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ON THE IMPORTANCE OF FINNISHING SCHOOL: HALF A CENTURY OF INTER-GENERATIONAL ECONOMIC MOBILITY IN FINLAND

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Abstract: Trends in inter-generational economic mobility in Finland are analyzed using panel data from 1950 through 1999 on more than 200 thousand sons and daughters born between 1930 and 1970. A significant decline is estimated in the inter-generational transmission elasticity from the 1930 birth cohort until the baby boom cohorts of the early 1950s. After that we observe no increase in the extent of mobility for the 1950s and 1960s birth cohorts. The quite dramatic transformation of the Finnish economy in the second half of the twentieth century is outlined in the paper. A decomposition of the inter-generational transmission elasticities across cohorts shows that most of the decline in transmission reflected a reduction in the impact of family income on duration of children's education accompanied by a decline in the returns to schooling. Despite the large volume of rural – urban migration during this period of transformation, regional mobility played only a minor role in increasing economic mobility.

Key words: Inter-generational mobility, cohorts, education, migration

JEL Classification: J62

Tiivistelmä: Tässä tutkimuksessa analysoidaan sukupolvien välisen taloudellisen liikkuvuuden trendejä suomalaisella paneeliaineistolla vuosina 1950–1999. Aineisto käsittää yli 200 000 välillä 1930–1970 syntyneen lapsen ja heidän vanhempiensa tiedot. Tulosten mukaan sukupolvien välinen taloudellinen liikkuvuus lisääntyi merkittävästi 1930-luvun alun syntymäkohorttien ja 1950-luvun alussa syntyneiden suurten ikäluokkien välillä. Sen jälkeen liikkuvuuden ei havaita enää kasvaneen 1950- ja 1960-luvun syntymäkohorteissa. Tutkimuksessa kuvaillaan 1900-luvun jälkipuoliskon aikana tapahtunutta voimakasta talouden rakennemuutosta. Sukupolvien välisen tulojouston dekomponointi osoittaa, että lisääntynyt liikkuvuus johtuu lähinnä koulutukseen liittyvistä tekijöistä: Perhetaustan vaikutus koulutukseen väheni merkittävästi ja koulutuksen tuotot pienenivät. Huolimatta voimakkaasta kaupungistumisesta ja maaltamuutosta muuttoliike voimisti sukupolvien välistä taloudellista liikkuvuutta vain hieman.

Asiasanat: Sukupolvien välinen taloudellinen liikkuvuus, kohortit, koulutus, muuttoliike

Summary

Empirical analysis of inter-generational economic mobility has generally been hampered by samples that are quite restricted in size. Until recently, most of the literature refers to the cross-sectional extent of inter-generational transmission. In the last few years interest has increased in how inter-generational transmission elasticities have evolved over time and birth cohorts. A part of the interest stems from the observations on widening inequality in earnings in the US. A number of studies have attributed much of the increase in earnings inequality to rising returns to education. If rich parents have rich children largely because the parents provide their offspring with a more complete education, and the returns to that education rise, then the inter-generational transmission of incomes rises, too.

Most of the scarce empirical attention to the evolution of inter-generational transmission over time has focused on the US case. Mayer and Lopoo (forthcoming) and Fertig (2003) use the PSID and estimate declining inter-generational transmission from fathers to sons, but the results on daughters are more mixed. However, sample sizes in these studies remain very small, around 300-500 observations per each cohort. Lee and Solon (2004) argue that most of these estimates are too imprecise to discern any significant trend. Lee and Solon find no trend in the PSID data, even though they manage to increase the sample size by using a fixed measure of family income and annual earnings for the children. Finally, Levine and Mazumder (2002) use several different data sets (PSID, NLS and GSS) and find very mixed results: some estimates suggest a decline in inter-generational elasticity while others suggest a rise.

Results from other countries are even more rare. Blanden et al. (2001) estimate decreasing inter-generational mobility in Britain between birth cohorts 1958 and 1970. Bratberg et al. (2004) find no trend for Norwegian sons born in 1950 – 1965, and a small tendency to increasing inter-generational mobility for daughters.

For the present study a unique data set was compiled, surmounting some of the limitations on prior samples for the US in particular. We compile two panels of data, extending from 1950 through 1999, on families of more than 200 thousand sons and daughters, encompassing 41 annual cohorts of children born between 1930 and 1970 (with parents born as early as 1880).

Inter-generational mobility increased markedly across these cohorts born between 1930 and 1970. Both sons' and daughters' economic prospect came to replicate those of their parents less closely over time, though most of this change occurred across those cohorts born between the early 1930s and the early 1950s. The pattern proves relatively insensitive to alternative income measures tested in the paper.

The latter part of the 20th century was a remarkable period of economic transformation in Finland. Real GDP per capita grew at 3.15 percent per year on average. In 1950, nearly 40 percent of labor force were employed in primary production; by 2000 this fraction had declined to just over 5 percent. Over the same interval, the population shifted from being two-thirds rural to two-thirds urban residents. In 1950, children were required to attend school only until age 14, and among the generation of children born in 1940 56 percent never completed more than primary education; by 2000 Finland ranked sixth among the EU-15 countries in percent of adult population with at least an upper secondary education. In other words, Finland went rapidly from resembling a middle income, developing country to a high-tech economy within the last half of the twentieth century.

What are the connections between trends in inter-generational mobility and economic transformation? In this paper, we attempt to answer the question by decomposing the changes in inter-generational transmission elasticity, following a study by Levine and Mazumder (2002). They decompose inter-generational transmission elasticity into a 'direct effect' and an effect operating through investment in child's human capital. Here, the approach is modified and extended to incorporate investments into human capital both in the form of schooling and in the form of migration. We also extend the approach beyond a two-period comparison to look at all 41 birth cohorts in our data.

The decomposition analysis shows that most of the decline in transmission reflected a reduction in the impact of family income on duration of children's education accompanied by a decline in the returns to schooling. Despite the large volume of rural – urban migration during this period of transformation, regional mobility played only a minor role in increasing economic mobility

Yhteenveto

Sukupolvien välisen taloudellisen liikkuvuuden tutkimusta ovat usein vaikeuttaneet saatavilla olevien aineistojen rajallinen koko ja aikaulottuvuus. Viime vuosiin saakka tutkimukset ovat keskittyneet selvittämään taloudellisen aseman periytymistä yksittäisissä poikkileikkauksissa. Aivan viime aikoina on herännyt kiinnostus siihen kuinka sukupolvien välinen taloudellinen liikkuvuus kehittyy yli ajan ja kuinka se vaihtelee eri syntymäkohorteissa. Osittain tämä kiinnostus on saanut alkunsa tuloerojen voimakkaasta kasvusta Yhdysvalloissa 1990- ja 2000-luvulla. Useat tutkimukset ovat nimittäin osittaneet, että suuri osa tuloerojen kasvusta selittyy kasvaneilla koulutuksen tuotoilla. Mikäli rikkaiden vanhempien lapsista tulee rikkaita lähinnä koska heidän vanhemmillaan on varaa kouluttaa lapsiaan, ja samanaikaisesti tämän koulutuksen tuotot kasvavat, silloin myös sukupolvien välinen tuloaseman periytyminen voimistuu.

Sukupolvien välisen taloudellisen liikkuvuuden trendejä käsittelevä vähäinen kirjallisuus on keskittynyt lähinnä Yhdysvaltojen tilanteen tarkasteluun. Mayer ja Lopoo (tulossa) ja Fertig (2003) arvioivat, että poikien taloudellinen liikkuvuus on lisääntynyt, mutta tytärten osalta tulokset ovat epäselviä. Ongelmana näissä tutkimuksissa on pieni aineistokoko. Ikäluokkaa kohti on käytettävissä ainoastaan 300–500 havaintoa. Lee ja Solon (2004) toteavat, että näiden aineistojen puitteissa on mahdoton löytää tilastollisesti merkitseviä trendejä. He kasvattavat aineistokokoa ottamalla lapsille havaintoja ansiotuloista useiden vuosien ajalta, mutta eivät siitä huolimatta löydä trendiä. Edellä mainitut tutkimukset perustuvat PSID-aineistoon. Levine ja Mazumder (2002) puolestaan käyttävät useita eri aineistoja (PSID, NLS ja GSS) ja löytävät eri aineistoista keskenään ristiriitaisia tuloksia: toiset estimaatit viittaavat liikkuvuuden lisääntymiseen, kun taas toisten valossa liikkuvuus näyttäisi vähentyneen.

Euroopan osalta vastaavat tutkimukset ovat toistaiseksi vielä hyvin harvinaisia. Blanden ym. (2001) estimoivat sukupolvien välisen taloudellisen liikkuvuuden vähentyneen Isossa-Britanniassa syntymäkohorttien 1958 ja 1970 välillä. Bratberg ym. (2004) puolestaan eivät löydä norjalaisesta aineistosta mitään merkkiä liikkuvuuden muutoksista vuosina 1950 – 1965 syntyneiden poikien osalta. Tytärten taloudellinen liikkuvuus sen sijaan näyttäisi hieman kasvaneen.

Tässä tutkimuksessa käytetään ainutlaatuista suomalaista aineistoa, jonka suuri otoskoko mahdollistaa sukupolvien välisen taloudellisen liikkuvuuden trendien aiempaa tarkemman tutkimisen. Aineisto koostuu kahdesta paneelista, käsittää vuodet 1950 – 1999 ja sisältää tietoja yli 200 000 pojasta ja tyttärestä. Nämä lapset ovat syntyneet vuosina 1930 – 1970 ja heidän vanhempansa välillä 1880 – 1950. Yhteensä aineistossa on 41 lasten syntymäkohorttia.

Sukupolvien välinen taloudellinen liikkuvuus lisääntyi voimakkaasti Suomessa syntymäkohorttien 1930 ja 1970 välillä. Sekä poikien että tytärten taloudellinen asema määräytyi vähenevässä määrin heidän vanhempiensa aseman perusteella. Kuitenkin suurin osa tästä muutoksesta tapahtui 1930-luvun alun syntymäkohorttien ja 1950-luvun alun suurten ikäluokkien välillä. 1950- ja 1960-luvulla syntyneiden osalta ei havaita muutoksia liikkuvuuden kehityksessä.

1900-luvun jälkipuolisko edusti voimakkaan taloudellisen ja yhteiskunnallisen rakennemuutoksen aikaa Suomessa. Reaalinen BKT per asukas kasvoi keski-määrin 3,15 prosenttia vuodessa. Vuonna 1950 yli 40 prosenttia työvoimasta työskenteli alkutuotannossa; vuoteen 2000 mennessä tämä osuus oli pudonnut noin viiteen prosenttiin. Samanaikaisesti Suomi muuttui maaseutuvaltaisesta maasta kaupunkivaltaiseksi: kaksi kolmasosaa väestöstä asui aiemmin maaseudulla, ja vuoteen 2000 mennessä sama osuus asui kaupungeissa. Vuonna 1950 lasten tuli käydä koulua 14-vuotiaaksi asti ja esimerkiksi vuonna 1940 syntyneistä lapsista 56 prosenttia lopetti koulunkäynnin kansakoulun jälkeen; vuonna 2000 Suomen aikuisväestö oli kuudenneksi koulutetuinta EU-maiden joukossa ja nuorten osalta Suomi oli kaikkein koulutetuimpien joukossa. Toisin sanoen, 50 vuoden aikana Suomi muuttui keskituloisesta vasta kehityksen alkuvaiheissa olevasta maasta korkean teknologian tietoyhteiskunnaksi.

