

Poverty in Denmark

A socioeconomic poverty threshold

Executive Summary

In association with the Think Tank Cevea (www.cevea.dk).

See Danish paper for details.

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Purpose

The purpose of this project is to develop a quantitative model for poverty measurement in Denmark which takes into account social mobility and social heritage. As such the main goal is to define, measure and forecast the poverty development in Denmark, as well as identify and analyse the factors influencing poverty. Furthermore it is the purpose of this paper to inspire the academic fields working with poverty to use sophisticated quantitative statistical models to gain a more detailed picture of poverty.

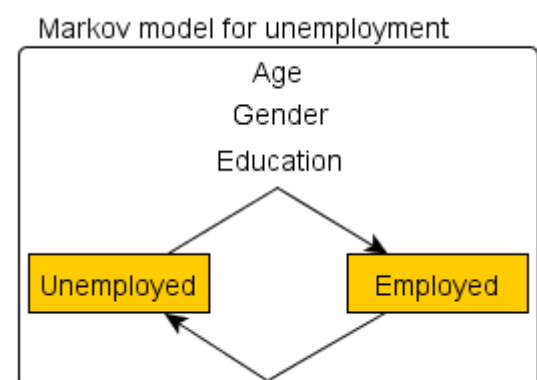
Definition of poverty

The model for our poverty threshold is named SIM (Social Income Mobility Model). SIM classifies all households below the 50% median income as being poor by definition. Meanwhile households between the 50% and 70% median income are classified as poor if and only if after a 5 year period they cannot gain an income above the 70% median income. Finally all the households above the 70% median are classified as non-poor households by definition. With this definition we have explicitly established a poverty threshold which takes into account social mobility, and in effect also social heritage. From a conceptual point of view SIM is extremely simple, however to model it statistically a list of models and assumptions are needed to carry out the calculations for poverty. This is the compromise we make to ensure that the poverty threshold has sociological and political applications in Denmark. Only a conceptually simple poverty threshold, different from the traditionally used median incomes, can have wide influence and application.

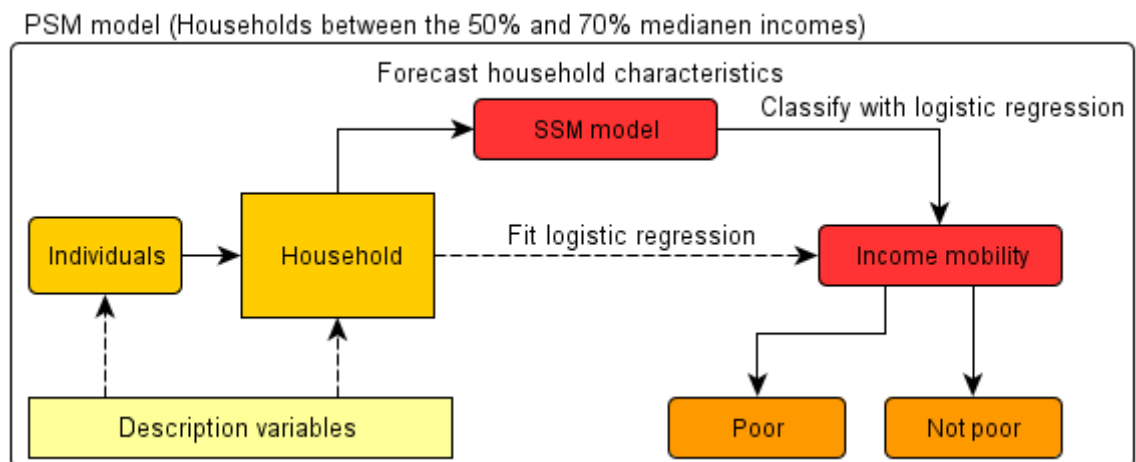
Theoretical definition and assumptions

From our definition of poverty we define two sub models: SSM (*Stochastic Social Mobility Model*) and PSM (*Positive Social Mobility Model*). The SSM model forecasts household characteristics 5 years into the future. That is, given a household with a number of children, number of adults, age of each adult, education of each adult and so forth, it will give a vector of plausible future characteristics of this household with their estimated probabilities. There is only one important exception to this. The SSM model disregards the income of the household and all the individuals. In other words it uses only social characteristics to predict the future state of the household. This is an important aspect of our poverty definition, which ensures that we regard households in the bottom of the income fractiles in just as highly as the households on the verge to earning more than the 70% median income. So the social characteristics determine explicitly whether or not a household is in poverty.

