Abstract

This paper investigates intergenerational mobility within Denmark, considering which local areas produce higher and lower rates of persistence in income and education choices across generations. Recent research on these aspects of economic and educational mobility has emphasized nationally aggregated measures finding Denmark to have higher mobility than e.g. the US and similar mobility to that of the other Scandinavian countries, while within Denmark, families on the extremes of the income distribution see lower mobility (see e.g. Corak 2006; Jøntti et al. 2006; Landers? and Heckman 2016; Munk et al. 2016). Other research has shown varying degrees of access to higher education as well as horizontal stratification in education choices to be more prevalent in Denmark (Munk and Baklanov, 2014; Munk and Thomsen, 2017).

These lines of research answer questions about intergenerational mobility for the aggregate population, but does not ask questions about spatial distributions of opportunity. Nolan et al. (2011) describe neighbourhoods and their intrinsic communities as an essential factor in explaining social mobility, while Chetty et al. (2014, 2016a,b) have shown that economic mobility and opportunities can differ significantly between neighbourhoods with long term impact on the lives of children in the US. Explanations for neighbourhood effects may partly be found in school quality, diversity, and average economic characteristics of the neighbourhood (Rothwell and Massey, 2015).

In this paper I will add to the existing literature by asking what characterizes the spatial distribution of social mobility in Denmark. In particular, I ask in which areas income mobility is relatively high and low, and in which areas vertical and horizontal mobility in educational choices is stronger. To understand what drives these differences, I will characterize neighbourhoods in terms of structure of the local education system, average income characteristics, ethnic diversity, parental educational diversity, as well as industrial composition.

In an attempt to tease out causal effects I will introduce instrumental variables regressions, using historical characteristics of the neighbourhoods as instruments. To investigate the hypotheses, I make use of Danish register data which is available over the period 1980 to 2015. The dataset allows for linking parents and children and contain individual characteristics such as income and educational attainment in addition to background characteristics such as age and gender. The questions the paper answers, relate intricately to local economic environ-
ments and economic geography, and can aid the understanding of differences in local economic environments.

References:


Finding the Land of Opportunity
Intergenerational Mobility in Denmark

Jesper Eriksen
Department of Business and Management
Aalborg University

January 10, 2018

Abstract

This paper investigates intergenerational mobility within Denmark, considering which local areas produce higher and lower rates of persistence in income across generations. Intergenerational mobility studies have tended to emphasize national level statistics and making international comparison, often finding that Denmark and other Scandinavian countries show higher levels of mobility than such countries as the US and the UK. The paper uses Danish register data from the period 1980-2012. Estimating rank-rank correlations and canonical intergenerational elasticity estimates the paper documents significant differences in mobility between regions in Denmark, comparable to the differences found in the literature between the smallest estimates of mobility in the US and highest estimates of mobility in Denmark. Future developments of the paper include investigating how these regional differences relate to regional characteristics such as local labor markets and industrial structures, social capital, learning cultures, income inequality, as well as educational resources.
1 Introduction

Equal opportunity is a hallmark idea of modern society. The research on intergenerational mobility, which inherently investigates the existence of opportunity, have seen a significant increase in interest within the last 20 years, partly owing to increased availability of multi-generational sample and administrative data, and to research that has shown rising inequalities in income and wealth over time (Atkinson et al., 2011; Piketty, 2014). Several sources provide valuable overviews of national-level mobility estimates, including Blanden (2013), Corak (2006a), Corak (2016), Jäntti et al. (2006), and Torche (2015). In a Danish context income mobility studies remain relatively scarce and tend to emphasize national level statistics (see e.g. Bratsberg et al. 2007, Boserup et al. 2016, Hussain et al. 2009, Landersø and Heckman 2017, and Munk et al. 2016). While most comparative studies suggest that Denmark is better at promoting equal opportunities than for example the US and the UK, little is known about how opportunity varies within Denmark. This paper investigates the variation in mobility by geography in Denmark and adds to a recent strand of the literature on intergenerational mobility (see e.g. Chetty et al. 2014) that has documented large disparities in regional differences in intergenerational mobility in other countries.

