Redistribution, Occupational Choice and Intergenerational Mobility: Does wage equality nail the cobbler to his last?[*]

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Abstract

The classical Roy-model of selection on the labor market is extended in order to analyze intergenerational mobility. This is done by linking ability uncertainty to family background. I derive implications for the allocation of talent and for background dependent earnings patterns within occupations and show that a very compressed wage structure can cause negative sorting of people with family background in the occupation with low returns to ability. I also study the effects of income redistribution on mobility and talent allocation. It is found that a redistributive welfare system either reduces vertical mobility or enhances it at the cost of a shrinking proportion of people choosing the occupation with high returns.

Keywords: Intergenerational mobility, occupational choice, allocation of talent, redistribution.

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1. Introduction

Intergenerational mobility, or the degree to which economic and social status are transmitted from parents to o¤spring, has received attention both in the theoretical and the empirical literature.[1] While sociologists have focused on occupational or class mobility, economists have taken a greater interest in income mobility.

There are both equality and e¢ciency implications of intergenerational mobility. Concern for equality of opportunity calls for attention to the extent to which individual welfare is determined by choices and e¤orts within control of the individual and to what extent it is predetermined by genes and upbringing. Furthermore, it is of relevance to what extent the degree of predetermination is in‡uenced by institutional factors that can be a¤ected by policy. With regard to e¢ciency, it is of interest whether family background constrains individual choices in such a way that the allocation of talent is not optimal from society's point of view.

Baumol (1990) and Murphy, Shleifer and Vishny (1991) argue that the allocation of talent has growth implications since talented people in the right jobs create positive human capital externalities, while they can even be destructive in the wrong positions. Recent work by Galor and Tsiddon (1997) and Hassler and Rodríguez Mora (2000) also emphasizes the reinforcing links between economic growth and social mobility arguing along the lines that growth provides incentives for mobility which improves the allocation of talent. However, the links to inequality are a classic subject of debate. Aghion, Caroli, and García-Peñalosa (1999) survey the literature on inequality and growth and conclude that, in the presence of capital market imperfections, redistribution may foster growth by improving the e¢ciency of human capital (and other) investments and hence the stimulate the development of new technologies. However, this growth process is not sustainable since it generates inequalities that lead to ine¢cient resource allocation.

In summary there seem to be two views: The …rst argues that mobility is stimulated by earnings di¤erences because individuals from weak educational/social background require stronger economic incentives in order to opt for higher education than do individuals with well educated parents. The second, argues that the reason why individuals from weak educational/social background require stronger economic incentives is that they are constrained by their lack of resources and

[1] See e.g. Becker and Tomes (1979, 1986), Björklund and Jäntti (1997), Checchi et al (1999), Eriksson and Jonsson (1996), Mulligan (1997, 1999), Solon (1992), and Zimmerman (1992).

that redistribution could relieve these constraints and improve allocation.

Mulligan (1997), does not …nd that the empirical evidence on consumption and earnings mobility complies with the patterns that would be generated if intergenerational mobility was in‡uenced resource constraints. Should we then settle for the idea that inequality enhances mobility? Not necessarily. The contribution of this paper is to show that family background related ability uncertainty may hamper social mobility also in the absence of capital market imperfections, and further, that redistribution may reduce further or enhance mobility depending on the degree of risk aversion, the incentive structure and, importantly, how redistribution takes place. Another contribution of this paper is to emphasize the role of heterogeneous human capital by focussing of occupational choice as a mechanism by which economic status is transmitted from one generation to the next. Occupational mobility can be argued to be of particular relevance for the transmission of economic status in societies where family income is not the dominant source of heterogeneity across individuals.

Previous theoretical work by economists on intergenerational mobility, e.g. Becker and Tomes (1986) has focused mainly on the transmission of income earning capacity through mechanisms connected to human capital investments and bequests.[2] Such models suggest that because inequality of opportunity is a result of inequality of outcome in the parent generation working through imperfect capital markets, policies aimed at providing equal access to education would lead toward equality of opportunity.

In this model, family background is important because it is assumed that the occupation of the parents in‡uences the quality of the information a child has about what it takes to succeed in di¤erent types of careers and about the child's talent for di¤erent jobs. In particular, it is assumed that individuals face more ability uncertainty when considering a career in an unfamiliar occupation than when judging prospects in the family occupation. I thus introduce family background determined di¤erences in access to information of a kind which is similar to what has previously been discussed by sociologists, into the study of intergenerational mobility.[3] However, I do not make the common assumption that people from a particular background (generally those from well educated families) always have access to better information. In a wider interpretation,

[2] Sociologists, on their part, have been more interested in social mobility, i.e. the transmission of socioeconomic status or class, which is generally measured as some combination of mobility with regard to occupation, education and income.

[3] See e.g. Erikson and Jonsson (1996).

this information advantage need not be restricted to the parental occupation, but could be relevant also for other occupations that the individual has become familiar with and gained information about.