The SSM model is modeled as different markov processes forecasting respectively unemployment status, handicap, child births and education. The first 3 markov models are continuous processes, while the last one for education is discrete. They each control for different relevant factors including age, gender, a priori education status, a priori number of children. So for each of our four characteristics that we are modeling, we have a list of markov models modeling these. To do this we need to assume a range of properties of the poverty processes, mainly that the social processes can be split into categorical states, that the transition between these states follow an exponential distribution, and that the population is homogenous. With these assumptions our estimates are central.



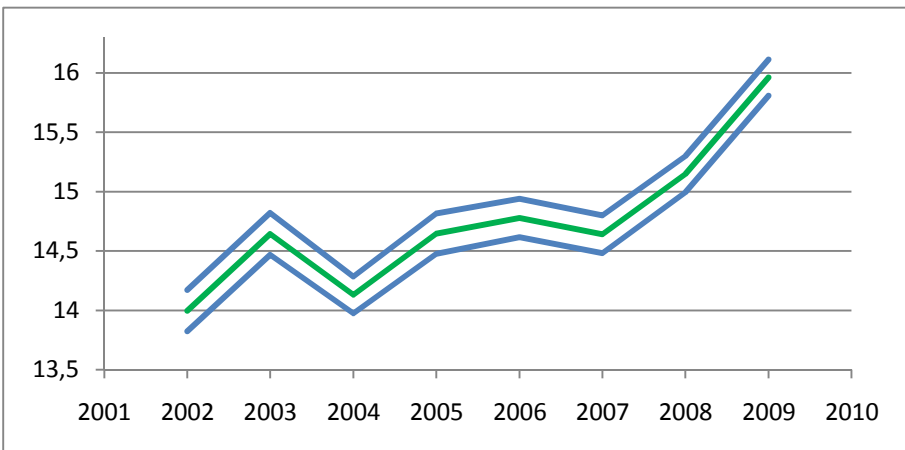
The PSM model is a logistic regression modeling whether or not a household, from its social characteristics, is below or above the 70% median income. It can be realized as the following diagram:



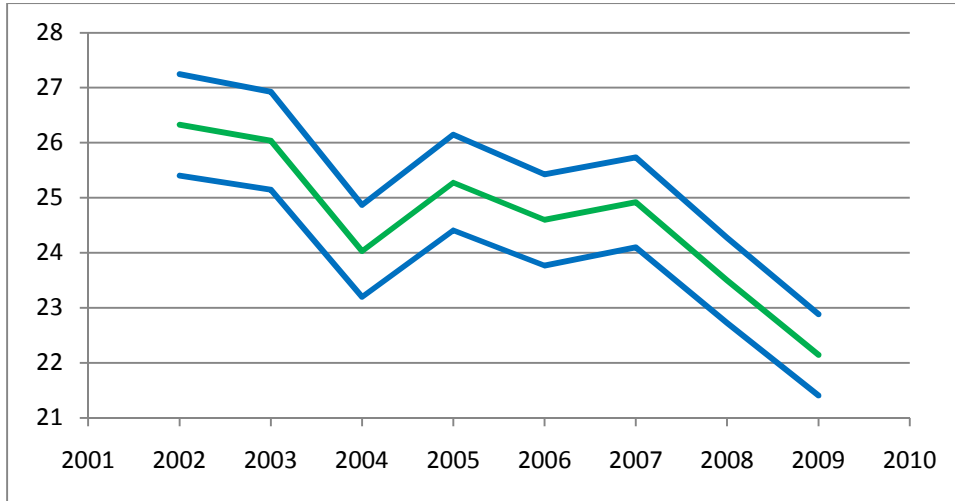
As the diagram shows the logistic regression is fitted for the households before they are forecasted 5 years into the future. This can be seen as a further development of the theoretical work by Chaudhuri et al. ^[1], who shows that with panel data and linear models, one can successfully model the risk of poverty. This is essentially what we are doing with the PSM model. The output for a certain household will be a probability of whether or not that household is in poverty after 5 years. Our final poverty threshold, SIM, will then be the sum of all the probabilities added with the number of households living below the 50% median income. To gain the most applicability we choose to fit it for our data for the year 2009. This should be viewed as reference point in our definition of poverty. However we expect not to have any considerable influence on the final results, as the characteristics influencing poverty are believed to change, but still overlap extensively throughout the years. Among the variables measured in the PSM model are gender, educational level, activity (working, unemployed, student, retired), medically handicapped, ethnic background, fathers education, mothers education, number of people living in household, number of children living in household. Of which the first four variables also apply to the household spouse.