Miten taloudellinen kehitys ja rakennemuutos liittyvät sukupolvien välisen liikkuvuuden trendeihin? Tässä tutkimuksessa kysymykseen pyritään vastaamaan dekomponoimalla sukupolvien välisen tulojouston muutokset samaan tapaan kuin Levinen ja Mazumderin (2002) tutkimuksessa. He jakavat sukupolvien välisen tulojouston niin sanottuun suoraan (tulo)vaikutukseen ja inhimillisen pääoman (eli koulutuksen) kautta toimivaan vaikutukseen. Tässä tutkimuksessa lähestymistapaa laajennetaan ottamaan huomioon inhimillisen pääoman investoinnit sekä koulutuksen että muuttoliikkeen muodossa. Lisäksi tarkastelu laajennetaan koskemaan kaikkia 41 syntymäkohorttia kahden periodin vertailun sijaan.

Dekomponoinnin tulokset osittavat, että suurin osaa sukupolvien välisen taloudellisen liikkuvuuden lisääntymisestä johtuu perhetaustan vähentyneestä vaikutuksesta lasten koulutuksen hankkimiseen ja samanaikaisesta koulutuksen tuottojen pienentymisestä. Huolimatta kaupungistumisen nopeasta tahdista muuttoliike selitti ainoastaan pienen osan liikkuvuuden lisääntymisestä.

Contents

1. Introduction

Empirical analysis of inter-generational economic mobility has generally been hampered by samples that are quite restricted in size. Most of the existing evidence refers to the US case. In the US context Solon (1992) demonstrates that downward bias in transmission elasticity estimates, resulting from errors in measuring parental permanent income, can be substantially diminished by longer panels of observation on parental incomes. Yet, as Solon notes, there is a potential for bias in such analyses when attrition from the panel data becomes severe, as in the commonly used US Panel Survey of Income Dynamics (PSID). Moreover, Couch and Lillard (1998) find that estimates of the inter-generational transmission elasticity, using the PSID data, are extremely sensitive to sample selection in most prior studies, which censor observations on low or zero earnings.

More recently, interest has increased in how inter-generational transmission elasticities have evolved over time and birth cohorts. A part of the interest stems from observations on widening inequality in earnings in the US. Societies with very unequal income distributions can, in principle, exhibit high inter-generational mobility across the widely dispersed outcomes; conversely, there may be little inter-generational mobility across a narrow range of societal outcomes. Nonetheless interest in a link between inequality and immobility does arise: there is a potentially common, contributing factor. A number of studies have attributed much of the increase in earnings inequality in the US to rising returns to education.[1] If rich parents have rich children largely because the parents provide their offspring with a more complete education, and the returns to that education rise, then the inter-generational transmission of incomes rises too.[2]

Again, most of the empirical attention to the evolution of inter-generational transmission over time has focused on the US case. Mayer and Lopoo (forthcoming) return to the PSID data to examine various outcomes for sons at age thirty, looking at four, non-overlapping time intervals between 1949 and 1965. Fertig (2003) looks at sons' and daughters' average earnings in the PSID data over a five-year period, using five rolling samples of cohorts which move over a total of five years, centered from 1970 through 1974. In both studies, the inter-generational transmission from fathers to sons is estimated to decline (remarkably sharply so in some instances) across the four and five periods of observation respectively, though results on daughters appear more mixed. However, sample sizes remain quite small in both studies, typically amounting to 300-500 in each cohort group despite aggregating over four or five annual cohorts. Indeed Lee and Solon (2004) argue that most of these estimates prove too imprecise to discern any significantly negative trend in transmission elasticities. Instead, Lee and Solon use the PSID data to regress annual

observations on family incomes of sons and daughters on a fixed measure of family income of their parents. This approach enables Lee and Solon to estimate inter-generational transmission elasticities at 22 points in time, with an average of 510 sons and 576 daughters in each estimate. Small samples in the early periods generate relatively imprecise estimates in this study, but thereafter transition elasticities exhibit no clear trend either up or down. Levine and Mazumder (2002) use the National Longitudinal Surveys (NLS) and the General Social Survey as well as the PSID to compare inter-generational transmission elasticities for sons at two points in time. In this study, the findings prove mixed: some estimates suggest a decline in inter-generational mobility while others suggest a rise.

Outside of the US, studies of changes in inter-generational transmission are even rarer. Blanden *et al.* (2001) look at earnings and family incomes of sons and daughters for one cohort born in the UK in 1958 and another born in 1970, using the National Child Development Study and the British Cohort Survey respectively. These estimates indicate that inter-generational mobility fell between the two cohorts, the later cohort having grown up during a period of widening inequality in Britain. Bratberg, Nilsen and and Vaage (2004) extract register based data from the Norwegian Database of Generations to compare four cohorts of children born in 1950, 1955, 1960 and 1965. For this study of Norway, the sample sizes are far larger than in other studies and the estimates of father-son and father-daughter earnings transmission elasticities prove fairly small but precisely estimated. Both time average measures of children's earnings and earnings at specific ages are explored. Among sons the mean transmission elasticities prove fairly stable across time, though among daughters there is a small tendency to increasing inter-generational mobility.

A fresh data set has recently been compiled on Finland, surmounting some of the limitations on prior samples for the US in particular, and the present paper represents a first look at these Finnish data.[3] For this study, we compile two panels of data, extending from 1950 through 1999, on the families of more than 200 thousand sons and daughters, encompassing 41 annual cohorts of children born between 1930 and 1970 (with parents born as early as 1880). Attrition from this panel is virtually non-existent, save for those who died or emigrated, being predominantly register based data as in the Norwegian study.

A number of alternative approaches are used to look at these data, employing both time average earnings and earnings at particular ages, as in various prior studies. Moreover, the issue of including zero earnings observations on children is addressed. The general pattern that emerges proves relatively insensitive to these alternative measures. Inter-generational economic mobility increased markedly across these cohorts born between 1930 and 1970. Both sons' and daughters' economic prospects came to replicate those of their parents less

closely over time, though most of this change occurred across those cohorts born between the early 1930s and the early 1950s.

The period from 1950 to the turn of the millennium was one of remarkable, though uneven transformation in Finland. Based on end point comparisons, real GDP per capita grew at 3.15 percent per year over this half century. In 1950, nearly 40 percent of the labor force were employed in agriculture, forestry and fishing; by 2000 this fraction had declined to just over 5 percent. Over the same interval, the population shifted from being two-thirds rural to two-thirds urban residents. In 1950, children were required to attend school only through age fourteen though many left at age thirteen in rural areas, and among the generation of children born in 1940, 56 percent never completed more than a primary education; by 2000 about 28 percent of persons aged 19-21 had entered university, in addition to those benefitting from post-secondary vocational education, and Finland ranked sixth among the EU-15 countries in percent of adult population with at least an upper secondary education.[4] In essence, Finland went from resembling a middle income, developing country to a high-tech economy within the last half of the twentieth century. Structural transformation came relatively late to Finland, but then happened very fast.

Although inter-generational mobility increased and major transformations occurred in the Finnish economy during this half century, neither happened at an even pace. What were the connections? Towards exploring this question, a decomposition of the changes in inter-generational transmission across cohorts is also reported in this paper. Levine and Mazumder (2002) decompose the inter-generational transmission elasticity into a 'direct' effect and an effect that operates through investments in the child's human capital in the form of schooling. Specifically, Levine and Mazumder examine the change in contributions of these components between two time periods in the US. Here, this approach is modified and extended. In the Finnish context, rapid educational expansion occurred but the structure of the economy also underwent major shifts. It seems plausible that so long as children remain in agriculture, in a stable agrarian setting, little economic mobility may be observed; on the other hand, opening new opportunities in industry and services in town may tie children less to the life-style and incomes of their parents. Accordingly, the Levine-Mazumder decomposition is modified to incorporate investments in human capital both in the form of schooling and in the form of migration; it is also extended beyond a two-period comparison to look at all 41 cohorts in our data.

This very simple decomposition framework is outlined in the following section. The data sets compiled for this study, the specification of variables, and some issues arising in estimation are then described in Section 2. The results on the levels and trends in inter-generational transmission across cohorts are presented and discussed in Section 3. To place the decomposition analysis in context,

Section 4 offers a brief history of some of the more salient changes that occurred in Finland over the relevant period, before presenting the decomposition results in Section 5. The paper closes by attempting to place these results in perspective and by offering some thoughts on further work.

2. A Simple Framework

The inter-generational transmission elasticity, τ, is typically obtained by estimating an equation of the following general form:

$$(1) \qquad \ln y^c_i = \gamma + \tau \ln y^p_i + \alpha' A_i + \eta_i$$

where y^c_i is some measure of child i's permanent economic status and y^p_i represents the permanent economic status of i's parents. A_i is a vector of polynomial terms in the age of both the child and parent and α is a vector of corresponding coefficients. The standard justification for including these age controls is that measured incomes of both child and parents may depart systematically from their permanent counterparts, according to the age at which these income are observed.

Here, we are interested in investigating how the inter-generational transmission elasticity has altered across birth cohorts. The standard model is accordingly modified to become:

$$(2) \qquad \ln y^c_{ib} = \gamma_b + \tau_b \ln y^p_{ib} + \alpha_b' A_{ib} + \eta_{ib}$$

where subscript b indicates that person b is born in cohort b = 1,2,... B. In other words, all parameters are permitted to vary across cohorts and, in particular, no specific functional form is imposed on the trend in transmission elasticities, τ_b, across cohorts.

Equations such as (1) and (2) are reduced forms, typically derived from models in which parents' permanent income is correlated with investment in the child's human capital and hence the child's earnings. The source of this correlation remains a matter of considerable dispute: whether the role of parents' incomes represents a budget constraint effect, or if high earnings abilities are simply transmitted from parent to child (either genetically or through the home environment).[5] Levine and Mazumder (2002) explore a method of decomposing the reduced form estimate of the inter-generational parameter (τ) by separate estimation of some of the underlying structural relationships, focusing upon duration of schooling as the key measure of the child's human capital in which parents invest.

As noted in the introduction, during the latter half of the twentieth century there was not only a massive expansion in the Finnish educational system but a substantial transformation out of agriculture with associated urbanization. In the present context, we therefore modify the approach of Levine and Mazumder to incorporate human capital investments in the form of migration as well as in education. In particular, let:

(3) $\ln y^{c}_{ib} = \kappa_b + \delta_b \ln y^{p}_{ib} + \rho_b s^{c}_{ib} + \lambda_b m^{c}_{ib} + \beta_b' A_{ib} + \xi_{ib}$

(4) $s^{c}_{ib} = \varsigma_b + \sigma_b \ln y^{p}_{ib} + \varepsilon_{ib}$

(5) $m^{c}_{ib} = \nu_b + \mu_b \ln y^{p}_{ib} + \omega_{ib}$

where s^{c}_{ib} and m^{c}_{ib} are measures of educational attainment and of migration of child i in birth cohort b. Substituting (4) and (5) into (3), it is clear from comparison with (2) that:

(6) $\tau_b = \delta_b + (\rho_b \sigma_b) + (\lambda_b \mu_b)$

The first term on the right of (6) is akin to what Levine and Mazumder call the 'direct' effect of parental income on the child's economic status.[6] The second term reflects the effect of parental income on the child's outcome that operates through investments in the child's schooling, while the third component reflects the effect through investment in migration. In turn, the schooling and migration components both comprise two effects: the influence of parental incomes on the human capital investments and the returns on those investments realized by the child. For example, if only rich parents are able to educate their children to higher levels and the returns to schooling are high, then inter-generational transmission of incomes will also be high; if either education becomes more egalitarian or the returns to education decline then inter-generational mobility increases.

By estimating the system of equations (3) through (5), it is then possible to decompose the reduced form transmission elasticity into these direct, schooling and migration components. To these estimates, Section 5 returns. But first, it is necessary to describe the nature of our data in greater detail and to outline some of the estimation issues that arise.

3. Data, Specification and Estimation Issues

In 1964 personal identity codes were introduced in Finland. These codes permit Statistics Finland to track individuals across the population censuses conducted in 1970 and every five years thereafter.[7] These identity codes further enable Statistics Finland to access information on individuals across administrative registers such as the Central Population Register, Tax Register, and the annually updated Longitudinal Employment Statistics file that has existed since 1987. Altogether this represents a panel of information on the entire resident population of Finland for the years 1970, 1975, 1980, 1985 and then annually from 1987 through 1999. Extracting from these data, two sub-samples are drawn for this study.

