,792	11.32	2.73	7	15	SES
Female	Dummy variable coded one for females	2,792	0.46	0.50	0	1	SES
Immigrant	Dummy variable coded one for people who are not born as Swedish citizens	2,792	0.06	0.24	0	1	SES
Cohab	Dummy variable coded one for people who are married or who are living with a partner	2,792	0.68	0.47	0	1	SES
Kids	Dummy variable coded one for people who have children living at home	2,792	0.32	0.47	0	1	SES
City	Dummy variable coded one for people living in a city or in a densely populated area	2,792	0.58	0.49	0	1	SES
Unemployed	Dummy variable coded one for people who are unemployed or who participate in labor market programs	2,792	0.08	0.27	0	1	SES
Retired	Dummy variable coded one for people who are retired	2,792	0.17	0.37	0	1	SES
Early Retired	Dummy variable coded one for people who have been granted early retirement	2,792	0.05	0.21	0	1	SES
Housework	Dummy variable coded one for people who work at home	2,792	0.01	0.09	0	1	SES
Student	Dummy variable coded one for students	2,792	0.08	0.27	0	1	SES
Crime	Number of reported crimes per 100 inhabitants	2,792	12,885	3,038	7,398	18,458	BRÅ
Mean Income	Mean disposable income in the county, 1,000 SEK	2,792	139,594	10,438	117,778	162,121	LINDA
Population	The log of the county's population	2,792	13.27	0.90	10.96	14.39	SCB

Notes: SES = Swedish Election Studies; LINDA = LINDA and authors' own calculations; BRÅ = The Swedish National Council for Crime Prevention; SCB = Statistics Sweden. The Swedish Social Science Data Service (SSD) has made the data from the SES available. The SES data were originally collected in a research project at the Department of Political Science at Göteborg University, under the guidance of Sören Holmberg and Mikael Gilljam. Neither SSD nor the primary researchers are responsible for the analyses presented in this paper.

Appendix B. Additional Empirical Specifications

Table B1. Ordered logit estimates for different specifications of inequality and ethnic heterogeneity

	Estimates for the included ethnic heterogeneity and inequality variables	*Cross-section*	*Panel sample without fixed effects*	*Panel sample with fixed effects*
Specification 1	Proportion Foreign	-27.1997 (12.0077)**	-33.7406 (21.2334)	-12.2982 (18.8853)
Specification 2	Ethnic Index	-14.3507 (8.7278)	-21.3620 (15.1536)	-7.8553 (12.4554)
Specification 3	P90-10	-1.0968 (1.0814)	-2.9501 (3.1612)	-3.7050 (2.2472)*
	Proportion Foreign	-25.1343 (12.7529)**	-26.8348 (23.0178)	-4.5338 (20.2390)
Specification 4	P90-50	2.3042 (2.4243)	8.5242 (3.6573)**	2.4209 (3.9966)
	Proportion Foreign	-27.7147 (11.4297)**	-35.8030 (19.0935)*	-12.8632 (18.3031)
Specification 5	P50-10	-3.9669 (2.3611)*	-13.9569 (5.5200)**	-11.6480 (4.7120)**
	Proportion Foreign	-23.0718 (11.5570)**	-15.4294 (18.7663)	1.7435 (16.9924)
Specification 6	P50-10	-3.9434 (2.3461)*	-13.6355 (5.6886)**	-11.6139 (4.7750)**
	P90-50	2.2325 (2.7241)	7.3447 (2.8195)***	1.7860 (2.8864)
	Proportion Foreign	-23.5950 (10.9817)**	-17.6985 (17.0580)	1.3487 (16.5884)
Control variables in each specification	County characteristics	Yes	Yes	Yes
	Individual characteristics	Yes	Yes	Yes
	Time dummies	Yes	Yes	Yes
	County dummies	Yes	Yes	No
	Individual fixed effects	No	No	Yes
	Observations	2,792	516	516
	Pseudo R2	0.03	0.04	0.16–0.17