By introducing family background e¤ects into a simpli…ed version of Willis' (1991) formulation of Roy's classic occupational choice model from 1951, I derive how the degree of occupational mobility, and how talent allocation and earnings patterns of people with di¤erent family background depend on the incentive structure of the economy, i.e. on wage di¤erences between occupations and the sensitivity of earnings to ability within di¤erent occupations.[4]

I …nd that if return to ability is similar across occupations, ability uncertainty may cause people with family background in the low returns to ability occupation to perceive that they can get a higher return on their talent in their family occupation than they would in the high returns to ability occupation. This leads to negative sorting of people with family background in the low return occupation, i.e. it causes the high ability people to stay in the low return occupation and the low ability people to go for the high return occupation. There is, however, always positive sorting of people with family background in the high return occupation. Hence, similar returns to ability across occupations may cause newcomers into an occupation to earn less on average than stayers.

If returns to ability di¤er enough across occupation there is positive sorting of people regardless of background. If mobility is very low, people with background in the low-return occupation tend to have higher earnings on average in both occupations, whereas high mobility implies that people with background in the high return occupation earn more on average in both occupations.

I also analyze the e¤ects on mobility and talent allocation of three forms of redistribution. From the results on talent allocation, it can be concluded that compressing the wage structure in such away that occupations come to be perceived as similar in terms of return to ability may indeed be very costly in terms of e¢ciency if leads to a situation of negative sorting of newcomers into the high return occupation.

First, I look at redistributive taxation which redistributes income both within and across occupations. Second, I turn to redistribution across occupations.

[4] My treatment of occupation is close to that of Roy (1951) and Sicherman and Galor (1990). In Roy, occupations di¤er because the require input of di¤erent abilities (or combinations of abilities). Because people are heterogeneous with respect to their endowment of abilities they will have comparative advantage for some occupations. Sicherman and Galor de…ne occupations according to the level and the type human capital required.

Third, I study the effects of redistribution within an occupation. The first form of redistribution is what economists generally consider when discussing redistribution, i.e. Robin Hood policies, or taking from the rich and giving to the poor using progressive taxation to finance welfare programs. The second form of redistribution is indirect and, hence, rarely discussed in terms of redistribution. The types of policy considered here are subsidies to or protection of certain sectors of the economy which affect relative wages in the economy. The obvious example relevant to most developed economies are the huge subsidies to agriculture. Other examples are the trade restrictions protecting the US automobile industry or the highly regulated Swedish construction sector. Third, I look at wage compression within occupations, which is commonly viewed as being an effect of union wage setting.[5]

I find no simple answer to if redistributive policies enhance or reduce overall mobility. A redistributive welfare system reduces mobility as well as the proportion of people choosing the high return occupation, if risk aversion is moderate. However, if risk aversion is strong mobility is enhanced, but it is so at the cost of less people in the high return occupation unless the occupations are very similar.

Inter-occupational redistribution, or reducing the relative wage in the high return occupation, increases downward mobility and decreases upward mobility which results in a smaller share of people in the high return occupation. The total effect on mobility is either unclear or negative.

If changes in wage dispersion are restricted to one occupation, e.g. as a result of solidarity wage policy, effects on mobility are complex. However, it is interesting to note that in the situations when solidarity wage policy in the low return occupation unambiguously leads to increased upward and total vertical mobility, the driving force behind the upward mobility is that wage compression in the low return occupation actually increased the inter-occupational return difference. On the other hand, when upward mobility increases as a result of wage compression in the high returns occupation, the driving force tends to be the reduction in risk connected to choosing that occupation.

Contrary to the results in the human capital models of intergenerational mobility, this paper illustrates that equality of outcome in the parent generation or free education do not guarantee equality of opportunity of the young generation. The information differences introduced in this model make the allocation of talent and earning capacity depend on family background also in the absence of the human

[5] In wage negotiations unions demand equal pay for equal job disregarding individual productivity differences. See e.g. Freeman and Medoff (1984).

capital investment costs and credit market imperfections or genetic transmission of ability for that matter, that are the driving forces behind the transmission of inequality in the Becker-Tomes model.

The paper proceeds as follows. Section 2 outlines a model in which occupational choice is influenced by family background. Section 3 analyses the implications of the model for mobility, allocation of talent and for earnings patterns. The fourth section uses the tools developed in sections 2 and 3 to address the question in the title of the paper by analyzing the effects of different forms of redistribution. Section 5 concludes.

2. The Model

This section outlines a simple model of how young individuals, who are heterogeneous in abilities and family background, make occupational choices. The structure of the model is inspired by Willis' (1986) version of Roy's occupational choice model dating from 1951. The Roy-model does not deal directly with intergenerational mobility. Instead it focuses on how occupational choice is governed by comparative ability advantages and on the implications of such choices on the distribution of income and allocation of talent. I introduce uncertainty about ability into the Roy-model. In order to capture the influence of family background on occupational choice, I assume that people can assess their ability to work in their parents' occupation but that they are uncertain about how able they are to work in other, unfamiliar, occupations.

2.1. Basic structure

I consider individuals as young and as workers. When young, individuals are supported by their parents while choosing a future occupation. In working life, individuals live off their own earnings. Since the implications of resource constraints have been thoroughly analyzed by Becker and Tomes and others, I abstract from that kind of inequality of opportunity by assuming that all individuals receive the same amount of money from their parents and that education is free. This implies that the individual's choice of occupation does not influence the level of consumption as young. Hence, the individual simply chooses the occupation which yields the highest expected working life utility.