The first sub-sample of our data is based on a one percent, random sample of individuals in the 1970 Population Census, plus all family members cohabiting with those individuals at the time of the 1970 Census. In particular, for present purposes the observations drawn from this first data set comprise all persons aged 0-19 in 1970, provided they are living in a family and not alone in 1970. For each of these sons and daughters, panel information is then available both on the individual and on each parent present in the family in 1970. By 1999, 29 percent of the fathers and 11.5 percent of the mothers present in 1970 were known to have died. Otherwise less than three percent of both mothers and fathers had 'disappeared' from the panel by 1999 despite substantial emigration, particularly to Sweden, in the interim.[8]

The second sub-sample incorporates an additional data set, namely the 1950 Population Census. This was the first census of the entire population of Finland, but was obviously conducted before personal identity codes were introduced in 1964. Recently, however, Statistics Finland assigned identity codes to individuals in a ten percent random sample of households from the 1950 Census.

In a major, pains-taking exercise, Statistics Finland has now manually matched all of the individuals from this ten percent sample of the 1950 Census (some 700 thousand people) with their individual records in the 1970 Census. The second sub-sample in the present study then comprises all persons ages 0-20 in 1950 and living with a family drawn in this ten percent sample. Of the 1950 fathers in our second sub-sample, 29.8 percent could not be located in the 1970 Census; similarly, 18.4 percent of the mothers, 14.7 percent of the sons and 16.9 percent of the daughters could not be located in the 1970 Census. These rates of attrition are quite consistent with projected rates of demise and emigration over the twenty year interval.[9] For all remaining individuals in the sub-sample, bridging to the 1970 Census has proved possible and hence to the post-1964 identity codes. Thus, where these sons, daughters and their parents were identified as live residents of Finland in the 1970 Census, panel data are available on this second

set of individuals for 1950, 1970, 1975, 1980, 1985 and then annually from 1987 through 1999, provided they survived and did not emigrate prior to 1999.

In Section 3, estimates of equation (2) are reported, derived by pooling these two sub-samples. However, before presenting these results, a number of issues of specification and of estimation procedures require clarification.

Specification of variables

The basic measure adopted to represent y^c_i is the time average of annual earnings for the son or daughter, across all years in which positive earnings are reported and in which the son or daughter is at least 25 years of age and less than 60 years of age. The lower bound on age is imposed to exclude casual and part-time earnings among students in particular. The upper bound applies only to a few older cohorts in the 1950 sample and is imposed to exclude semi-retired people. Earnings include relatively small amounts of self-employment earnings as well as all wages, salaries and bonuses, and all measures are expressed in constant prices using the national consumer price index. Two additional variants on measures of sons and daughters earnings are also considered in the following section, but discussion of these is postponed until that stage.

The permanent income of the parents, y^p_i , is represented by the time average of taxable income accruing to the parents.[10] In the data files, taxable income is reported for each parent individually; joint tax returns do not exist in Finland. The 'parents' are defined as the head of the family and any 'spouse' (whether formally married or not) present in the household when the family is first observed. Thereafter, family income is defined as the sum of taxable incomes of both parents, even if they no longer cohabit.

Taxable income is reported for each live resident of Finland in our sample, from 1970 onwards. However, one unfortunate feature of the data is that no information on incomes was collected in the 1950 Census. There exist, however, detailed cross-tabulations of mean taxable incomes by industry, occupation, gender and region of residence in 1950.[11] These tables are used here to construct an estimate of the income for each 1950 household based on the cross-tabulation characteristics. Moreover, additional, positive income observations are available on some 60.6 percent of 1950 fathers and 70.5 percent of 1950 mothers from the later, 1970-1999, panel data.

The vector of age measures, A_i , is composed of the mean observation age of the son or daughter, the mean observation age of the household head and the squares of both. The sons' and daughters' mean ages are calculated over time periods in which positive earnings are observed, given that the person is older than 24 and younger than 60. Thus, within each birth cohort this permits some variation in

mean ages of sons and daughters. For the household head, mean age refers to an average over years in which positive income is observed for this head.

Issues in estimation

The pooled sub-samples provide observations on 118,497 sons and 108,107 daughters, each with positive reported earnings and matched with parents having positive reported incomes. In other words, the 41 annual birth cohorts on average contain 2,890 sons and 2,637 daughters satisfying these criteria. Given these large sample sizes, the initial estimates in the following section treat each annual birth cohort separately.

However, sample sizes vary considerably across birth cohorts. In particular, the numbers of observations are lowest at the very beginning and in the middle of the time period. A study by the Finnish Population Research Institute (1995) estimates that, at least in the mid-1980s, Finnish children continued to live with their parents beyond age 16 more frequently than did children in the other Nordic countries: 95 percent of boys ages 16-19 were still at home in Finland as were 88 percent of girls. Nonetheless, the numbers of 19 and 18 year old 'children' still living at home in the 1950 and 1970 Censuses, and hence the observations on their corresponding birth cohorts, are comparatively small. This not only affects the precision of estimates for these birth cohorts but the danger of selection bias should also be noted, resulting from sample selection in leaving home. It has not been possible to attempt any correction for such potential selection bias in the present study, so the estimates for the birth cohorts in 1930-32 and 1951-52 should be treated with particular caution.

Throughout, reported estimates of standard errors are robust to heteroskedasticity and clustered to permit correlation in errors between siblings within the same family. Moreover estimates of the system of equations (3) through (5), reported in Section 5, are obtained by joint estimation as seemingly unrelated regressions with potentially correlated errors. The resulting linear probability estimates of the migration equation (5) are also estimated separately by probit. and differences between the derivative of the probit specification at the sample mean and the seemingly unrelated estimates of (5) explored.

4. Estimates of Inter-Generational Mobility by Birth Cohort

Figure 1 presents ordinary least squares estimates of the inter-generational transmission elasticity parameters, τ_b in equation (2), bounded by 95 percent confidence intervals on these estimates. Each point estimate is obtained from pooled data on three annual birth cohorts formed in rolling samples, with separate regressions within each three-year cohort for sons and for daughters. Comparable estimates for each individual birth cohort year were also generated but are not displayed here for brevity. The single year cohort estimates exhibit essentially the same patterns as those shown in Figure 1, though obviously the latter smooth out some of the year-to-year fluctuations. In general, both sets of estimates prove fairly precise. For instance, across the 41 single cohort estimates the simple average of t-statistics for a zero null hypothesis is 11.5 for sons and 8.5 for daughters, although the comparatively small sample sizes in the very early years and in the 1951-53 period render estimates relatively imprecise in those ranges.

The dependent variable in Figure 1 is the natural logarithm of mean average earnings across years of positive observed earnings when the son or daughter is between ages 25 and 59.[12] Two issues arise with respect to such measures: the first concerns the exclusion of years of zero earnings; the second concerns the effects of alternative age constraints.

With respect to the first issue, Couch and Lillard (1998) find that estimates of inter-generational transmission elasticities in the US prove extremely sensitive to inclusion of periods when sons and daughters have low or zero earnings. Specifically, the results of Couch and Lillard suggest that arbitrarily excluding low earnings observations, as is common practice, substantially biases upwards the estimates of inter-generational transmission. As Couch and Lillard (1998:318) note, by including low earnings observations, "Permanent status is measured as an average across all periods, not simply those when things are going well." Once Couch and Lillard include these periods of low earnings and replicate prior estimates with the PSID and NLS data, only very weak transmission is found where prior estimates indicated substantial immobility between generations.

In the Finnish context, no such upward bias from exclusion of zero earning periods is apparent. Figure 2 depicts estimates comparable to those in Figure 1 but now including zero earning years in computing mean earnings for each son and daughter.[13] Within virtually every cohort group, both for sons and daughters, the point estimate of the transmission elasticity is slightly greater when zero

earning observations are included: about 7.6 percent greater for sons and 10.8 percent greater for daughters on average.

The second issue with respect to measurement of the dependent variable in Figure 1 arises from imposing age constraints on observations of sons' and daughters' earnings. For instance, Reville (1995) shows that estimates of inter-generational transmission tend to rise with the age at which sons' earnings are observed, at least in the US. (See also Lee and Solon, 2004). Are the higher transmission elasticities estimated for the earlier cohorts in both Figure 1 and Figure 2 simply a reflection of having observed the earlier cohorts at older ages? To explore this possibility, a third set of estimates is presented in Figure 3 in which only (positive) earnings at (approximately) age 30 are included for each son and daughter.[14] For the daughters, the transmission elasticity estimates are lower in Figure 3, for earnings at age 30, than when average positive earnings are used in Figure 1. There is, however, no particular time pattern to the difference in these estimates, except in the last couple of cohorts where very few daughters are observed at age 30. For sons, on the other hand, the transmission elasticity estimates actually prove greater among the earlier cohorts when only earnings at age 30 are adopted, whereas estimates in the middle cohorts (born between 1943 and 1963) are lower, thus leaving a steeper time profile in Figure 3. It seems the decline in the transmission elasticity in Figures 1 and 2 was not simply a result of having observed the earlier cohorts at older ages.

In the US context, the focus has been on whether there is a positive or negative trend in the extent of inter-generational mobility. In Figures 1, 2 and 3, no matter which measure of the dependent variable is adopted, the earlier cohorts in Finland tend to exhibit the greatest lack of inter-generational mobility, both among sons and daughters. However, it is clear from these figures that the changes over time in Finland are not well represented by a linear trend: indeed, the profile across cohorts is not uniformly monotonic.

Towards testing the broad changes over time, Table 1 presents estimates of the transition elasticities based on five-year, non-overlapping cohorts. The lower panel shows F-tests on the change in elasticity from each five-year period to the next as well as from 1930-34 to1965-70. In the Appendix, Table A.1 presents a more complete set of F-tests across each pair of periods for the case of mean positive earnings, corresponding to the first two columns in Table 1.

Statistical confidence in the decline in inter-generational transmission from the earliest cohorts, born in 1930-34, to the latest born, in 1965-70, exceeds 99 percent. Indeed, the estimated transmission elasticities for the first two cohorts, born in 1930-34 and 1935-39, are significantly greater (at a one percent confidence level or better) than for any of the later cohorts born from 1945 onwards, both for sons and daughters and irrespective of the alternative measures

of the dependent variable explored.[15] In contrast, among the steps in which the estimated transmission elasticity increased slightly from one five-year period to the next, in only one case does this step differ significantly from zero even at a five percent confidence level.[16] From the 1930-34 birth cohort (1935-39 for earnings at age 30) to the 1945-49 cohort, the estimated drop in transmission elasticity is substantial and statistically significant at greater than a one percent level.[17] From 1945-49 through to the 1965-70 cohort no significant change in estimated transmission elasticity is found at the one percent significance level.

Overall, the inter-generational transmission of economic outcomes from parents to children thus declined significantly from those born in the early 1930s through to generations born at the end of the 1960s. Yet this shift occurred unevenly: most of the reduction in the impact of parents upon their children occurred at an early stage, among cohorts born between 1930 and the beginning of the 1950s. Thereafter, little further change in inter-generational transmission occurred. What underlay this?

5. Background Facts on Developments in Finland

Despite the normal onset of business cycles during the 1950s and 1960s, the Finnish economy grew very rapidly, averaging more than four percent growth in GDP per capita. Over the next two decades growth began to slow and during 1990-93 Finland underwent perhaps the deepest recession suffered by any industrial country in recent decades, following the loss of the Soviet export market. Unemployment and real consumption wages have both mirrored these overall developments in GDP growth. (See Table 2).