Results

We estimate our SSM model from Eurostat, OECD, LABORTA and Denmark Statistics ^{[4], [5], [6], [7]}, while the PSM model is estimated from both the Luxemburg Income Study data ^[3] and the European Social Survey data ^[2], from 2002, 2004, 2006 and 2008. From the Luxemburg Income study we are able to make deeper analysis of poverty for the single year 2004, while for the European Social Survey data we are able to estimate the poverty development from 2002 to 2009. We now present the main results:



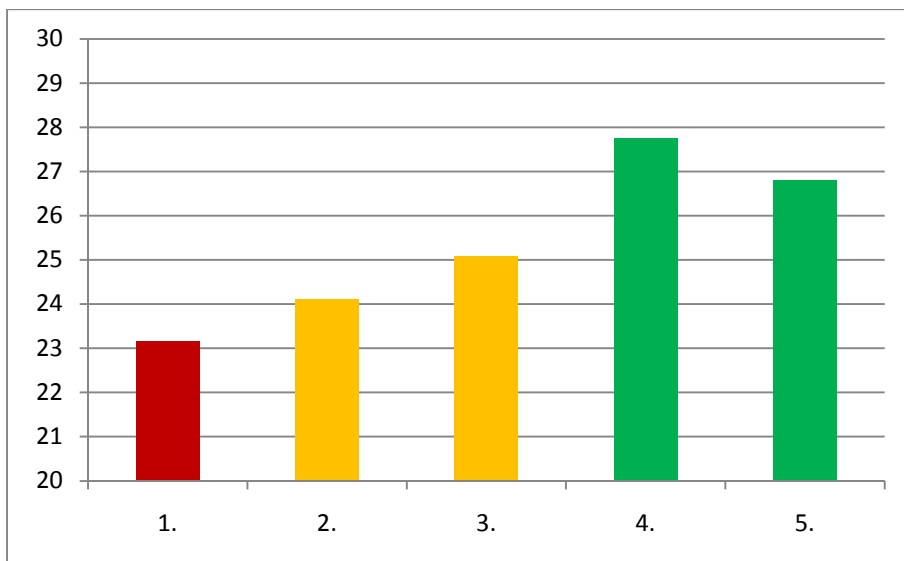
SIM poverty threshold for Denmark from 2002 to 2009 with 80% simultaneous confidence intervals for comparing two different years (ESS)



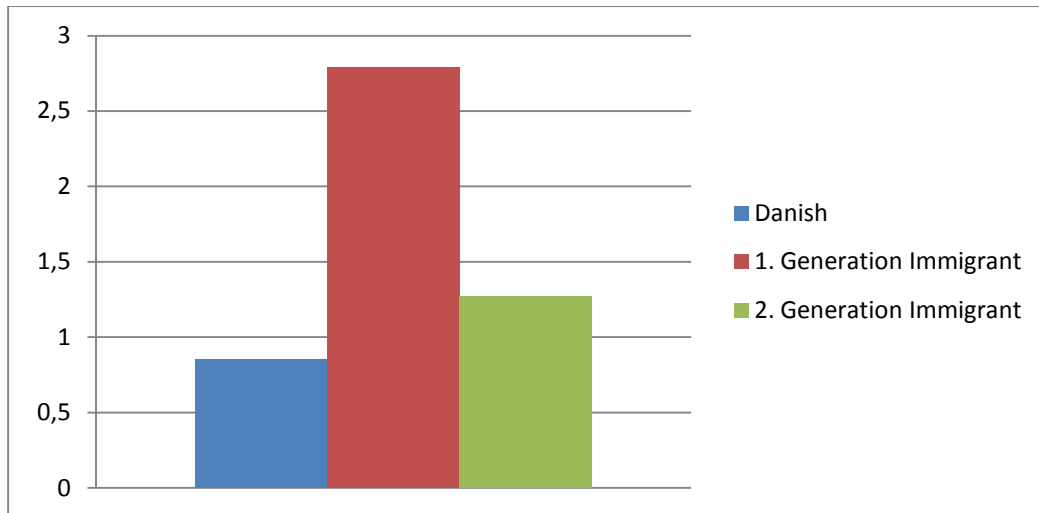
Percentage individuals below 70% median income who escape poverty from 2002 to 2009 with 80% simultaneous confidence intervals for comparing two different years (ESS)