Working life utility of an individual who chooses occupation i depends on the level of consumption, c_i, that is achieved while working in occupation i: This level of consumption may be subject to uncertainty because the individual cannot be sure how well he will succeed in the chosen occupation. The individual cares about expected working life utility:

$$E\left[U(c_i)\right] \qquad U' > 0;\ U'' < 0. \tag{2.1}$$

I assume that the utility function has constant relative risk aversion. The coefficient for relative risk aversion is γ and the higher is γ the more risk averse the individual:

$$U(c) = \frac{1}{1-\gamma} c^{1-\gamma}. \tag{2.2}$$

The individual influences his level of consumption as a worker through the choice of occupation. Because I disregard savings, consumption as a worker is determined by earnings:

$$c_i = Y_i(A_i), \tag{2.3}$$

where earnings, Y_i, in occupation i depend on the individual's endowment of the occupation specific ability A_i.

While the Roy-model assumes that each occupation requires a combination of abilities, I assume that there is one ability specific to each occupation. It is further assumed that there are only two occupations and two abilities, h (high) and l (low). I also assume that each individual is endowed with ability specific to each occupation and that occupations differ precisely because they require different abilities. Each individual has ability A such that

$$A = \{A_i\}; \quad i = h, l. \tag{2.4}$$

In the entire population, abilities are assumed to be joint log normally distributed with the same mean and variance such that $\ln A_h$ and $\ln A_l$ are joint normally distributed with zero mean, unit variance and correlated with ρ. Log normality implies that ability is always greater than zero and, furthermore, that the ability distribution is skewed since there is no upper bound to ability. The natural logarithm of ability, which is used later in the analysis, is symmetrically distributed around zero.

It is further assumed that the individual has full information about his endowment of the ability specific to his family occupation, but that he faces uncertainty about his endowment of the ability specific to the unfamiliar occupation.[6] The

[6] More realistic would perhaps be to assume uncertainty also with regard to ability for the family occupation, but that the uncertainty regarding the unfamiliar occupation would be greater. However, results would not be significantly altered qualitatively.

individual thus forms a prior belief about the uncertain ability based on knowledge about ability in the family occupation, knowledge about how abilities are distributed in the population in general and on how abilities are correlated. I assume that abilities are not correlated across generations.

First define:

$$a_i \equiv \ln A_i. \tag{2.5}$$

Let j be the family occupation, then the individual knows his ability for occupation j. The individual thus forms a prior belief about a_i based on a_j and ρ. The prior distribution for a_i is:

$$f(a_i \mid a_j) = N(a_j \rho, \sqrt{1 - \rho^2}). \tag{2.6}$$

The standard deviation of the prior distribution is larger the closer to zero the correlation between the two abilities.

I follow Willis (1986) in assuming that earnings in occupation i take the following form:

$$Y_i = W_i A_i^{\beta_i} \quad i = h, l, \tag{2.7}$$

where earnings, Y_i, depend on the wage rate, W_i, on the individual's endowment of occupation i specific ability A_i, and on the occupation specific parameter β_i which determines the sensitivity to ability of earnings in occupation i. Henceforth, $A_i^{\beta_i}$ is referred to as the individual's productivity in occupation i. Note that productivity and earnings increase with ability sensitivity, β_i, if ability A_i, is larger than one. If ability is less than one, increasing ability sensitivity lowers individual productivity.

As an analogue to the Roy model, we can see that if individuals are randomly assigned to occupations, the distribution of the natural logarithm of earnings in each occupation i is: $\ln Y_i \sim N(\ln W_i, \beta_i)$. Empirically evidence on earnings distributions rather supports this implication, and can hence justify our distributional assumption regarding ability. The model implies a positive relation between the ability intensity of an occupation and the standard deviation of earnings within the occupation. In the model, the actual distribution of earnings within an occupation, however, deviates from this because the individual's choice of occupation depends on ability and family background.

2.2. The choice of occupation

I assume that the individual chooses to stay in the family occupation if expected working life value achieved in the family occupation, j, is at least as high as the expected working life value achieved in the unfamiliar occupation, i.

$$V_j \geq V_i. \tag{2.8}$$

Using the utility function, the earnings function and the conditional distribution of ability for the unfamiliar occupation, we derive the value, V, to the individual in terms of the known ability of choosing the family occupation or the unfamiliar occupation.[7] The value for an individual who chooses to stay in the family occupation is:

$$V_j(A_j) = \frac{1}{1-\gamma}\left(W_j A_j^{\beta_j}\right)^{1-\gamma}. \tag{2.9}$$

The expected value if the individual should choose the unfamiliar occupation is:

$$V_i(A_j) = \frac{1}{(1-\gamma)}\left(W_i A_j^{\beta_i \rho} \xi_j\right)^{1-\gamma}, \tag{2.10}$$

where

$$\xi_j = e^{(1-\gamma)\frac{\beta_i^2}{2}(1-\rho^2)} \tag{2.11}$$

is an uncertainty factor capturing the uncertainty involved in choosing the unfamiliar occupation and is composed of risk and chance. There is $e^{\frac{\beta_i^2}{2}(1-\rho^2)}$, which is a larger than unity chance factor, resulting from the positive effect on expected earnings of the possibility that ability for the unfamiliar occupation is high. The magnitude of the counter veiling risk factor, $e^{-\gamma\frac{\beta_i^2}{2}(1-\rho^2)}$, which is associated with the disutility of facing uncertainty regarding future earnings, depends on the degree of relative risk aversion. When the coefficient of relative risk aversion, γ, exceeds unity (i.e. log-utility), risk aversion is strong and the risk factor dominates the chance factor such that the uncertainty factor, ξ, is smaller than unity. When risk aversion is moderate, $\gamma < 1$, the chance factor dominates and the uncertainty factor, ξ, is larger than unity.