The share of agriculture and forestry in total employment declined quite steadily over the second half of the 20th Century. In 1950, agriculture and forestry provided almost 40 percent of total employment, falling to about a quarter in 1970 then continuing to decline to some 6 percent in 2000. Meanwhile, the fraction of total employment in manufacturing grew from 22 percent in 1950 to 28 percent in 1980. Initially, a part of this industrialization was driven by the reparations agreement with the Soviet Union following World War II, under which Finland was obliged to deliver heavy industrial goods in kind. However, from 1981 onwards the share of employment in manufacturing has declined quite continuously and Finland, as with other high income countries, has become a service dominated economy.

Together the employment growth in manufacturing and in services have resulted in rapid urbanization. When 40 percent of employment was in agriculture and forestry in 1950, two thirds of the population lived in rural communes. The period of rapid urbanization coincided with the period of rapid manufacturing employment growth, and by 1980 sixty percent of the population were in urban communes reflecting rapid rural-to-urban migration during the intervening three decades. Since 1980, the trend toward urban concentration has continued, and in 2000 almost two thirds of the population were in urban areas.

In the process of these transitions, the portion of household incomes derived from self-employment fell substantially. In 1950, the large numbers of self employed farmers meant that more than a quarter of all household income was derived from self employment; by 1980 this had fallen to eleven percent and has been below a tenth since 1990. Meanwhile Finland's welfare state has expanded substantially. In 1950, total gross transfers to households amounted to less than six percent of household incomes; during the recession in the early 1990s transfers, almost entirely from government, reached nearly a third of household incomes, though this has fallen off again slightly with the recovery to 2000.

The distribution of disposable incomes among households in Finland is particularly equal, even by European standards. (Atkinson *et al.*, 1995). Little information exists on the distribution of income in the1950s, partly through lack

of data, though a study by the Central Statistical Office (1970) finds no change at all in the relative incomes of the top and bottom deciles, among full time workers, from 1955 to 1966. In a later study, Uusitalo (1989) finds that income inequality decreased sharply thereafter, from1966 to 1971 and again from 1971 to 1976, then remained fairly stable over the next decade to1985.[18] Meanwhile, Eriksson and Jäntti (1997) demonstrate, using census data, that earnings inequality followed a similar pattern of sharply diminished inequality from 1971 to 1975, then continued but milder movement toward more equality through 1985. Eriksson and Jäntti note that this wage compression occurred during a time of highly centralized wage bargaining, then demonstrate that earnings inequality increased substantially from 1985 to 1990 with a return to more decentralized wage setting. More recent studies of income distribution during the 1990s confirm this continuing trend toward greater inequality, despite the high levels of transfers. (Riihelä *et al.*, 2002).

Lastly, in this brief sketch, Figure 4 shows the levels of education completed by each annual cohort born in Finland from1900 through 1970, estimated from our complete pooled sample, including 1950 parents. A 1921 Law on Compulsory Education required all children to attend school through age 14 in urban areas, 13 in rural areas, though it appears not to have been fully implemented at least prior to World War II. The Law on Primary Schools, enacted in 1957 and 1958, increased the minimum school leaving age to 15, and in 1970 the introduction of Comprehensive Schools was accompanied by a rise in school leaving age to 16. By the time of the 1935 birth cohort, nearly two thirds of children did not continue past primary school although almost ten percent ultimately completed a tertiary education. Thereafter, the incidence of secondary schooling began to rise steadily and quite dramatically. Among those born in the early 1950s, more than two-thirds continued beyond primary school and about fifteen percent achieved a tertiary education. By the end of our period of observation, almost thirty percent of the birth cohorts of the late 1960s completed a tertiary education.

6. Decomposition Results

Against this background of developments in Finland, we turn in this section to a decomposition of transmission elasticity estimates into the direct, education and migration components distinguished in equations (3) through (6). To estimate this structure requires additional measures of schooling and migration for each son and daughter. Schooling of each child, s^c_i , is measured in years, after converting the raw data on level of schooling completed to an equivalent measure in years typically required for completion. The migration measure, m^c_i , is set equal to one if the son or daughter is ever observed residing in a region different from their region of birth, and otherwise equals zero.[19]

Based on these measures, the set of equations (3) through (5) is estimated, for each three-year rolling cohort, as a seemingly unrelated system. The results are presented in the appendix, Table A.2. Figure 5 depicts the resulting direct (δ_b), education (ρ_b σ_b) and migration (λ_b μ_b) composites for the case, comparable to Figure 1, in which the logarithm of mean positive earnings is the dependent variable in (3).

Despite the rapid urbanization of Finland, especially during the 1960s and 1970s, the estimated migration component played a very small part in the inter-generational transmission of inequality. On average, sons born between 1930 and 1940 who migrated from one region to another are estimated to have earned about 16.5 percent more than those sons, with comparable schooling levels, who remained in their region of birth. For daughters the difference was about 11 percent. However, even among these earlier cohorts, the influence of parental incomes on the probability of such migrations was small: a doubling of family income is estimated to have been associated with a rise in the probability of migration by only .07 among both sons and daughters.[20] The combined effect was only a small advantage to the children of richer parents, realized through inter-regional migration. After the 1940 birth cohort, both the returns to migration and the association between family income and the odds of migrating declined fairly steadily; any connection between inter-regional migration and inter-generational transmission of inequality soon disappeared.[21] It is possible that the weak association between family income and the propensity to migrate might reflect some non-linearity in this association. However, the propensity to migrate is at least quite monotonic and increasing in income over each quartile of family income, within each cohort. On balance, our estimate of the migration component, within overall inter-generational transmission of inequality, is thus both small throughout and declining over time. Whether this small effect stems from representing migration in the form of inter-regional migration rather than being able to discern the transition from a rural to urban setting must await more complete data.

Whereas the migration component averages only about 2 percent of the total inter-generational transmission for both, sons and daughters, the educational component is far greater, averaging 36 percent of the total transmission for sons and 42 percent for daughters. As with the migration component, the education component clearly declined with successive cohorts. Indeed, the estimates in Figure 5 indicate that from the 1930-32 birth cohort to those born in 1968-70, the decline in the education component contributed 88 percent of the overall decline in the total transmission elasticity among sons and 54 percent among daughters.

Figure 6 looks more closely at what underlay this change in the educational component. The total educational component, which is defined as (ρ_b σ_b) in (6), corresponds to the curves marked Rho*Sigma. Estimates of both sub-components, Rho (ρ_b) and Sigma (σ_b), are also shown separately each re-based as an index set equal to 100 in 1930-32 for ease of comparison. The returns to schooling, ρ_b, declined fairly steadily across cohorts, both amongst sons and daughters.[22] It is feasible that the decline in estimated returns to education reflect having observed earlier cohorts at later ages, combined with any tendency for the returns to education to rise with age. Indeed, this may well explain the tendency, noted by Reville (1995) in the US context, for the inter-generational transmission of incomes to rise with age at which children are observed. (See Lucas and Pekkala, 2003). However, if equation (3) is re-estimated with the logarithm of earnings at age 30 as the dependent variable then the estimated returns to education still decline, slightly more substantially even than for the time average estimates, from the early cohorts to those born in the late 1940s.[23] Indeed, no matter whether time average earnings or earnings at age 30 are adopted, the estimated returns to schooling had fallen to about half their initial level by the time of the cohorts born at the end of World War II.

Sigma, the effect of parental incomes on duration of schooling, (σ_b in equation (4)), also declined over the range of cohorts shown in Figure 6, though most of the decline in σ_b is estimated to have occurred among the cohorts born during the 1940s. Estimates for the 1951-53 interval are relatively imprecise, as a result of the smaller samples. However, for both sons and daughters, there is a small rise in the estimates of σ_b from the birth cohorts of the mid-1950s to those born at the end of our sample period. Nonetheless the composite education component exhibited little change over this latter interval as the returns to schooling continued to decline.

Thus, both the decline in the returns to schooling and the lessening impact of family income on education attainment contributed substantially to the overall decline in the educational component. Based on end-point comparisons, the change in the logarithm of ρ_b amounted to 63 percent of the difference in the overall change in the logarithm of ρ_b σ_b among sons and nearly 54 percent among daughters.

Meanwhile, even as the migration and more importantly the education components have declined over time, both for sons and daughters, the estimated direct component has persisted throughout and even increased slightly over time among sons, though not among daughters. Quite what underlies this residual, 'direct' effect (ranging perhaps from inherited abilities to effects of parental incomes on quality, as opposed to quantity of schooling alone, or to other forms of human capital investments) must await further efforts at decomposition.

7. In Perspective: Conclusions and Further Work

Between those cohorts of children born in the early 1930s and those born at the end of the 1960s, inter-generational economic mobility is estimated to have increased significantly in Finland. However, this does not reflect a simple linear trend of rising mobility across generations. Rather, all of the rise in mobility was already apparent among the cohorts born in the early 1950s: thereafter little change in either direction is observed.

This general pattern holds both for sons and daughters. The pattern is also unaffected by inclusion of zero earning measures in averaging children's earnings across time, or by focusing on earnings at age thirty rather than looking at the time average. It seems the higher inter-generational transmission elasticity estimates for the early period are not merely a reflection of rising inter-generational transmission with age of the offspring, and of having observed early cohorts at older stages.

The overall rise in inter-generational mobility over the last half of the 20th Century was accompanied by diminished income inequality over the same period. To uncover the precise connections between theses two forms of greater equality would require more work; the analysis of inter-generational mobility presented here focuses upon cohorts, whereas the limited, existing evidence on changing inequality refers to time periods instead. Moreover, almost nothing is known of changing income inequality among the generations of 1950 parents. Nonetheless, it is intriguing to note that most of the estimated increase in inter-generational mobility occurred across cohorts who were in their early to middle adult years during those episodes, from the mid-1960s to mid-1980s, when the largest declines in overall income and earnings inequality were observed. The later cohorts studied here, among whom little further change in inter-generational mobility is noted, were exposed less to this period of increasing equality; rather, they are observed earning largely during a time when overall inequality actually increased, after 1985.

A very rapid transformation of the Finnish economy occurred during this period of overall increasing inter-generational mobility. As the economy grew quickly, Finland was transformed from a predominantly agrarian, rural society in 1950 to a high-tech, urban, service-based economy in 2000. The returns to inter-regional migration proved fairly high among sons born before World War II, though this was less true for daughters. It seems that those sons who were able to leave their region of origin and to take advantage of the newly expanding sectors in their prime working years did quite well. However, among both sons and daughters, the influence of parental incomes on the propensity to migrate proved fairly small even in the initial stages and declined further among later cohorts. The combined effect was that inter-regional mobility appears to have had little

influence on inter-generational mobility even among our earlier cohorts and ultimately vanished entirely.

In contrast, the link between parental incomes and level of educational attainment of their sons and daughters, combined with the returns on that schooling, play a key part in the story. Almost all of the additional inter-generational mobility between the earliest and latest cohorts in this study is attributable to the combined effect of declining returns to schooling and a diminished effect of parents' incomes on the ultimate schooling level of their children. Again, the decline in estimated returns to education does not appear to reflect observing the early cohorts at older ages: estimates based on earnings at age 30 for each cohort also display a decline from the relatively high returns attained among the earlier cohorts. No matter whether time average earnings or earnings at age 30 are examined, most of the decline in the returns to education, for both sons and daughters, had occurred by the time of the cohorts born in the early 1950s.

This was also the period in which the influence of parents' incomes on their children's schooling underwent the sharpest decline. For cohorts of children born in the early 1930s, secondary schooling and certainly a tertiary education were the prerogative of the elite: by the time that the cohorts born in the early 1950s were going through school this was less clearly the case. What underlay this transition must await further work, but some hypotheses may be suggested. The 1950s and 1960s were periods of exceptional economic growth, rising real wages and low unemployment. No doubt the new prosperity enhanced the demands for education, and perhaps particularly so among poorer families. But access to schools, the supply side, probably mattered too. In 1950 there were 220 secondary schools in the country with 95 thousand pupils; by 1960 there were 338 secondary schools educating 214 thousand students and by 1970 the number of secondary schools reached 474 with enrollment of over 323 thousand. Yet capacity alone does not tell the full story; the new schools were widely scattered. By the end of World War II most secondary schools were in larger urban areas, where a minority of the population dwelt. Moreover these schools charged fees approximating a half month of pay for an agricultural laborer at the time. By 1970 not only had substantial migration occurred into the major urban areas, but the new schools were more easily accessible among the remaining rural population. How much of the additional school retention during the 1950s reflected these shorter commuting times, as opposed to growing family incomes, declining school fees, and the 1957 increment to the minimum school leaving age, remains to be investigated systematically. Whatever the cause, a very major expansion in secondary schooling occurred precisely among those cohorts where greater inter-generational economic mobility was first effected.