Equality of opportunity and intergenerational mobility are related concepts. At its core, equality of opportunity suggests that all individuals have equal possibilities to make out of their life what their preferences, grit, and abilities permit - unaffected of such factors as family background, colour of skin, and the kindergarten they attend. Corak (2006b) lists three different linkages through which parents can influence their children and decrease equality of opportunity. Firstly, family culture and investment in the child can affect its human capital, skills, and perceptions of opportunities. Secondly, parents’ social connections can increase or decrease the likelihood of gaining access to particular jobs and educations. Finally, latent genetic ability can affect the strength of the relationship between parents and children’s outcomes. Internationally oriented research suggests that the extend to which parental resources matters for children’s outcomes can be mediated by public policy which relates to the welfare policies of the country (Krueger 2012 and Nolan et al. 2011). In addition, however, also characteristics tied to the local area and community appears to matter for the strength of the link between parental resources and child outcomes.

A recent paper by Chetty et al. (2014) document large differences in US intergenerational mobility across commuting zones. While this in and of itself bears relevance to policy discussion, they also show that the degree of mobility correlates with local area characteristics. They find that residential segregation and income inequality is negatively correlated with mobility, and that quality of primary schools, social capital, and family stability on the local area is positively correlated with mobility. The work of Putnam (2015) also investigates opportunities in the US. Taking a different approach than Chetty et al. (2014), he shows that the

1Møllegaard and Jæger (2015) shows that also grandparents’ social capital matters for children’s outcomes.)
opportunities of children in the US differs markedly between different areas, and that a large part of a generation of kids has been lost due to lacking local institutional capacity to support them. In this paper I investigate how social mobility differs across regions in Denmark, and in future developments, I will investigate how differences in mobility relate to factors such as those emphasized by Chetty et al. and Putnam.

In the next section I initially describe the methodology of the paper. Firstly I introduce the data and the traditional problems in intergenerational mobility studies, as well as the two different estimates of mobility that I use in the paper, the canonical intergenerational elasticity, and the rank-rank regression coefficient. In the results section, I first show that the IGE estimate is affected by the choice of how to handle non-positive incomes. In addition, I show that log of child income is not linear in log of parental income. As a result, the IGE may be inappropriate as a uni-dimensional measure of mobility. The expected rank of a child, however, is linear in the rank of parents. This suggests that the rank-rank estimate of mobility provide a better approximation to mobility in a Danish context. Using both measures to investigate municipal mobility I find that mobility varies across Danish municipalities. IGE estimates (which are inversely related to mobility) ranges from 0.045 to 0.427. This spans a range of the smallest Danish IGE and some of the largest US IGE national level estimates found in the literature. The Rank-rank estimates lies in the interval 0.099 to 0.325 and suggest less dispersion of opportunities. Both estimates, however, suggests economically relevant disparities in mobility across localities in Denmark. In future developments of the paper I will investigate how these differences in IGEs and rank-rank mobility measures relate to local characteristics such as health, social capital, segregation, income inequality, as well as education resources that may affect the local learning cultures.

2 Data and Measures

Most recent studies of intergenerational mobility has turned to using administrative data sources as opposed to multi-generational sampled data. In this paper I utilize Danish administrative registers to investigate mobility. The data spans a period of 1980-2012 and include information such as age, family links, educational attainment and enrollment, as well as income. I include three cohorts of children born in 1973, 1974, and 1975, as well as their

\[\text{The research by Landersø and Heckman (2017) suggests that parental background remains a strong predictor of individual income and educational outcomes in a Danish context, even if the welfare state provide better learning outcomes for less-privileged children. They further suggest that one main explanation for this prediction power and inherent lacking mobility (in spite of a large welfare state) is lacking incentives to pursue schooling (through returns to schooling). Bowles and Gintis (2011) provides an institutional and structural explanation for why the American educational system may not provide equal opportunities for all. Future research in a Danish context may help shed light on the extend to which similar characteristics of the Danish education system affect individual outcomes.}\]
After removing observations that cannot be linked to any location in Denmark, the total amount of children in the study is 206,717.