Combine (2.8), (2.9) and (2.10) to derive the following condition for when the individual chooses the family occupation:

$$\left(\beta_j - \rho\beta_i\right) a_j \geq \ln\left(\frac{W_i}{W_j}\right) + (1-\gamma)\left(1-\rho^2\right)\frac{\beta_i^2}{2}, \tag{2.12}$$

where we have used the fact that $a_j = \ln A_j$. Henceforth a is referred to as ability.

[7] See appendix A1.

Condition (2.12) tells us that the individual's choice of occupation depends on the difference in productivity at expected ability (the left hand side), the difference in wage rates and the last term on the right hand side which is the natural logarithm of the uncertainty factor ξ_j. Henceforth, the natural logarithm of the uncertainty factor ξ_j is called the risk premium on choosing the unfamiliar occupation. If risk aversion is strong (s.r.a.), $\gamma > 1$; the risk premium is negative, implying that the individual demands a higher wage to compensate for the risk in order to choose the unfamiliar occupation if the return to expected ability is the same in both occupations. If risk aversion is moderate (m.r.a.), $\gamma < 1$; the risk premium is positive.[8] The magnitude of the risk premium is greater the greater is β_i; i.e. the higher are the potential gains/losses of opting for the uncertain occupation. The more closely correlated the two abilities, the smaller the absolute size of the premium, since closer correlation implies that there is less uncertainty.

Condition (2.12) implies that if the family occupation is perceived to be more ability sensitive than the unfamiliar occupation, i.e. $\left(\beta_j - \rho\beta_i\right) > 0$; individuals above a certain ability level chooses the family occupation. If the unfamiliar occupation is perceived to be more ability sensitive, individuals below a certain ability level stay in the family occupation. In general, the occupation which is perceived as more ability sensitive attracts the most able people. I define a cut-off ability, a_J^*; for people with parents in the j-occupation, for which expected value is the same in both occupations:[9]

$$a_J^* \equiv \left(\frac{\ln\left(\frac{w_i}{w_j}\right) + (1-\rho^2)(1-\gamma)\frac{\beta_i^2}{2}}{\left(\beta_j - \rho\beta_i\right)} \right). \qquad (2.13)$$

When analyzing the determinants and consequences of the individual's choice to stay in or leave the family occupation, three states can be distinguished based on the sign of the denominator in 2.13, i.e. depending on which occupation is perceived to be most sensitive to ability.

State 1: The family occupation is perceived to be the more sensitive to the known ability, $\beta_j - \rho\beta_i > 0$. This implies that earnings at the expected ability are

[8] This result regarding the sign of the risk premium is analogous to the discussion in Caballero (1991) regarding the sign of the investment - uncertainty relationship.

[9] Remember that the individual chooses the family occupation if expected utility is the same in both occupations.

higher in the family occupation, provided that ability is above average ($a_j > 0$). The individual sticks to the family occupation if a_j is at least as high as the cut off ability:

$$\text{Family occupation, } j, \text{ is chosen if } a_j \geq a_J^*. \tag{2.14}$$

The cut-off ability is positive or negative i.e. above or below average ability, depending on the wage rates in the two occupations and depending on the risk premium:

$$a_J^* \gtreqless 0 \quad \text{if} \quad \ln\left(\frac{W_j}{W_i}\right) \lesseqgtr (1-\gamma)\left[1-\rho^2\right]\frac{\sigma_i^2}{2}. \tag{2.15}$$

Mobility, M_J, in state 1 is:

$$M_J = F(a_J^*),$$

where F is the marginal c.d.f. of a_j.

State 2: The perceived sensitivity of earnings to a_j is higher in the unfamiliar occupation, $\beta_j - \rho\beta_i < 0$. This condition can only be satisfied for positive correlation between abilities. Hence, the individual stays in the family occupation if his a_j is smaller than or equal to the cut-off ability:

$$\text{Family occupation, } j, \text{ is chosen if } a_j \leq a_J^*.$$

Again the level of the cut-off ability depends on wage rates and the risk premium.

$$a_J^* \gtreqless 0 \quad \text{if} \quad \ln\left(\frac{W_j}{W_i}\right) \gtreqless (1-\gamma)\left[1-\rho^2\right]\frac{\sigma_i^2}{2}. \tag{2.16}$$