The big expansion in tertiary education followed, starting with the generation born in the early 1950s. Government guaranteed loans for students had been

introduced in 1959, but the generation born in the early 1950s were the first to be able to take advantage of the subsidized interest rates on students loans added in 1969, followed by grants introduced in 1972. Certainly from 1969 onwards the portion of student financing obtained from grants and loans escalated dramatically. (See Blomster 2000). Yet there is little evidence that this increased the average inter-generational mobility much beyond the levels achieved among the cohorts born in 1945-50.

It remains feasible that access to college and hence greater earnings were indeed enhanced for particular income classes in these later cohorts, though undetected here. In future work, it would thus be of considerable interest to pursue this issue further: to examine not just the number of years of education completed but to look at the discrete choices whether to continue schooling at each level and how this varied across cohorts. Moreover, in so doing, it may prove important to go beyond the average transmission elasticity estimates considered here, to look at transmission among different income classes, within each cohort.

Meanwhile, it seems that at least on average, the rapid expansion in the Finnish educational system in the second half of the 20th Century came at the price of lower returns on investments in schooling. As higher education became less a prerogative of the elite, the rewards to this education declined. Overall inter-generational economic mobility increased, almost entirely because the capacity of rich parents to transmit an earnings advantage to their children through more extensive, highly rewarded education evaporated.

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Endnotes

[1.] See, for example, Bound and Johnson (1992) or Juhn, Murphy and Pierce (1993).

[2.] See the model developed in Solon (forthcoming).

[3.] Österbacka (2001) uses portions of these data to look at father-son correlations in earnings but not how this transmission has evolved over time.

[4.] See Havén (1999) and the OECD *Education at a Glance 2004* at www.oecd.org/edu/eag2004

[5.] See Becker and Tomes (1986). Lucas and Pekkala (2003) present a model and evidence attempting to distinguish between some of these effects in the context of Finland.

[6.] Levine and Mazumder include parents' education as an additional explanatory variable in their equivalents of both (3) and (4), then add a further 'noncausal auxiliary equation' relating parental education to parental income. Their direct effect is correspondingly slightly more complex, as is the second term. Interpretation of an auxiliary equation becomes correspondingly more difficult if parental migration is included. For now, we therefore elect to limit the decomposition to the extent reflected in (3) through (5), which are relatively easy to interpret.

[7.] The 1990 Census was the first totally register-based population census in Finland. However, some data were recovered from registers already in 1970, and by 1985 only information concerning workplace and occupation was asked on the questionnaire.

[8.] For a more detailed discussion of these data and attrition from the data see Lucas and Pekkala (2003).

[9.] From 1950 to 1969 gross emigration amounted to nearly 7.5 percent of the population. In 1950, the median age of our sample of fathers was about 40 and of mothers was 37. Statistics Finland (2000) notes that the 1950 sample identified in the 1970 Census is indeed quite consistent with their 1950 Census demographic profile. It appears that individuals from the 1950 Census were assigned a 1970 identity code with very high precision, and that the age groups we are interested in were found in the 1970 census remarkably often.

[10.] For a detailed consideration of reasons to consider family income rather than parental earnings, at least in Finland, see Lucas and Pekkala (2003).

[11.] The tables are contained in Central Statistical Office (1953) having been compiled from information on individual family's incomes, collected by the tax authorities and provided to the Central Statistical Office on punch cards. Unfortunately, the cards were later destroyed after the information on them had been tabulated.

[12.] Abul Naga (2002) notes conditions under which such between-individual estimators can prove more efficient than estimation based on annual observations on each child.

[13.] Couch and Lillard (1998) replicate prior results that had adopted a single year of data on earnings of sons in the PSID and NLS. To represent zero earnings in this logarithmic equation, the authors adopt an arbitrarily low value for the dependent variable. In Figures 1 and 2, the dependent variable is the logarithm of a time series average which permits inclusion of zero earnings in the arithmetic mean. See Lucas and Pekkala (2003) for further results on inclusion of 'children' who are never observed earning and reasons underlying the contrasting results in Finland.

[14.] Given that from 1970 to 1985 data are available only at five year intervals, for those born between 1940 and 1955 earnings in the year of observation falling closest to their 30th birth year were adopted. Similarly, for those born in 1970, data refer to age 29 (1999 being the last year of observation).

[15.] The only exception is among daughters' earnings at age 30, where confidence is weak that the estimated transmission elasticity for the 1935-39 cohort is greater than for later cohorts.

[16.] The solitary exception is again among daughters when observing earnings at age 30: the probability of finding an F-statistic greater than that on the rise in transmission elasticities estimated for cohorts born in 1960-64 compared to 1965-70 is 0.02.

[17.] Again, the case of daughters' earnings at age 30 is an exception: here the transmission elasticity is estimated to have declined only slightly from 1935-39 to 1945-49 and confidence in this decline is only about 98.5 percent.

[18.] In particular, Uusitalo (1989) estimates that the portion of disposable income per consumer unit going to the poorest decile of persons stood at about 12 percent of that going to the richest decile in 1966, then increased to 24 percent by 1976 and 27 percent by 1985.

[19.] Region of birth is recorded for each individual in the 1950 and 1970 Censuses though unfortunately no specific information is available about whether the child grew up in an urban or rural setting.

[20.] These refer to the linear probability model estimates. As a check, the migration equation (5) was estimated separately as a probit specification and the derivative with respect to family income at the sample mean evaluated within each cohort. For both sons and daughters, the absolute value of the difference between the probit and linear probability estimates of μ averaged less than 0.0004.

[21.] Given that the available measure of migration is whether each person has ever migrated, the probability of observing migration tends to rise with age. In this cross cohort analysis this rising propensity is reflected in the fixed, intercept effect for each cohort, though it is not really feasible to estimate any interaction effect between family income and child's age within cohorts.

[22.] This is in accord with prior evidence on decreasing returns to education over time in Finland during the 1970s and 1980s. Returns are estimated to have then dipped in the mid-1990s, following the deep recession, but largely to have recovered by the end of the century. See Asplund 1999, Pekkala and Berman 2002, and Government Institute for Economic Research, 2004.

[23.] The estimates based on earnings at age 30 tend to show a modest rise in returns to schooling among the later cohorts though never to the levels among the earliest cohorts. This tendency to higher returns among the later cohorts is consistent with prior findings that the returns to education in Finland rose during the 1990s, which is when these cohorts reached age 30.

Tables

Table 1: Inter-Generational Elasticity Estimates by Five-Year Birth Cohorts

	Logarithm of average earnings				Logarithm of earnings at age 30	
	Zeros excluded		Zeros included			
Cohorts	**Sons**	**Daughters**	**Sons**	**Daughters**	**Sons**	**Daughters**
	τ_b (s.e.)	τ_b (s.e.)	τ_b (s.e.)	τ_b (s.e.)	τ_b (s.e.)	τ_b (s.e.)
1930-34	.333	.262	.331	.312		
	(.016)	(.018)	(.018)	(.021)		
1935-39	.290	.223	.321	.258	.348	.191
	(.011)	(.013)	(.014)	(.015)	(.014)	(.017)
1940-44	.259	.200	.270	.209	.271	.158
	(.009)	(.010)	(.011)	(.012)	(.010)	(.012)
1945-50	.218	.160	.225	.165	.185	.144
	(.007)	(.007)	(.009)	(.009)	(.007)	(.009)
1950-54	.241	.164	.249	.163	.190	.131
	(.011)	(.012)	(.014)	(.014)	(.012)	(.014)
1955-59	.230	.157	.238	.167	.181	.132
	(.009)	(.009)	(.011)	(.011)	(.011)	(.012)
1960-64	.203	.164	.221	.181	.189	.134
	(.007)	(.007)	(.009)	(.009)	(.010)	(.011)
1965-70	.194	.160	.208	.194	.203	.165
	(.008)	(.007)	(.009)	(.009)	(.009)	(.010)
	Tests on First Differences Between Five-Year Cohorts					
Cohorts compared	F-value (Prob>F)	F-value (Prob>F)	F-value (Prob>F)	F-value (Prob>F)	F-value (Prob>F)	F-value (Prob>F)
1930-34 to 1965-70	87.41	39.39	47.91	36.02		
	(.000)	(.000)	(.000)	(.000)		
1930-34 to 1935-39	6.49	4.37	0.28	5.77		
	(.011)	(.037)	(.599)	(.016)		
1935-39 to 1940-44	5.38	2.61	9.49	7.90	22.96	2.46
	(.020)	(.107)	(.002)	(.005)	(.000)	(.117)
1940-44 to 1945-50	13.02	12.37	11.58	10.10	43.30	0.80
	(.000)	(.000)	(.001)	(.002)	(.000)	(.372)
1945-50 to 1950-54	3.10	0.11	2.19	0.03	0.12	0.55
	(.079)	(.746)	(.139)	(.868)	(.733)	(.460)
1950-54 to 1955-59	0.49	0.16	0.29	0.06	0.27	0.01
	(.423)	(.693)	(.590)	(.801)	(.605)	(.926)
1955-59 to 1960-64	5.64	0.30	1.45	1.07	0.37	0.01
	(.018)	(.585)	(.229)	(.301)	(.542)	(.920)
1960-64 to 1965-70	0.75	0.18	1.39	1.05	1.30	5.26
	(.385)	(.675)	(.238)	(.305)	(.254)	(.022)

*Notes: Robust standard errors (clustered by family). Models control for average age of child and parent. Earnings at age 30 do not include zero earnings. When modeling earnings at (approximately) age 30 only birth cohorts 1935-1970 are included.

Table 2: Transformation of the Finnish Economy 1950-2000

	Percent					
		1950-60	**1960-70**	**1970-80**	**1980-90**	**1990-2000**
Annual growth of GDP per capita		3.96	4.40	3.09	2.67	1.64
Average unemployment rate		1.72	1.96	3.66	4.87	11.74
Growth of real manufacturing wage		3.60	3.12	2.68	2.06	1.59
	1950	**1960**	**1970**	**1980**	**1990**	**2000**
Share of employment in agriculture	39.4	31.1	24.1	14.2	8.9	6.1
Share of employment in manufacturing	21.8	22.9	27.9	28.0	22.2	21.2
Share of population urban	32.3	38.4	50.9	60.4	62.0	65.4
Household incomes from self employ.	25.6	21.1	13.6	11.2	7.8	7.6
Household incomes from transfers	5.9	7.8	14.0	17.1	21.9	32.8

Sources: Central Statistical Office (1968, 1971); Uusitalo (1989); Statistics Finland at http://www.stat.fi/index_en.html; IMF *International Financial Statistics* at http://ifs.apdi.net/imf/; International Labour Office Bureau of Labour Statistics at http://laborsta.ilo.org/.