Notes: This table should be compared with Table 3. The reported results for measures of ethnic heterogeneity and disposable income inequality in each specification are from an ordered logit which includes a large set of control variables, as stated in the bottom section of the Table. The column denoted "Cross-Section" displays results based on the full pooled 1994 and 1998 samples, the column denoted "Panel Sample Without Fixed Effects" are results for the 1994−1998 panel without controls for individual fixed effects, and the last column are results for the panel sample when individual fixed effects are controlled for (as described in Appendix C). For instance, Specification 1 and the column "Cross-Section" is an ordered logit with Trust as dependent variable and the following explanatory variables: Proportion Foreign, the county specific variables displayed in Table 2, the individual specific variables displayed in Table 1, plus time and county dummies. Specification 2 for the same column displays the results from the same ordered logit but where Ethnic Heterogeneity is included instead of Proportion Foreign, and so forth. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table B2. Income quantile regressions

	90th percentile	10th percentile	Estimates for the 90th percentile minus estimates for the 10th percentile
Mean trust	-0.0382	-0.0510	0.0128
	(0.0713)	(0.1596)	(0.1589)
Trust	0.0201	0.0329	-0.0129
	(0.0079)**	(0.0148)**	(0.0142)
Schooling	0.0529	0.0102	0.0427
	(0.0068)***	(0.0154)	(0.0176)**
Age	0.0697	0.2982	-0.2285
	(0.0102)***	(0.0188)***	(0.0198)***
Age squared	-0.0006	-0.0030	0.0024
	(0.0001)***	(0.0002)***	(0.0002)***
Female	-0.3965	-0.2640	-0.1325
	(0.0293)***	(0.0592)***	(0.0624)**
Cohab	0.0184	0.0749	-0.0566
	(0.0337)	(0.0751)	(0.0923)
Kids	-0.0325	0.1397	-0.1722
	(0.0376)	(0.0663)**	(0.0724)**
Immigrant	-0.0582	-0.1211	0.0629
	(0.0552)	(0.1391)	(0.1457)
City	0.0474	0.0432	0.0042
	(0.0258)*	(0.0658)	(0.0635)
Time dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	2,050	2,050	2,050

Notes: Log of income is dependent variable. In order to correspond to the sample used for the inequality measures, only individuals aged 20–64 who are not students or old age pensioners are included. Bootstrapped standard errors based on 200 replications in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Appendix C Fixed effects ordered logit

We apply the following panel data model developed in Ferrer-i-Carbonell and Frijters (2004):

$$\begin{aligned} Trust_{it}^{*} &= x_{it}\beta + f_i + \varepsilon_{it} \\ Trust_{it} &= k \Leftrightarrow \lambda_k^i \le Trust_{it}^{*} \le \lambda_{k+1}^i \end{aligned}, \qquad \text{(C1)}$$

where $Trust_{it}^{*}$ is latent, and $Trust_{it}$ is observed trust. This is an ordered logit model with fixed individual effects, f_i, and *individual* specific thresholds, λ_k^i. Ferrer-i-Carbonell and Frijters (2004) show that this set-up allows for a conditional likelihood function where the individual fixed effects have dropped out, thus circumventing the "incidental parameters problem" that otherwise prevents fixed effects in most discrete choice models; see e.g. Wooldridge (2002). Under fairly mild conditions, the resulting estimates of β are consistent and normally distributed.

In practise, the described estimator is the same as Chamberlain's (1980) fixed effects logit model in the sense that the dependent variable is still collapsed into binary variables. The novel part is the individual specific thresholds. To apply the traditional Chamberlain model to ordered multinomial responses, one has to transform the dependent variable to a (0,1) scale depending on whether or not it is higher than a common barrier k (as e.g. Hamermesh, 2001, does). With this method, we could have focused on whether reported trust is higher than 5 or not. With individual specific thresholds, the dependent variable is transformed given an individual specific barrier, k_i. This means that all individuals who report a change in the dependent variable are included in the analysis, which allows a substantially larger part of the original sample to be utilized. Like the classic fixed effects logit, this estimator cannot predict probabilities and marginal effects since they depend on the unknown individual fixed effects.