To measure the intergenerational mobility, I require estimates of parental income and children’s income. Parental income is measured as the average CPI adjusted parental income while the child is between the age of 7 and 15 (the years 1980-1988, 1981-1989, and 1982-1990 for each cohort respectively). The income includes all income from salaries and personal business, public transfers, capital income, and non-classifiable income. The use of total income including public transfers provides a measure of total resources available in the family when the child was young. Alternate measures used in the literature includes earnings or earnings and transfers. This may closer reflect the effect of parental earnings capacity on child earnings capacity, whereas using total parental income including transfers provides an estimate of resources available to each generation. Capital owning families may have immediately larger pools of resources available than non capital owning families. The measure of mobility may in addition depend on how parental resources are defined - either as father’s, other’s, or the total household income. The initial research on intergenerational mobility has emphasized father-son income relations due to data availability (Solon, 2002) whereas recent literature (e.g. Chetty et al. 2014) has tended to emphasize household income as a more cogent measure of resources available in the household. I show the effect of choosing alternate income measures at the national level and use parental household income measures in the remaining part of the analysis.

Measuring parents income over a total of 8 years provides an estimate of the long-run income of the parents, and the resources available to the child. The substantial measurement period also minimizes the risk of measurement error when attempting to estimate the long-run income of parents. Measurement error has been found to create significant attenuation bias in IGE estimates in a US context (Mazumder 2005 and Solon 1992).

Children’s income is measured as total income in the years 2010-2012 for every cohort. The income is measured when the children are 35-37, 36-38, and 37-39 years old for the 1975, 1974, and 1973 cohorts respectively. In addition to measurement error of parental income, another concern regarding IGE estimates is measurement of children’s long-run income (Solon, 2002). Measuring children’s income in the early stages of their career can severely underestimate the IGE as this often does not provide an adequate estimate of long-run income. Landersø and Heckman (2017) shows that IGE’s become stable for Danish income data in the second half of the 30’is. This suggest that measuring children’s income over this period provides stable and comparable IGE estimates for the three cohorts.

A relevant problem in investigating intergenerational mobility is how to handle non-positive

---

3The choice of cohorts and measurement periods follow that of other Danish research, including Landersø and Heckman (2017), to aid comparison between the estimates in the literature and the estimates in this paper. A significant challenge in the international literature has been lacking comparability of estimates (Solon, 2002).
income. For 1.96 percent of the observations household parental income is non-positive, and for 0.3 percent children’s income is non-positive. The Intergenerational Elasticity, which I introduce in the next section, requires the use of log-income, and therefore does not permit non-positive incomes to enter the analysis. Former studies have handled this by either dismissing observations with non-positive incomes, or transforming the incomes to an arbitrary level near 0. Figure 1 shows densities of total income measured in 1000 DKK and log of total income for children’s and parents respectively, when non-positive incomes have been recoded to 1000 DKK. Blue lines indicate medians. in particular show the presence of recoded negative and zero incomes on the left sides of each of the four figures. In the analysis I find that the choice of how to handle non-positive incomes significantly affects the IGE measures.

The primary results of this paper relate to local areas. As regional divisions I make use of the smallest entities in the available registers, Danish municipalities. In 2007 Denmark underwent a municipal reform, merging a total of 278 into 98 municipalities (and 13 counties into 5 regions). Although the children’s municipalities are indicated before the reform, I shows results that pertain to the present day administrative division of the country. This ensures that sufficient observations are present in all investigated areas to undertake the analysis, and aid comparison for present day policy discussions. I assign each child to the municipality in which the child has residence for the longest period while at the age of 7 to 15. This is the spatial anchoring of the analysis.

Measuring Mobility

Mobility has been investigated with a range of different statistics. The most frequently used in former economic studies is the Intergenerational Income Elasticity (Blanden, 2013; Solon, 2002), the coefficient obtained from regressing log of child income, \( \log(Y_c) \) on log of parental income \( \log(Y_p) \) according to the model

\[
\log(Y_c) = \beta_0 + \beta_{IGE} \log(Y_i) + \epsilon.
\]

The regression provides a relative mobility estimates, the percentage increase in children’s earnings from a percentage increase in parents income. A higher IGE suggests a stronger relation between children’s income and their parents’ income levels. Social mobility is assumed to be inversely related to this coefficient: the higher the IGE, the lower equality of opportunity. That is, parents income determines less of the outcomes of their children. Former research has found estimates between 0.034 for log of daughters’ and fathers’ earnings (Jäntti et al., 2006), and 0.351 for log of gross income excluding transfer for children and parental household

---

\(^4\) Figure 4 in appendix A.1 shows density plots without recoded zero and negative income.