Mobility, M_J, in state 2 is:

$$M_J = 1 - F(a_J^*).$$

State 3: In State 3, both occupations are perceived as equally sensitive to ability, $\beta_j - \rho\beta_i = 0$. Hence, ability does not matter for occupational choice. Occupational choice depends only on the relative wage and on the risk premium. The individual sticks to the family occupation if

$$\ln\left(\frac{W_j}{W_i}\right) \geq (1-\gamma)\left[1-\rho^2\right]\frac{\sigma_i^2}{2}. \tag{2.17}$$

Mobility, M_J, in state 3 is:

$$M_J = \begin{cases} 1 & \text{if } \ln\left(\frac{W_j}{W_i}\right) < (1-\gamma)(1-\rho^2)\frac{\sigma_i^2}{2} \\ 0 & \text{otherwise} \end{cases}.$$

2.3. Efficiency and Steady State

In order to discuss the implications of the individual's decision rules it is useful to define what is meant by efficient talent allocation and level of mobility as well as define what would be a steady state in the model. The occupations are henceforth referred to as h (high) and l (low), where it is assumed that $\beta_h > \beta_l$: This assumption implies that H-people, i.e. those whose parents are in the h-occupation always perceive the h-occupation as more ability sensitive. L-people, on the other hand, may be in state 1, 2 or 3.[10] Hence, there are two situations that need be analyzed: Hierarchia, in which people regardless of background perceive the h-occupation as more ability sensitive, and Egalitaria, in which people of both backgrounds perceive their own family occupation as the most ability sensitive.

Efficiency

Assuming that society is risk neutral, an efficient allocation of talent is one which maximizes total expected earnings, rather than total expected value. This implies that the expected earnings of the marginal individual should be equal in both occupations. It is straight forward to derive the cut-off ability associated with this definition of efficiency. For those with parents in the $j-$occupation (i.e. the unfamiliar occupation is i):

$$a^{*}_{J\,\max E[Y]} \approx \left(\frac{\ln\left(\frac{w_i}{w_j}\right) + (1-\rho^2)\frac{\sigma_i^2}{2}}{\beta_j - \rho\beta_i} \right). \tag{2.18}$$

The efficient cut-off ability is affected by the positive chance factor, $(1-\rho^2)\frac{\sigma_i^2}{2}$. The efficient cut-off levels imply a larger fraction of people opting for the unknown occupation than what is the case when the individual's choice is influenced by risk aversion. The reason is that, with risk neutrality, the potential loss of having someone of poor talent in the wrong occupation is smaller the potential gain to society from having the very talented in the right place.

Steady State

Steady state is defined as a situation in which the fractions of the total population that choose each occupation is constant in each generation. Let upper-case letters represent the occupation of the parents and lower-case represent the occupation chosen by the young generation, such that P_H is the fraction of the total population with parents in the $h-$occupation, i.e. the fraction of H-people. Hence, $(1-P_H)$ is the fraction of L-people. M_H is the share of H-people that

[10] State 3 will not be analyzed here.

are mobile , i.e. who choose the l-occupation, and $(1 - M_H)$ is the fraction of H-people who choose to stay in the h-occupation. M_L is the mobile fraction of L-people, i.e. who opt for the h-occupation and the rest, $(1 - M_L)$, stay in the l-occupation. P_h is the proportion of the present generation that chooses occupation h. Steady-state is defined by two equations:

$$P_h = P_H(1 - M_H) + (1 - P_H)M_L$$

$$P_h = P_H.$$

Hence the steady state fraction of people in the h-occupation is:

$$P_H^{ss} = \frac{M_L}{M_L + M_H}$$

and total steady state mobility is:

$$M = P_H M_H + (1 - P_H)M_L = \frac{2M_H M_L}{M_L + M_H}.$$

3. Talent Allocation, Mobility and Earnings Patterns

3.1. Allocation of talent and mobility

Based on the decision rules established in the previous section, this section characterizes the allocation of talent, mobility and earnings patterns in Egalitaria and Hierarchia. The discussion focuses on situations with positive ability correlation and it is assumed that $\beta_h > \beta_l$, and $W_h \geq W_l$.

Since $\beta_h > \beta_l$, H-people with below cut-off ability are mobile and choose the l-occupation. Hence, there is always positive sorting of H-people. H-mobility is:

$$M_H = F(a_H^*),$$

where F is the marginal c.d.f. of a_h. Depending on which state the L-people are in there is either positive or negative sorting of L-people. L-mobility is:

$$M_L = \begin{cases} 1 - F(a_L^*) & \text{if } \beta_l - \rho\beta_h < 0 \quad \text{Hierarchia: positive sorting} \\ 1 & \text{if } \beta_l - \rho\beta_h = 0 \text{ and } \ln\frac{W_h}{W_l} > -(1-\rho^2)(1-\gamma)\frac{\beta_h^2}{2} \\ 0 & \text{if } \beta_l - \rho\beta_h = 0 \text{ and } \ln\frac{W_h}{W_l} \leq -(1-\rho^2)(1-\gamma)\frac{\beta_h^2}{2} \\ F(a_L^*) & \text{if } \beta_l - \rho\beta_h > 0 \quad \text{Egalitaria: negative sorting} \end{cases}$$

In Egalitaria, where there is not unanimous ranking of the two occupations and occupations are in a sense similar, mobility is referred to as horizontal mobility. In Hierarchia, there is unanimous ranking of occupations in terms of ability sensitivity and mobility is called vertical mobility.