Figures

Figure 1
Inter-Generational Transmission Elasticity Estimates
Three-year rolling samples
Dependent variable: Log child' s mean earnings when earnings >0 and age >24

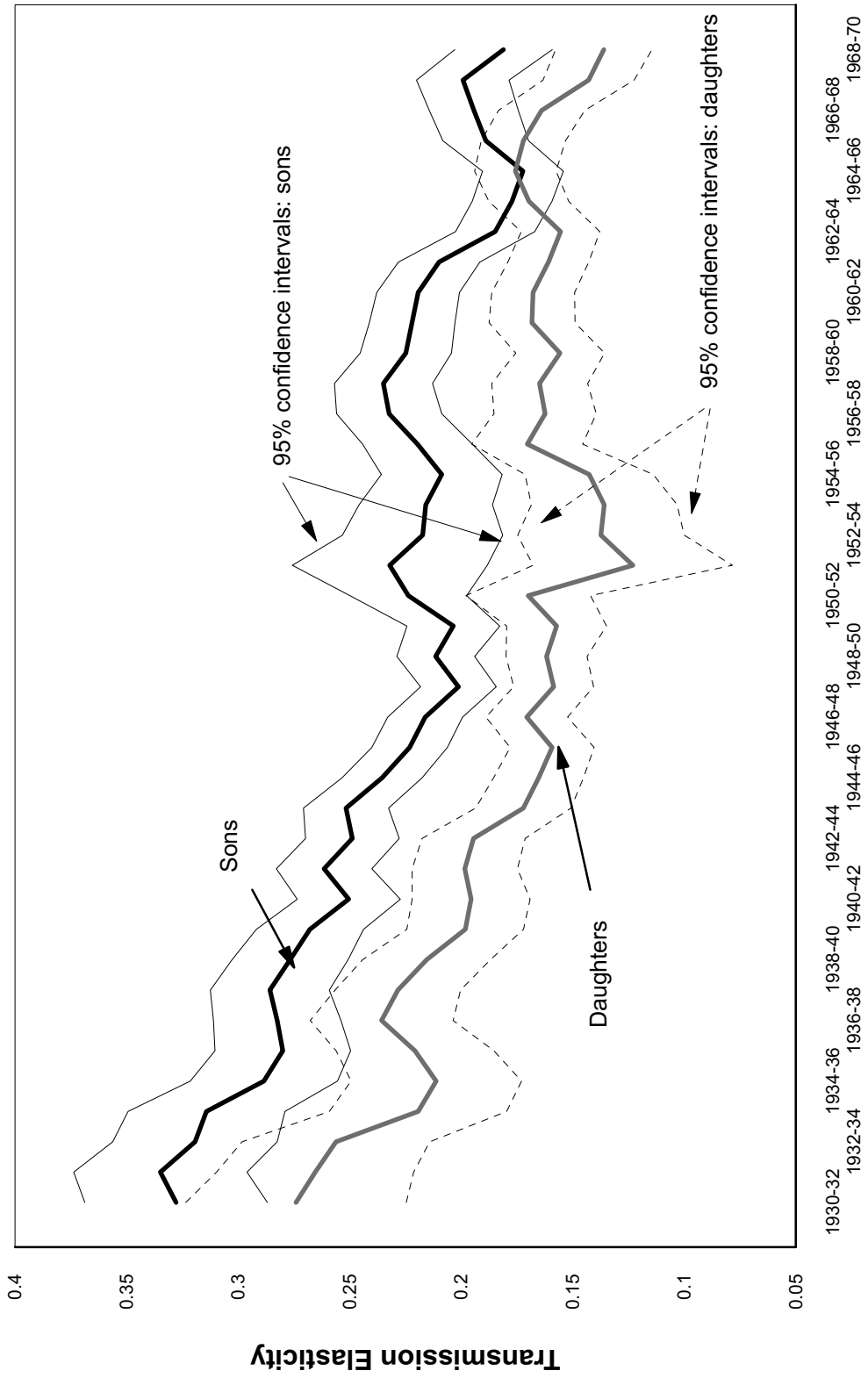


Figure 2
Inter-Generational Transmission Elasticity Estimates
Three-year rolling samples
Dependent variable: Log child' s earnings when earnings >=0 and age>24

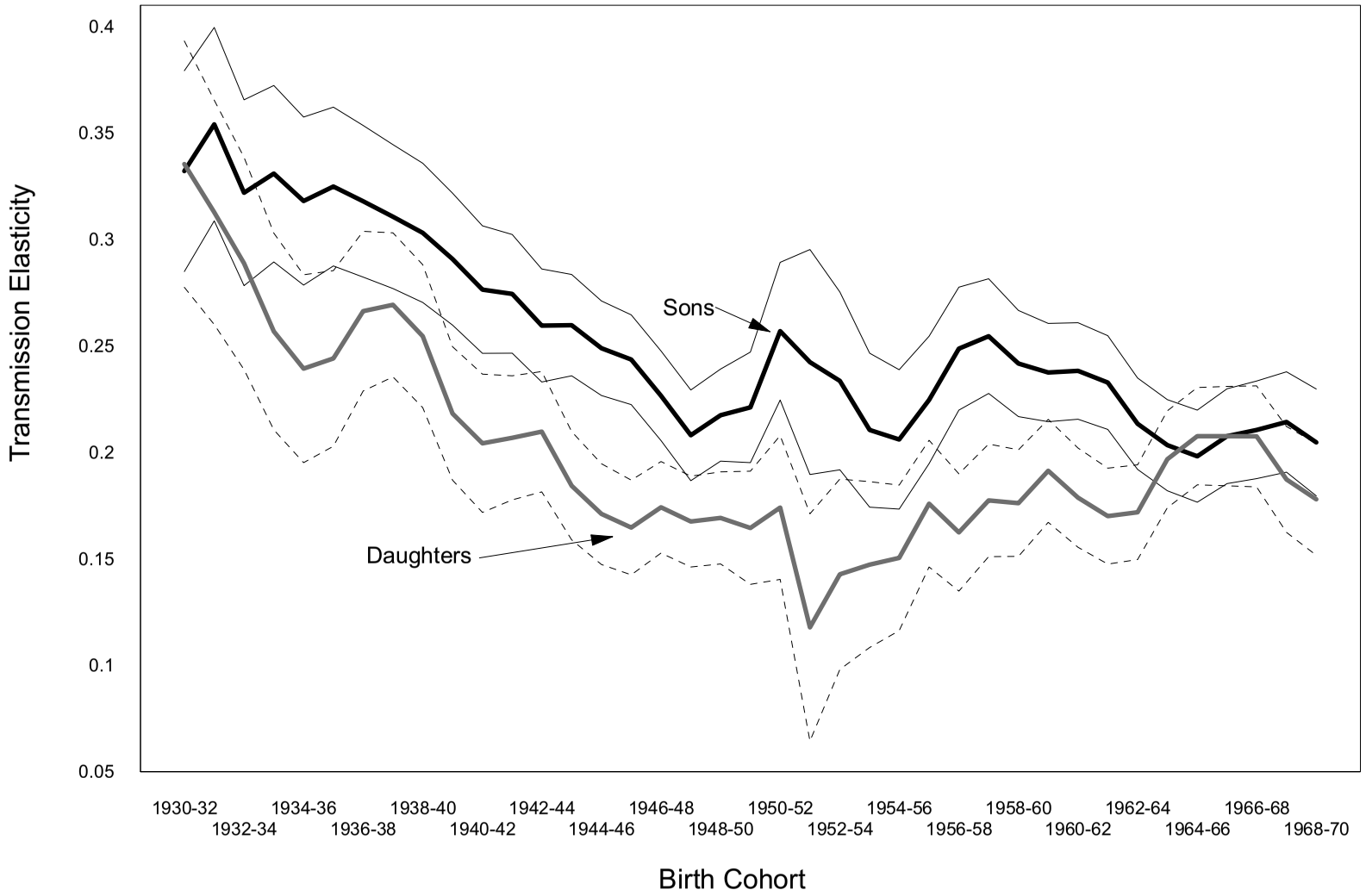


Figure 3
Inter-Generational Transmission Elasticity Estimates
Three-year rolling samples
Dependent variable: Log child' s earnings when earnings >0 and age =30