\(^5\) Corak (2006b) provide an alternate understanding of the IGE. By taking the anti-log of the estimated equation, one obtains what Corak describes as a measure of economic advantage. The higher the IGE, the higher the level of economic advantage understood as the increase in expected income in the next generation for the family compared to families at lower levels of income.
Figure 1: Density plots of parental household and child total income and log of total income.

Note: For each income density figure the blue line indicates the median. The upper left figure shows the density of total parental income in 2015 (in 1000 DKK). Total income includes labor earnings, income from own business, capital income, and public transfers. Parental income is measured when the child is at the age of 7-15 years old. The bump at DKK 1000 are caused by recoded negative or zero incomes. The median household income is just above DKK 550,000. The lower left figure shows similar total income for children measured between the ages 35-37, 36-38, and 37-39 for children born in 1975, 1974, and 1973 respectively. A similar spike in the density can be found at DKK 1000, which again indicates recoded negative or zero income. The upper right figure shows log of total parental income, and and the lower left figure shows log of child total income.
income (Landersø and Heckman, 2017).

The IGE is a linear measure of relative mobility in a society. Whenever the expected log income of the child is not linear in log of parental income, the IGE will not be able to summarize mobility and comparisons between municipalities may depend on local non-linearities. Bratsberg et al. (2007) and Landersø and Heckman (2017) have shown that Nordic countries and Denmark in particular, have non-linear relationships between expected log child income and log of parents’ income. In the analysis I re-investigate this claim, showing similar non-linearities.

An alternative measure of mobility, the rank-rank correlation, has been used by e.g. Chetty et al. (2014) and Boserup et al. (2014) to provide measures of intergenerational mobility in income in the US and wealth in Denmark, respectively. The Rank-rank correlation can be obtained as the regression coefficient from regressing the rank of children’s position in their income distribution on parents’ rank in their income distribution. The rank-rank coefficient, $\beta_{R_c, R_p} = \rho_{R_c, R_p}$, where $R_c$ is the child’s income rank and $R_p$ is the parental income rank, will lie between $[-1, 1]$ due to the uniform distributions of the ranks in the range $[0, 1]$ so that their variances are identical at $\text{var}[R] = \frac{1}{12} (0 + 1)^2$. In the analysis I investigate whether expected child rank is linear in parental rank. A non-parametric investigation shows that this is indeed the case. While the coefficient provides an estimate of relative mobility, under linearity the complete estimated model, $R_c = \beta_{R_c, R_p, 0}$ provides an absolute measure of mobility: We can provide the expected income rank of a child given the parental income rank (Chetty et al., 2014). Future developments of the paper will incorporate investigations of absolute mobility by municipality. Future developments of the paper will, in addition, include measures of mobility using transition matrices. Hertz (2006) uses a transition matrix to discuss mobility of minorities in the US. Here I estimate a matrix with the probability that an individual growing up in the bottom income quintile for moving to the top income quintile in adulthood (and correspondingly for the remaining groups) Hertz (2006). In the case of completely equal opportunity (no relation between parents and children’s income), the probability that an individual ends up in a particular income quintile would be equal across parental income quintiles.

To estimate the rank-rank coefficients, I rank children’s income within their cohort, parental income within the incomes of the parents to the same cohort. Within-cohort ranking reduces chances of income differences between the adult children’s cohorts to affect the estimates. Each cohorts income is measured at a slightly different point in their age group, suggesting that the younger 1975 cohort may be ranked lower than the 1973 cohort simply due to differences in the age-income distribution.\(^6\)

\(^6\)It is a well-known fact that income is concave in age, a fact apparent from return to schooling estimations where age appears squared in the estimated models (see e.g. Hanushek et al. 2017)
3 Results

The IGE is the baseline mobility measure for the following analysis, and national statistics form the background on which municipal mobility can be compared. In this section I investigate the national level characteristics of mobility in Denmark and discuss potential problems with the IGE and the relevance of the rank-rank mobility estimate for analysis of the municipal level.