Hierarchia: vertical mobility

In Hierarchia the most able, regardless of background, choose the h-occupation, i.e. there is positive sorting. When risk aversion is strong (s.r.a.), a_H^* is always negative, implying that less than half of the H-people are mobile. Unless W_h is sufficiently much larger than W_l, a_L^* is positive, which implies that less than 50 per cent mobility also of L-people when wage rates are similar. When risk aversion is moderate, a_L^* is always negative while a_H^* is positive unless W_h is sufficiently much larger than W_l. This implies that a majority of L-people are mobile and that this is so also for H-people if wage rates are similar. For given wage rates, mobility is higher the weaker is risk aversion. It can be shown that a_L^* is always more extreme, i.e. further from the mean ability zero, unless risk aversion is strong and W_h is sufficiently much larger than W_l.[11] The reason for this is that the risk factor is of greater magnitude for L-people than for H-people.

To see what earnings patterns prevail, compare expected log earnings of stayers and newcomers in the two occupations. Newcomers on average earn more in the h-occupation if $E[\ln Y_{Hh}] < E[\ln Y_{Lh}]$; i.e. if:

$$\ln W_h + \beta_h \int_{a_H^*}^{\infty} a_h f(a_h) da_h < \ln W_h + \left(1 - \rho^2\right)\frac{\beta_h^2}{2} + \beta_h \rho \int_{a_L^*}^{\infty} a_l f(a_l) da_l. \quad (3.1)$$

Newcomers on average earn less in the l-occupation if $E[\ln Y_{Ll}] > E[\ln Y_{Hl}]$; i.e. if

$$\ln W_l + \beta_l \int_{-\infty}^{a_L^*} a_l f(a_l) da_l > \ln W_l + \left(1 - \rho^2\right)\frac{\beta_l^2}{2} + \beta_l \rho \int_{\infty}^{a_H^*} a_h f(a_h) da_h \quad (3.2)$$

Given what is known about the cut-off abilities, the first condition will tend to hold when there is strong risk aversion and be violated when there is moderate risk aversion. The second condition will hold if risk aversion is strong enough, i.e. if mobility is very low. In the efficient allocation, cut-off abilities are such that mobility is even higher than in the moderate risk aversion case. Hence, the difference in average earnings is even larger in favor of the h-people.[12]

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[11] i.e. if $\ln \frac{W_h}{W_l} > \frac{(1-\gamma)(1-\rho^2)}{2} \frac{\left(\beta_l^2(\beta_l - \rho\beta_h) + \beta_h^2(\beta_h - \rho\beta_l)\right)}{(\beta_l - \beta_h)(1+\rho)}$.

[12] See appendix A.3.

When risk aversion is strong, the few L-people who venture upward into occupation h have high l-ability. Provided that there is positive ability correlation, they potentially earn more on average than the H-people who stayed in their family occupation. The rare few H-people who choose occupation l are low ability people and by the same argument, they therefore earn less than the L-people who choose to stay in occupation l. Hence, when there is strong risk aversion and vertical mobility, L-people will on average earn more in both occupations.

When risk aversion is moderate, a majority of the L-people venture into occupation h and only the most brilliant of the H-people stay in their family occupation. As a result, the H-people who choose to stay in their family occupation on average earn more than the newcomers. Only the least able of the L-people choose occupation l . The large group of H-people who opt for occupation l; on average, earns more than the L- people who stay in their family occupation. Hence, when there is moderate risk aversion and vertical mobility, H-people on average earn more in both occupations.

Egalitaria: horizontal mobility

In Egalitaria there is positive sorting of H-people and negative sorting of L-people. When risk aversion is strong a_H^* is always negative and so is a_L^*; unless W_h is sufficiently much larger than W_l. Hence, mobility is low. When risk aversion is moderate both cut-off abilities are positive, again unless W_h is sufficiently much larger than W_l in which case a_H^* is negative. Like in Hierarchia, it can be shown that a_L^* is more extreme than a_H^* unless wage rates are very different.

In Egalitaria those who opt for the unfamiliar occupation are those who have low ability for their family occupation. When there is positive ability correlation, this implies that newcomers into an occupation will tend to have low ability also for the new occupation and will hence, on average, tend to earn less than those with family background in the occupation. In the h-occupation $E[\ln Y_{Hh}] > E[\ln Y_{Lh}]$ if:

$$\ln W_h + \beta_h \int_{a_H^*}^{\infty} a_h f(a_h) da_h > \ln W_h + \left(1 - \rho^2\right)\frac{\sigma_h^2}{2} + \beta_h \rho \int_{-\infty}^{a_L^*} a_l f(a_l) da_l: \quad (3.3)$$

In the l-occupation: $E[\ln Y_{Ll}] > E[\ln Y_{Hl}]$ if:

$$\ln W_l + \beta_l \int_{a_L^*}^{\infty} a_l f(a_l) da_l > \ln W_l + \left(1 - \rho^2\right)\frac{\sigma_l^2}{2} + \beta_l \rho \int_{-\infty}^{a_H^*} a_h f(a_h) da_h: \quad (3.4)$$

It is not evident that these conditions hold. However, in simulations both conditions tend to hold unless ability correlation is too weak.