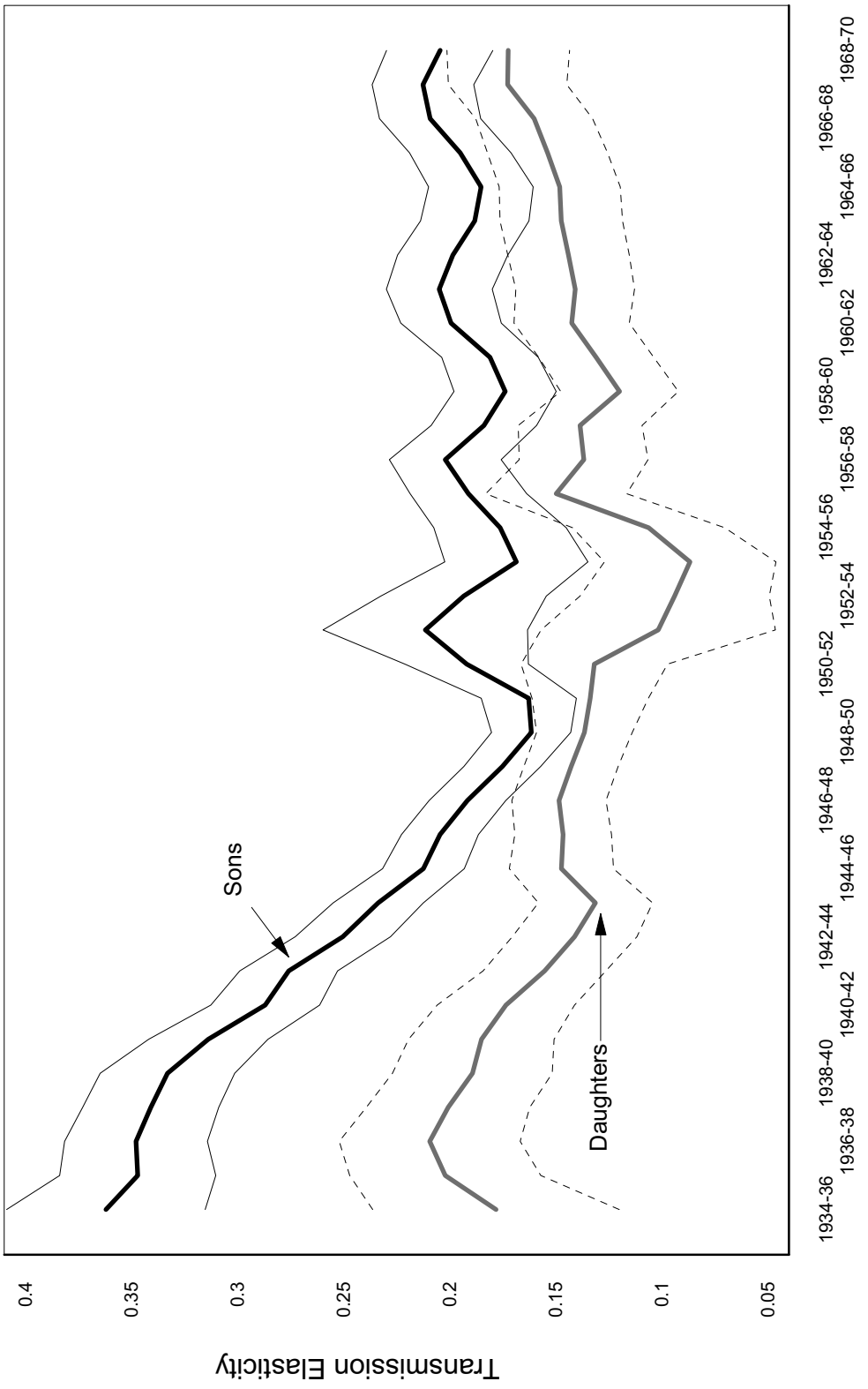


Figure 4
Education Level Achieved
By Birth Cohort 1900-1970

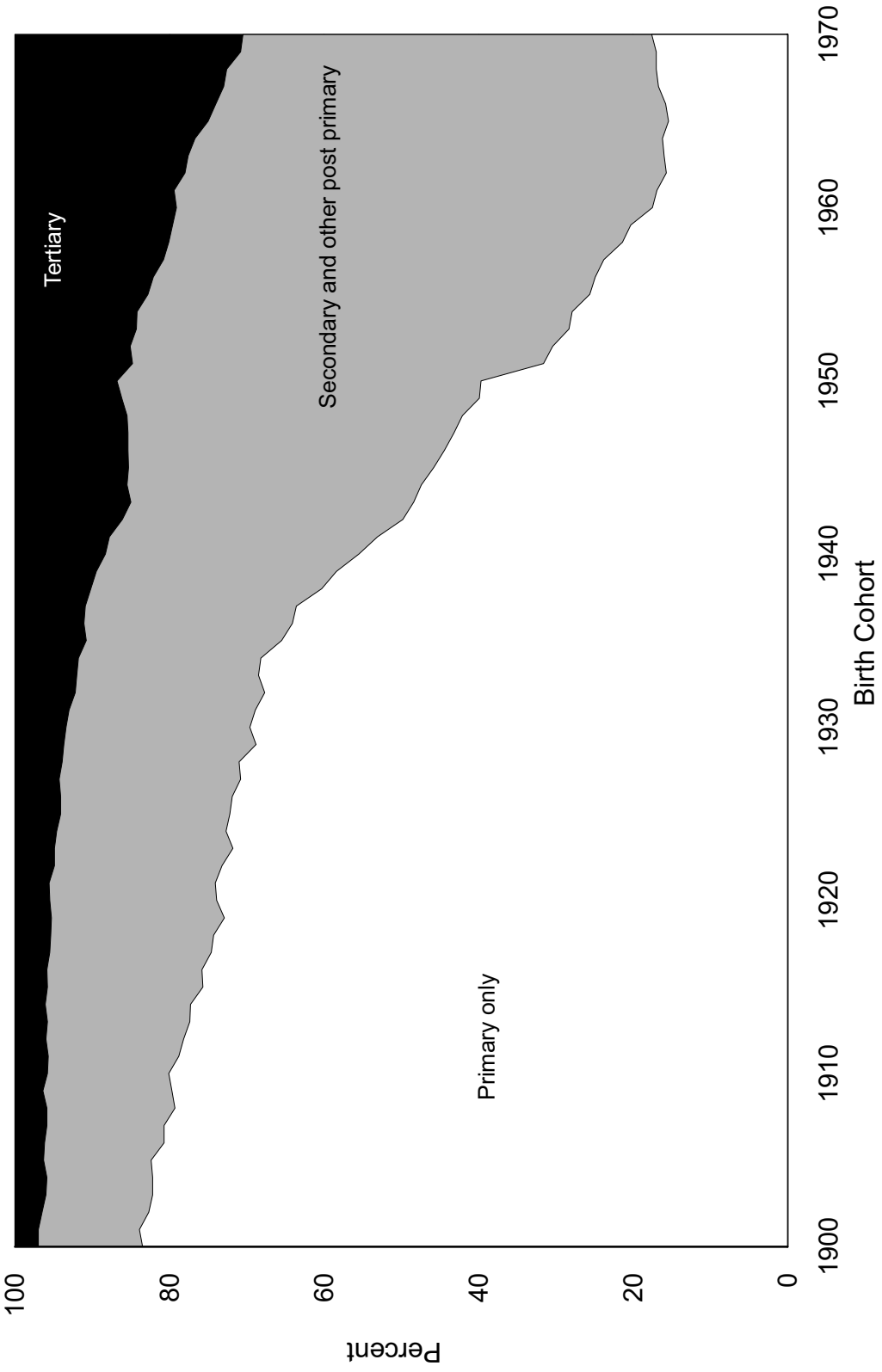


Figure 5
Decomposition of the Transmission Elasticities

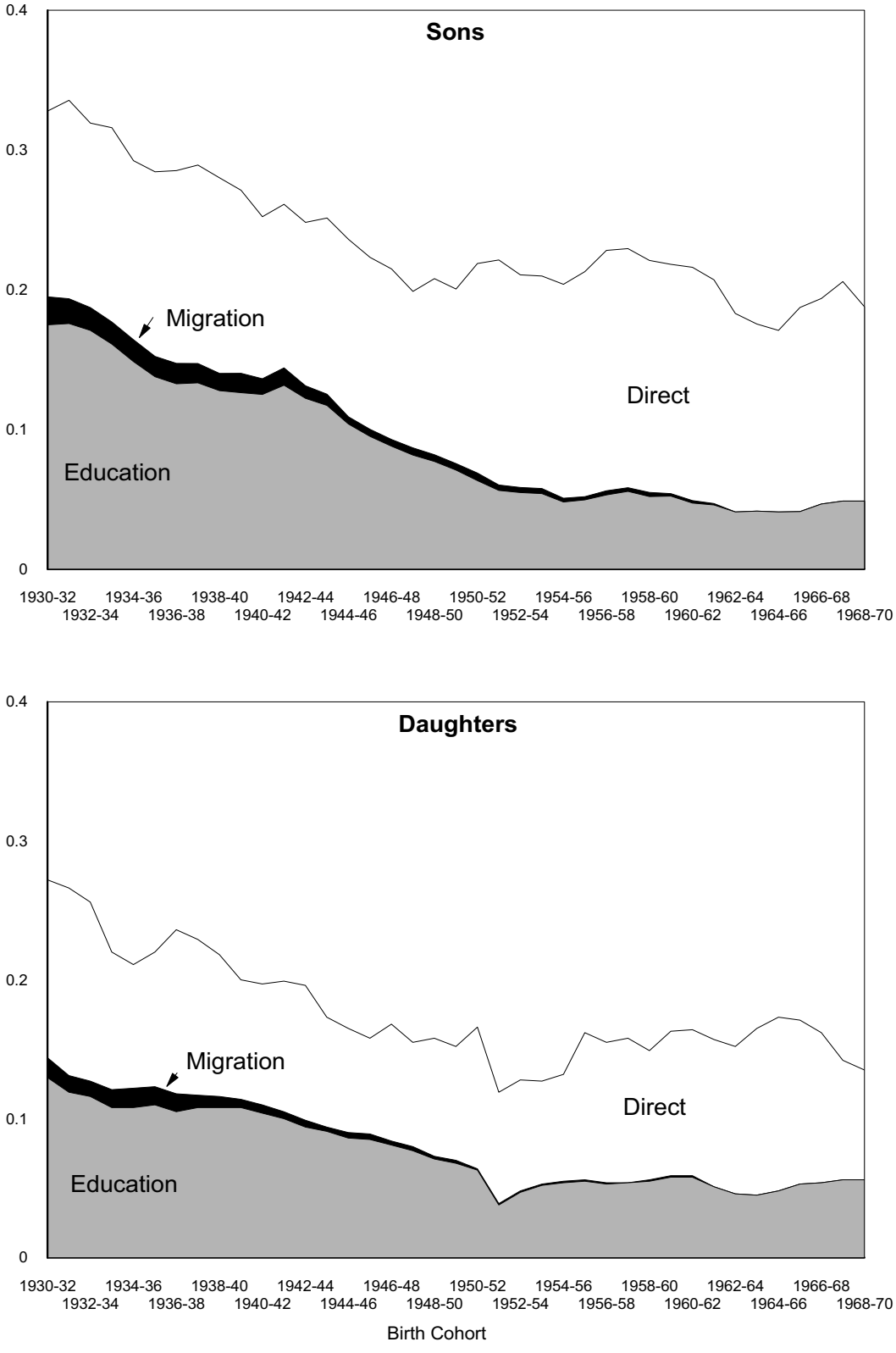
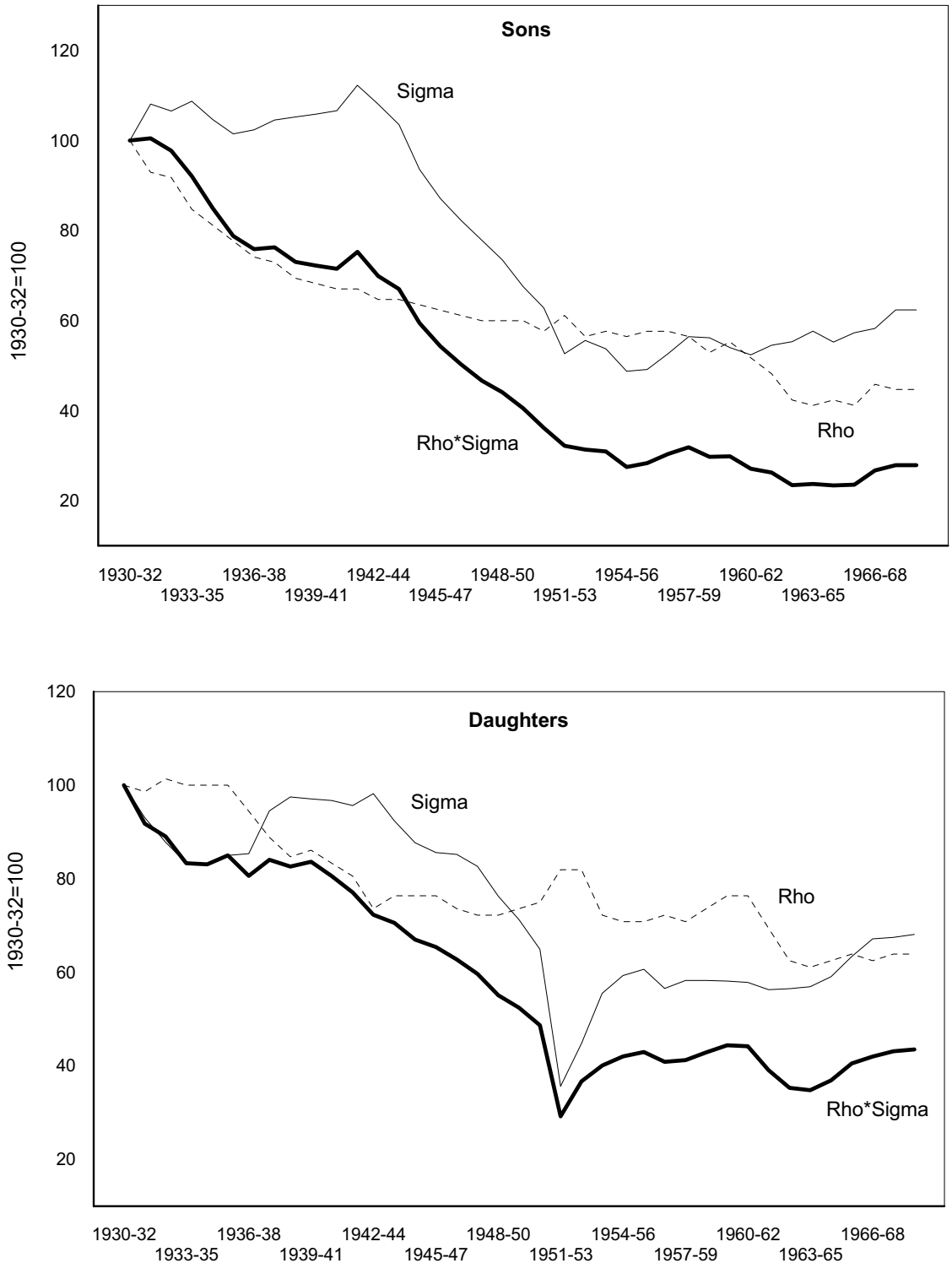