The IGE is the elasticity of total child and parental income, $\beta_{IGE}$. Figure 5 in appendix A.2 shows scatterplots of the total income and log total income for children and parental household income, where the estimated slopes in the log income subfigures show the IGE. The graphical inspection suggests that levels of mobility hinges on how non-positive incomes are handled. I initially estimate IGE’s for models that leave out observations with non-positive income with either parents or children, and models which includes the observations recoded to have a 1000 DKK value. As different studies have used different measures of parental income, I additionally estimate IGE’s for both household, mother’s, and father’s total income. The results of the initial, national level regressions can be found in table 1.

<table>
<thead>
<tr>
<th></th>
<th>Household</th>
<th>Father</th>
<th>Mother</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Negative Income IGE</td>
<td>.2925 (.0035)</td>
<td>.1908 (.0026)</td>
<td>.0510 (.0017)</td>
</tr>
<tr>
<td>Transformed Negative Income IGE</td>
<td>.2436 (.0035)</td>
<td>.0957 (.0019)</td>
<td>.0492 (.0018)</td>
</tr>
<tr>
<td>Rank-rank Estimate</td>
<td>.2570 (.0021)</td>
<td>.2417 (.0022)</td>
<td>.1216 (.0022)</td>
</tr>
</tbody>
</table>

Note: OLS standard errors are shown in parentheses.

The table shows that there are large discrepancies in the IGE between total family income when including and excluding observations with non-negative incomes. Firstly, for total household incomes, the IGE varies from .292 (close to that found by Landersø and Heckman 2017) to .244. For Father’s the corresponding IGE estimates are .191 and .096 and finally for Mother’s mobility seemingly declines slightly as the IGE goes down from .051 to .049. The large drops using father’s and mother’s incomes are large. The differences in estimates would suggest caution in dealing with non-negative incomes. In addition, comparing estimates across parental income measures (household, father’s and mother’s) also shows large discrepancies. The IGE for mother and children’s income is about 17 percent of the household income IGE when removing non-negative incomes, and 20 percent when recoding non-negative incomes. The Father-estimate is closer to that of household income, but is still just 40 percent of the IGE estimate using the income with recoded non-positive values. As the purpose of measuring the IGE is to investigate the relationship between resources in each generations, the preferred measure of income is household income for parents. Nevertheless these results should caution when comparing estimates between studies using both different ways of handling non-negative income, and measures of parental income.
The disparities in these national level IGE results suggest that the IGE should function as a supplemental measure of mobility in the municipal analysis, second to the rank-rank estimates. Chetty et al. (2014) and Boserup et al. (2016) suggests that in order to obtain relevant estimates with a linear estimator, the Rank-rank coefficient may provide a better estimate than the IGE in investigating income and wealth.

To investigate potential non-linearities in the log-income relationship I follow Chetty et al. (2014) and in the left side of figure 2 estimate the expected log child income given mean parental income for each of the 100 centiles of the log parental income distribution. This provides a non-parametric estimate of the relationship between children and parents log income. If the IGE relationship was linear, then the expected value of log child income should be well described by the blue linear regression line seen in the figure. The relationship seems to be non-linear with a flatter (higher mobility) income relationship in the lower end of the distribution, and a larger slope (lower mobility) in the middle of the parental log income distribution.

The right hand side of figure 2 shows the mean child income rank given parental income rank for each centile in the parental income rank regression. The regression line fitted on the plot corresponds to the rank-rank correlation $\rho_{RcR_p}$. With the exception of the very lowest deciles of the parental income distribution, the rank of children’s income appears to be linear in the rank of parental income.

Figure 2: Expected log income of children given mean income of parental household estimated by percentiles, and estimated rank of child total income given parental household rank.