4. Mobility, Earnings Patterns and Changes in the Incentive Structure

This section analyses how mobility and earnings patterns of people from different background are affected by policies that change the incentive structure. Effects on steady state mobility and steady state allocation of people between the two occupations are also analyzed. First, I introduce a more or less progressive redistributive welfare system. Second, I investigate effects of changes in relative wages that is a result of inter-occupational redistribution, and third, I analyze increased or reduced wage compression resulting from more or less solidarity wage policy[13].

4.1. Defining the policies considered

Redistributive welfare system: Increasing the progressiveness of a redistributive welfare policy is defined as a simultaneous proportional reduction of sensitivity of earnings to ability in both occupations in combination with a reduction in wage rates leading toward equalization of wage rates. I assume that the disposable earnings function in occupation takes the following form

$$Y^d = Y^{1-t}; \quad 0 \le t < 1; \tag{4.1}$$

and the average tax rate τ

$$\tau = 1 - \frac{Y^d}{Y} = 1 - Y^{-t}; \tag{4.2}$$

is increasing in earnings. The larger is t, the more progressive the tax system. A tax-system of this kind would always run a surplus.

Inter-occupational redistribution: Increasing (reducing) the relative wage in the high-occupation $\frac{W_h}{W_l} = W$, represents a redistribution from occupation l to h(or vice versa).

Solidarity wage policy: A reduction in the sensitivity of earnings to ability, β; in an occupation will be regarded as an effect of increased solidarity wage policy since it implies a change in the direction of "equal job equal pay", regardless of productivity.

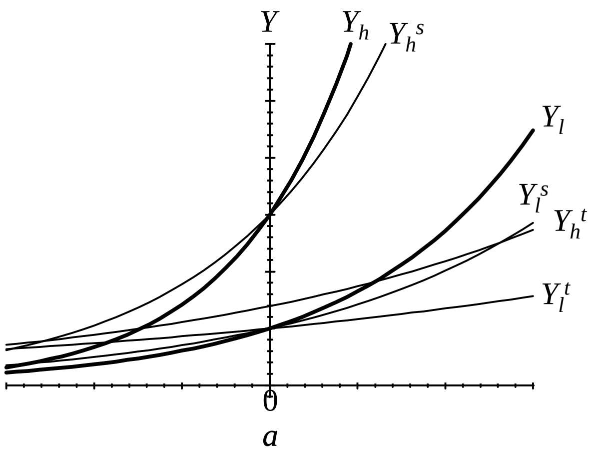
[13] See e.g. Edin and Holmlund (1993) for a critical discussion of solidarity wage policy as the cause behind Swedish wage compression.

Introducing taxation I can derive cut off ability for an individual with family background in occupation i:

$$a_i^* = \left(\frac{\ln\left(\frac{w_j}{w_i}\right) + (1-t)(1-\rho^2)(1-\gamma)\frac{\sigma_j^2}{2}}{\beta_i - \rho\beta_j} \right). \tag{4.3}$$

Figure 4.1 illustrates the first and last experiments to be analyzed when the economy starts out as an hierarchical economy. The second policy experiment, redistribution across occupations does not affect the slopes of the earnings functions, only the intercept, which is given by the wage rate.

Figure 4.1: Earnings as a function of ability



Y_i =Earnings in occupation *i*, Y_i^s = Earnings in occupation *i* under solidarity wage policy, Y_i^t = Earnings in occupation *i* with redistributive welfare system, *h*=high return occupation, *l*=low return occupation.

Comparative statics on cut-off abilities a_H^* and a_L^*, mobility, M_H, M_L and M; and the share of H-people, P_H with respect to the incentive structure parameters, $t; W; \beta_l; \beta_h$; reveal how choices and talent allocation are affected by policy changes. It is assumed that only one policy instrument is activated at a time.

Clearly, when the mobility of people of both background is affected in the same direction, the effect on total mobility is clear. Similarly, if mobility of H− and L− people are affected in different directions, the steady state effect on the total share of H-people is unambiguously such that if M_H increases while M_L decreases total share of H-people decreases.

The results of the comparative statics on M_H, M_L are summarized in tables 1 and 2a,b. Algebraic results are presented in appendices A.4-A.7.

Table 1
Effects on mobility of redistribution

	redistributive welfare system	
	strong risk aversion	moderate risk aversion
$\partial t > 0$	M_H + M_L +	M_H $-$ M_L $-$
	inter-occupational redistribution	
$\partial W > 0$	M_H + M_L $-$	

M_i = Mobility of $i-$people; $i = H, L$.

4.2. Redistributive welfare system

Raising t has the same effect on mobility whether the returns to ability are similar or not. There will be a reduction of mobility of both L- and H-people who are moderately risk averse while strongly risk averse people will become more mobile, regardless of background. Hence, a more redistributive welfare system increases efficiency if people are strongly risk averse, but reduces efficiency if people are moderately risk averse. In Hierarchia, regardless of attitude toward risk, background related earnings differences in both occupations will be reduced. In Egalitaria, average earnings increase for all groups if risk aversion is strong and decrease for all groups if risk aversion is moderate. Hence, effects on average earnings differences between people from different background are not clear.