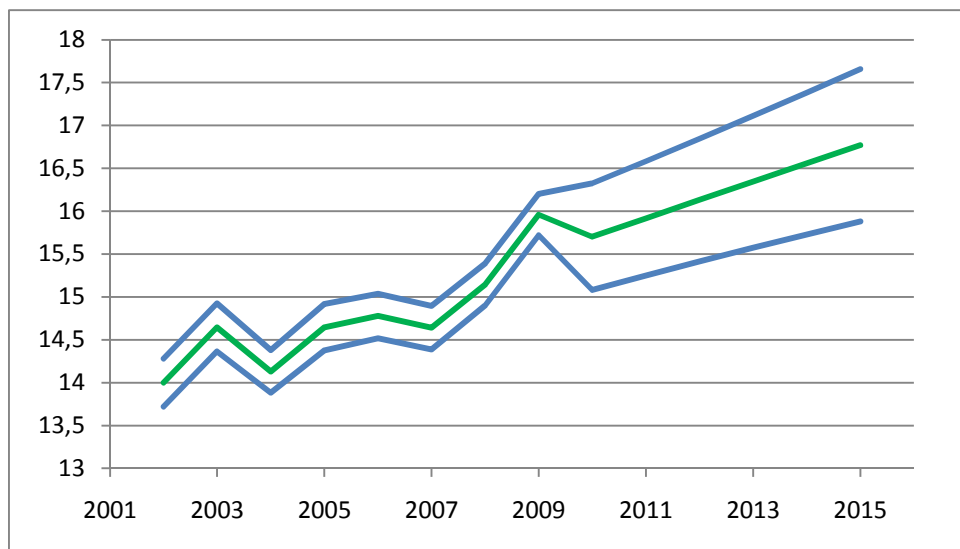
Percentage individuals who gain an income over 70% median income based on household head education for 2009 (ESS)



Percentage individuals who gain an income over 70% median income based on household income quantile for 2004 (LIS)



Ratio of poor people compared to the whole population based on ethnic background of household head for 2004 (LIS)



Linear prediction of SIM poverty threshold for Denmark from 2009 to 2014 with 80% simultaneous confidence intervals for comparing two different years (ESS)

Conclusion

From our new definition of poverty we find that the poverty in Denmark, just like the poverty threshold based on the 50% median income, has increased extensively and statistically significant over the last decade, with an increase of at least 10 percent. This is a huge increase in poverty, with strong indications of further increases, and may therefore require immediate action from the elected political representatives of the Danish government.

Furthermore we have shown that social heritage, educational level, unemployment and ethnicity play a dominant statistically significant role in determining if a family lives in poverty or not, and whether or not they can ever escape it. The poor people tend to be concentrated among families with many children and renters. Lastly the picture gets somewhat more complicated. Currently fewer women than men are living below the 50% median, but our results show that once they are in poverty, their chances of escaping it are far less than that of men. This could be a potentially serious poverty trap.

The project has developed a quantitative poverty threshold which takes into account social mobility and social heritage. With a simple definition of poverty and a list of statistical and sociological assumptions, we have managed to model this poverty threshold successfully with the use of markov models and logistic regression and prior scientific research. Through this model we have managed to measure poverty in Denmark over the last decade, and have so been able to make extensive analysis of the factors influencing poverty. Moreover with our developed statistical theory and the applications of our work, we have created a project which may inspire the academic fields working with poverty to use sophisticated quantitative statistical models to measure poverty in deeper detail.

References

[1] Shubham Chaudhuri, Jyotsna Jalan og Asep Suryahadi, 2002, "Assessing Household Vulnerability to Poverty from Cross-sectional Data: A Methodology and Estimates from Indonesia".

[2] ESS Round 4: European Social Survey (2011): ESS-4 2008 Documentation Report. Edition 4.0. Bergen, European Social Survey Data Archive, Norwegian Social Science Data Services.

ESS Round 3: European Social Survey (2011): ESS-3 2006 Documentation Report. Edition 3.3. Bergen, European Social Survey Data Archive, Norwegian Social Science Data Services.

ESS Round 2: European Social Survey (2011): ESS-2 2004 Documentation Report. Edition 3.3. Bergen, European Social Survey Data Archive, Norwegian Social Science Data Services.

ESS Round 1: European Social Survey (2011): ESS-1 2002 Documentation Report. Edition 6.2. Bergen, European Social Survey Data Archive, Norwegian Social Science Data Services.

[3] The Luxembourg Income Study

[4] OECD Statistics

[5] LABORTA Statistics

[6] Eurostat

[7] Denmark Statistics