The rank-rank correlation appears to provide a better (linear) estimate of intergenerational mobility at the national level, and can be expected to also provide a better measure for investigating the municipal intergenerational mobility. In addition, as the rank measure is indifferent to non-positive incomes we can also include observations with zero and negative incomes in the samples when estimating the rank-rank coefficients.
Mobility by Municipality

The Danish municipalities provide a natural guideline for estimating the intergenerational mobility. As the IGE is the standard measure of mobility, I initially estimate IGEs for each Municipality separately, using only non-negative income. Figure 3a shows a heat-map of the IGE’s across Denmark, and the left-hand side of table 2 shows the municipalities with the 10 highest and lowest IGEs. The most immobile municipalities have measured mobilities similar to or above US levels (e.g. Chetty et al. 2014; Mazumder 2005, whereas the municipalities with the lowest IGEs have levels around the lowest Danish IGEs in the literature (e.g. Munk et al. 2016; Bratsberg et al. 2007). From the map it becomes clear that mobility varies across the country.

The rank-rank coefficients (measuring relative mobility) provide a more appropriate measure of mobility under non-linearities in the log-income relationship between children and parents as documented at the national level. Figure 3b shows a heat-map of the rank-rank coefficients across the country. A comparison of the two maps suggest that many areas overlap between the two measures. However, the RR has lower variance and shows smoother transitions in the movements between figures. I similarly estimate rank-rank mobility measures of mobility and report the top 10 and bottom 10 municipalities in the right hand side of table 2. A comparison of the top and bottom mobility estimates suggests that the rank-rank relative mobility measure provides a less dispersed mobility measure. There is, however, a tendency for the same municipalities to be in the top and bottom of the distributions of mobility measures.7 Figure 7 in the appendix shows densities plots of the two sets of mobility estimates.

The differences in the IGE and Rank-rank estimates across the Danish municipalities show that the municipalities differ in the extend to which they promote intergenerational mobility. The maps in figure 3 further show that the areas in which mobility is high and low is rather consistent across the two measures. While documenting differences in mobility in and of itself is relevant, more interesting questions ask why we find differences in mobility by municipality. In future developments of this paper I will investigate how the estimated mobilities relate to local characteristics, such as potential social capital, learning cultures, income inequality, segregation, industrial composition, as well as educational resources.

4 Conclusion

Research on intergenerational mobility has for long emphasized national level comparisons of mobility. A recent strand of research has turned to investigating regional disparities in intergenerational mobility. This paper provides new results on intergenerational mobility using Danish administrative data. Firstly, I investigate the relevance of using traditional

7The correlation between the estimates is 0.68.
<table>
<thead>
<tr>
<th>Municipality</th>
<th>Estimate</th>
<th>Rank-Rank Coefficient</th>
<th>Municipality</th>
<th>Estimate</th>
<th>Rank-Rank Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fanø</td>
<td>.045</td>
<td></td>
<td>Albertslund</td>
<td>.371</td>
<td></td>
</tr>
<tr>
<td>Hørsholm</td>
<td>.144</td>
<td></td>
<td>Sorø</td>
<td>.099</td>
<td>Horsens</td>
</tr>
<tr>
<td>Lemvig</td>
<td>.156</td>
<td></td>
<td>Læsø</td>
<td>.168</td>
<td>Langeland</td>
</tr>
<tr>
<td>Bornholm</td>
<td>.160</td>
<td></td>
<td>Kalundborg</td>
<td>.108</td>
<td>Vesthimmerlands</td>
</tr>
<tr>
<td>Lyngby-Taarbæk</td>
<td>.167</td>
<td></td>
<td>Søborg</td>
<td>.175</td>
<td>Guldbergshund</td>
</tr>
<tr>
<td>Læsø</td>
<td>.174</td>
<td></td>
<td>Vordingborg</td>
<td>.180</td>
<td>Lolland</td>
</tr>
<tr>
<td>Solråd</td>
<td>.177</td>
<td></td>
<td>Ærø</td>
<td>.186</td>
<td>Glostrup</td>
</tr>
<tr>
<td>Billund</td>
<td>.186</td>
<td></td>
<td>Grorrauppa</td>
<td>.191</td>
<td>Sønderborg</td>
</tr>
<tr>
<td>Storms</td>
<td>.200</td>
<td></td>
<td>Herlev</td>
<td>.199</td>
<td>Morsø</td>
</tr>
<tr>
<td>Hedensted</td>
<td>.205</td>
<td></td>
<td>Sønderborg</td>
<td>.202</td>
<td>Høje Taastrup</td>
</tr>
<tr>
<td>Odense</td>
<td>.205</td>
<td></td>
<td>Bornholm</td>
<td>.209</td>
<td>Faxe</td>
</tr>
<tr>
<td>Egådalen</td>
<td>.207</td>
<td></td>
<td>Lolland</td>
<td>.212</td>
<td>Tårby</td>
</tr>
<tr>
<td>Odense</td>
<td>.205</td>
<td></td>
<td>Bornholm</td>
<td>.209</td>
<td>Høj Trace</td>
</tr>
<tr>
<td>Odense</td>
<td>.205</td>
<td></td>
<td>Lolland</td>
<td>.212</td>
<td>Bornholm</td>
</tr>
<tr>
<td>Odense</td>
<td>.205</td>
<td></td>
<td>Lolland</td>
<td>.212</td>
<td>Bornholm</td>
</tr>
<tr>
<td>Odense</td>
<td>.205</td>
<td></td>
<td>Bornholm</td>
<td>.209</td>
<td>Høj Trace</td>
</tr>
</tbody>
</table>
Figure 3: Heatmap of Danish Municipality IGE and Rank-Rank Estimates.