Figure 6
Decomposing the Education Component



Appendix

Table A.1. F-Tests on Differences Between Five-Year Cohorts

Dependent Variable: Logarithm of mean earnings when earnings>0

	Sons F{1,118449} (Prob>F)						
	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-70
1930-34	6.49 (0.01)	22.64 (0.00)	59.30 (0.00)	29.09 (0.00)	40.22 (0.00)	74.18 (0.00)	87.41 (0.00)
1935-39		5.38 (0.02)	31.76 (0.00)	10.34 (0.00)	17.46 (0.00)	45.15 (0.00)	57.37 (0.00)
1940-44			13.02 (0.00)	1.52 (0.22)	4.62 (0.03)	23.84 (0.00)	34.12 (0.00)
1945-49				3.10 (0.08)	1.21 (0.27)	2.35 (0.13)	6.26 (0.01)
1950-54					0.49 (0.48)	8.38 (0.00)	13.22 (0.00)
1955-59						5.64 (0.02)	10.25 (0.00)
1960-64							0.75 (0.39)
	Daughters F{1,108059} (Prob>F)						
	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-70
1930-34	4.37 (0.04)	12.78 (0.00)	39.17 (0.00)	26.97 (0.00)	35.22 (0.00)	34.84 (0.00)	39.39 (0.00)
1935-39		2.61 (0.11)	23.23 (0.00)	13.37 (0.00)	19.91 (0.00)	19.22 (0.00)	23.40 (0.00)
1940-44			12.37 (0.00)	5.89 (0.02)	10.29 (0.00)	9.18 (0.00)	12.40 (0.00)
1945-49				0.11 (0.75)	0.02 (0.90)	0.24 (0.62)	0.01 (0.93)
1950-54					0.16 (0.69)	0.00 (0.97)	0.07 (0.79)
1955-59						0.30 (0.59)	0.04 (0.84)
1960-64							0.18 (0.67)

Table A.2. Parameter Estimates for the Decomposition Model

Sons

Cohort	Delta	(se)	Rho (se*100)		Lambda (se*100)		Sigma	(se)	Mu	(se)	N. Obs.
1930-32	0.133	(.020)	0.085	(.022)	0.165	(.137)	2.058	(.099)	0.121	(.016)	4,503
1931-33	0.142	(.019)	0.079	(.019)	0.145	(.120)	2.225	(.099)	0.123	(.015)	4,542
1932-34	0.132	(.018)	0.078	(.016)	0.150	(.103)	2.192	(.096)	0.108	(.015)	4,724
1933-35	0.139	(.017)	0.072	(.016)	0.172	(.100)	2.237	(.092)	0.092	(.014)	5,000
1934-36	0.128	(.016)	0.069	(.016)	0.178	(.101)	2.154	(.089)	0.088	(.014)	5,289
1935-37	0.132	(.014)	0.066	(.015)	0.160	(.098)	2.088	(.085)	0.091	(.013)	5,664
1936-38	0.138	(.014)	0.063	(.013)	0.151	(.085)	2.107	(.082)	0.096	(.013)	5,987
1937-39	0.142	(.013)	0.062	(.013)	0.135	(.085)	2.152	(.079)	0.102	(.012)	6,477
1938-40	0.140	(.013)	0.059	(.013)	0.139	(.081)	2.165	(.076)	0.089	(.012)	6,473
1939-41	0.131	(.011)	0.058	(.011)	0.131	(.072)	2.179	(.071)	0.106	(.011)	7,200
1940-42	0.116	(.011)	0.057	(.009)	0.119	(.063)	2.194	(.070)	0.094	(.010)	6,977
1941-43	0.117	(.010)	0.057	(.008)	0.118	(.056)	2.310	(.067)	0.106	(.010)	7,536
1942-44	0.117	(.010)	0.055	(.008)	0.107	(.055)	2.224	(.067)	0.083	(.010)	7,432
1943-45	0.126	(.009)	0.055	(.008)	0.090	(.052)	2.131	(.062)	0.090	(.009)	8,838
1944-46	0.127	(.009)	0.054	(.007)	0.069	(.045)	1.926	(.056)	0.073	(.008)	10,383
1945-47	0.123	(.008)	0.053	(.006)	0.069	(.041)	1.793	(.052)	0.075	(.008)	11,809
1946-48	0.122	(.008)	0.052	(.006)	0.071	(.038)	1.693	(.050)	0.068	(.008)	12,489
1947-49	0.112	(.008)	0.051	(.006)	0.072	(.037)	1.602	(.050)	0.071	(.008)	12,424
1948-50	0.126	(.008)	0.051	(.006)	0.073	(.039)	1.513	(.049)	0.066	(.008)	12,198
1949-51	0.125	(.010)	0.051	(.008)	0.075	(.053)	1.390	(.058)	0.062	(.009)	8,350
1950-52	0.150	(.012)	0.049	(.010)	0.090	(.065)	1.293	(.072)	0.060	(.011)	4,995
1951-53	0.161	(.020)	0.052	(.020)	0.054	(.129)	1.084	(.119)	0.072	(.018)	2,005
1952-54	0.152	(.016)	0.048	(.015)	0.047	(.099)	1.144	(.098)	0.078	(.015)	3,019
1953-55	0.152	(.014)	0.049	(.014)	0.048	(.090)	1.106	(.084)	0.075	(.013)	4,086
1954-56	0.153	(.012)	0.048	(.012)	0.041	(.072)	1.003	(.075)	0.067	(.012)	5,141
1955-57	0.161	(.011)	0.049	(.010)	0.041	(.064)	1.012	(.068)	0.059	(.011)	6,264
1956-58	0.172	(.010)	0.049	(.008)	0.044	(.047)	1.084	(.063)	0.068	(.010)	7,142
1957-59	0.171	(.010)	0.048	(.008)	0.038	(.046)	1.162	(.060)	0.068	(.010)	8,093
1958-60	0.166	(.009)	0.045	(.006)	0.035	(.035)	1.157	(.054)	0.083	(.009)	9,196
1959-61	0.164	(.008)	0.047	(.006)	0.023	(.033)	1.112	(.049)	0.082	(.009)	10,285
1960-62	0.167	(.008)	0.044	(.005)	0.019	(.028)	1.078	(.044)	0.089	(.008)	11,519
1961-63	0.160	(.008)	0.041	(.005)	0.013	(.027)	1.122	(.043)	0.083	(.008)	12,574
1962-64	0.142	(.008)	0.036	(.004)	0.000	(.024)	1.139	(.042)	0.077	(.008)	13,584
1963-65	0.134	(.008)	0.035	(.004)	-0.007	(.022)	1.187	(.042)	0.065	(.008)	14,038
1964-66	0.130	(.009)	0.036	(.004)	-0.012	(.021)	1.137	(.042)	0.068	(.008)	14,341
1965-67	0.146	(.009)	0.035	(.004)	-0.015	(.021)	1.179	(.042)	0.065	(.008)	14,569
1966-68	0.147	(.009)	0.039	(.004)	-0.026	(.023)	1.199	(.042)	0.073	(.008)	14,748
1967-69	0.157	(.010)	0.038	(.004)	-0.041	(.023)	1.284	(.044)	0.071	(.008)	14,375
1968-70	0.139	(.010)	0.038	(.004)	-0.039	(.025)	1.284	(.046)	0.075	(.008)	13,701

Daughters

Cohort	Delta	(se)	Rho	(se*100)	Lambda	(se*100)	Sigma	(se)	Mu	(se)	N. Obs.
1930-32	0.128	(.023)	0.072	(.023)	0.125	(.141)	1.801	(.112)	0.114	(.018)	3,044
1931-33	0.135	(.021)	0.071	(.017)	0.102	(.103)	1.676	(.105)	0.113	(.017)	3,336
1932-34	0.129	(.019)	0.073	(.015)	0.095	(.091)	1.582	(.099)	0.118	(.016)	3,752
1933-35	0.099	(.018)	0.072	(.014)	0.114	(.084)	1.501	(.095)	0.116	(.016)	4,168
1934-36	0.089	(.017)	0.072	(.011)	0.112	(.068)	1.497	(.089)	0.122	(.015)	4,631
1935-37	0.097	(.016)	0.072	(.009)	0.111	(.052)	1.531	(.085)	0.120	(.014)	5,009
1936-38	0.118	(.015)	0.068	(.008)	0.110	(.048)	1.538	(.080)	0.117	(.013)	5,472
1937-39	0.112	(.014)	0.064	(.009)	0.106	(.055)	1.703	(.075)	0.088	(.012)	5,950
1938-40	0.102	(.013)	0.061	(.010)	0.088	(.061)	1.756	(.073)	0.086	(.012)	6,049
1939-41	0.086	(.012)	0.062	(.008)	0.081	(.050)	1.749	(.069)	0.068	(.011)	6,721
1940-42	0.087	(.012)	0.060	(.006)	0.078	(.035)	1.742	(.070)	0.076	(.011)	6,428
1941-43	0.094	(.011)	0.058	(.005)	0.076	(.030)	1.723	(.067)	0.065	(.011)	6,820
1942-44	0.097	(.011)	0.053	(.004)	0.063	(.028)	1.769	(.066)	0.072	(.010)	6,710
1943-45	0.079	(.010)	0.055	(.004)	0.062	(.027)	1.664	(.060)	0.054	(.009)	8,162
1944-46	0.075	(.009)	0.055	(.005)	0.067	(.030)	1.580	(.056)	0.052	(.009)	9,444
1945-47	0.069	(.009)	0.055	(.005)	0.059	(.033)	1.542	(.053)	0.060	(.008)	10,554
1946-48	0.084	(.008)	0.053	(.005)	0.048	(.034)	1.535	(.051)	0.061	(.008)	10,934
1947-49	0.075	(.008)	0.052	(.005)	0.043	(.030)	1.489	(.050)	0.061	(.008)	11,026
1948-50	0.085	(.008)	0.052	(.004)	0.046	(.027)	1.374	(.050)	0.043	(.008)	10,940
1949-51	0.082	(.010)	0.053	(.005)	0.049	(.032)	1.283	(.060)	0.043	(.010)	7,476
1950-52	0.102	(.013)	0.054	(.006)	0.039	(.038)	1.169	(.075)	0.025	(.013)	4,384
1951-53	0.080	(.020)	0.059	(.018)	0.023	(.106)	0.642	(.121)	0.042	(.020)	1,728
1952-54	0.080	(.016)	0.059	(.016)	0.033	(.095)	0.807	(.101)	0.027	(.017)	2,720
1953-55	0.074	(.014)	0.052	(.013)	0.034	(.076)	1.000	(.088)	0.033	(.014)	3,695
1954-56	0.077	(.013)	0.051	(.012)	0.018	(.072)	1.068	(.078)	0.036	(.013)	4,742
1955-57	0.106	(.011)	0.051	(.012)	0.011	(.070)	1.092	(.070)	0.049	(.012)	5,877
1956-58	0.101	(.011)	0.052	(.011)	0.009	(.063)	1.019	(.064)	0.065	(.011)	6,869
1957-59	0.104	(.010)	0.051	(.010)	-0.005	(.055)	1.049	(.059)	0.066	(.010)	7,924
1958-60	0.093	(.009)	0.053	(.008)	0.007	(.045)	1.049	(.053)	0.076	(.009)	8,943
1959-61	0.104	(.009)	0.055	(.008)	0.009	(.042)	1.047	(.048)	0.059	(.009)	10,079
1960-62	0.105	(.008)	0.055	(.007)	0.016	(.037)	1.042	(.045)	0.058	(.009)	10,988
1961-63	0.106	(.008)	0.050	(.006)	0.008	(.031)	1.014	(.043)	0.041	(.008)	11,864
1962-64	0.106	(.008)	0.045	(.005)	0.008	(.027)	1.018	(.042)	0.043	(.008)	12,636
1963-65	0.120	(.008)	0.044	(.005)	0.008	(.025)	1.025	(.041)	0.042	(.008)	13,203
1964-66	0.125	(.009)	0.045	(.005)	0.000	(.027)	1.064	(.041)	0.053	(.008)	13,667
1965-67	0.118	(.009)	0.046	(.006)	-0.008	(.029)	1.142	(.041)	0.043	(.008)	13,854
1966-68	0.108	(.009)	0.045	(.006)	-0.009	(.031)	1.210	(.042)	0.056	(.008)	13,769
1967-69	0.086	(.010)	0.046	(.006)	-0.013	(.032)	1.215	(.044)	0.049	(.008)	13,333
1968-70	0.079	(.011)	0.046	(.006)	-0.006	(.033)	1.227	(.046)	0.053	(.009)	12,564

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