Note: The figures show Danish Municipalities and their (left) associated IGE for total child and parental household income and (right) Rank-rank regression coefficient estimate between child rank in cohort income group, and adult income rank in child cohort. The Island Bornholm has been moved from the far right to the upper right in the figure.
intergenerational elasticity estimates in a Danish context. Like former research I documenting non-linearities in mobility measured by log-incomes. Rank-rank estimates of mobility, however, is linear at the national level. This is in line with recent research in the US by Chetty et al. (2014). Emphasizing the second measure, I further document large disparities in mobility by municipality in Denmark. The results show that Danish mobility measured by IGEs range from 0.045 to 0.427, spanning the smallest national level IGE estimates for Denmark to the some of the largest estimates of the IGE’s in the US. Rank-rank estimates range more moderately from 0.099 to 0.328, which lies within the range of former Danish national level measures of mobility. Both measures indicate that mobility differs significantly between Danish municipalities.

Futures developments of the paper includes investigating how these differences in mobility relate to local characteristics such as potential social capital, learning cultures, income inequality, segregation, industrial composition, as well as educational resources.
References


Appendices
A Income

A.1 Income Densities

Figure 4: Density plots of parental household and child total income including negative income.

Note: For each income density figure the blue line indicates the median. The left figure shows the density of total parental income in 2015 (1000 DKK) including negative income observations. Total income includes labor earnings, income from own business, capital income, and public transfers. Parental income is measured during the period when the children are at the age of 7-15. The right figure shows similar total income for children measured between the ages 35-37, 36-38, and 37-39 for children born in 1975, 1974, and 1973 respectively.
A.2 Income Scatter plots

Figure 5: Scatterplot of parental household and child total income and log of total income.

Note: Blue lines indicate simple linear regressions lines. The figures show (top-left) total child income against total parental household income with recoded non-positive income observations. (Lower-left) total child income against total parental household income removing non-positive income observations. (Upper-right) Log total child income against log total parental income with recoded non-positive income. (Lower-right) Log total child income against log total parental household income with removed non-positive observations. Slopes of the regressions lines in the upper-right and lower-right plots show the estimated IGE at the national level at .097 and .291, respectively.
B Danish Municipalities

Figure 6: Danish municipalities following the 2007 administrative reform.
C Municipality Results

C.1 Densities of IGE and Rank-Rank Coefficients

Figure 7: Densities of Municipality IGEs and Rank-rank Coefficients.

Note: The left-hand figure shows the density of IGEs estimated for the 98 Danish municipalities. The IGE is calculated as the regression coefficient between log child total income and log parental household total income, dropping non-positive observations. The Right-hand side figure shows the density of the rank-rank coefficients from a regression of the child income rank (within cohort) against parental income rank (within child cohort).