It can be shown that in Hierarchia increased taxation leads to reduced mobility and a smaller share of people in the h-occupation when there is moderate risk aversion.[14] With strong risk aversion increased mobility will come at the price of reduced share of people in the h-occupation unless wage rates are very similar. In Egalitaria, the effects on mobility are the same, the effect on the share of H-people is unclear unless wage rates are very similar and risk aversion is strong. Then, increased taxation will increased mobility and a higher share of H-people.

[14] See appendix A.8.

4.3. Interoccupational redistribution

A change in relative wages as a result of interoccupational redistribution will, of course, induce more people, regardless of family background, to choose the occupation in which the relative wage is increased. A relative wage decrease in the h-occupation would hence reduce P_H: The e¤ect on total mobility are either unclear or negative.[15] In Egalitaria, an implication of this is that the productivity di¤erence between people from di¤erent backgrounds will increase to the favor of H-people in the h-occupation and be reduced in the l-occupation. In Hierarchia, the average productivity increases for both L- and H-people in the two occupations.

4.4. Introducing solidarity wage policy

In general, disregarding uncertainty, a reduction in ¯ makes an occupation more attractive to an individual with below average (negative) ability and less attractive to an individual with above average ability. Uncertainty about ability will, however, a¤ect the individual's reaction to changes in the sensitivity of earnings ability in the unfamiliar occupation. The ability level at which the individual …nds that a reduction in ability sensitivity makes the unfamiliar occupation more or less attractive thus deviates from zero. If risk aversion is strong, a reduction in ability sensitivity of the unfamiliar occupation makes that occupation more attractive also for moderately positive abilities because the reduction in return to expected ability is compensated for by the reduction in risk. If risk aversion is moderate, however, a reduction in ability sensitivity of the unfamiliar occupation makes that occupation less attractive for individuals with moderately negative ability because the reduction in risk does not compensate for the substantial loss in terms of expected earnings. In other words, the e¤ect of solidarity wage policies on the mobility of people with di¤erent background will thus depend on the initial position of the cut o¤ abilities and on which occupation is a¤ected by the policy.

From tables 2a and 2b it can be seen that the mobility pattern of H-people depends on the relation between ¯$_h$ and ¯$_l$: The e¤ects on H-mobility are qualitatively the same if the di¤erence between ¯$_h$ and ¯$_l$ changes as a result of less/more solidarity wage policy in the h-occupation or more/less ditto in the l-occupation. If there is strong risk aversion, the mobility of H-people increases with the di¤erence in return to ability. If there is moderate risk aversion, H-mobility increases

[15] See appendix A.9.

with the difference between β_h and β_l when wage rates differ enough. If wage rates are similar H-mobility decreases with the difference between β_h and β_l.

The mobility pattern of the L-people is slightly more complex. However, if risk aversion is moderate, it is only the difference between β_h and β_l that matters. In Egalitaria, the mobility of L-people increases with the difference between β_h and β_l and reaches its peak of complete mobility at the border between Egalitaria and Hierarchia. If the difference increases further, L-mobility declines. However, if the wage difference is small enough in Hierarchia, upward mobility will increase again if the difference in ability return gets large enough.

When risk aversion is strong , L-mobility increases with the difference in return to ability if the wage difference is large enough. Mobility peaks at complete mobility when $\rho\beta_h = \beta_l$; and then declines as the difference between β_h and β_l gets larger. When the wage difference is small, mobility declines to zero mobility at $\rho\beta_h = \beta_l$ and then, in Hierarchia, upward mobility increases as the difference in returns to ability increases. If the difference between β_h and β_l rises beyond $\frac{\rho\beta_h}{2} = \beta_l$ as a result of increased β_h, L-mobility declines for all relative wages.

To summarize, in Hierarchia, upward mobility tends to be stimulated by wage compression in the h-occupation and hampered by wage compression in the l-occupation. The exceptions to this rule occur when wage rates are similar. In Hierarchia, upward mobility and total mobility can be stimulated by solidarity wage policy in the l-occupation because it makes returns to ability more different. This is the case when risk aversion is strong and wage rates are similar. Upward and total mobility can also be stimulated by wage compression in the h-occupation. This is the case when risk aversion is moderate and wage rates are similar and the reason is then that the h-occupation becomes less risky to the L-people and less interesting to the H-people. Wage compression in the h-occupation can also reduce upward and total mobility. This is the case when risk aversion is strong and wage rates are similar.

Table 2a

Effects on mobility, M, of solidarity wage policy

Egalitaria, $\beta_h > \rho\beta_l$; $\beta_l > \rho\beta_h$:			
	The sign of ∂M_i conditional on the relative wage rate $\ln W$		
s.r.a	$\ln W < c_l$	$c_l < \ln W < -\ln\xi_l$	$-\ln\xi_l < \ln W$
$\partial\beta_h$	M_H $+$ M_L $-$	M_H $+$ M_L $+$	
$\partial\beta_l$	M_H $-$ M_L $+$		M_H $-$ M_L $-$

$-\ln\xi_l = -(1-\rho^2)(1-\gamma)\left(\frac{\beta_h^2}{2}\right);$

$c_l = -(1-\rho^2)(1-\gamma)\frac{\beta_h}{\rho}\left(\beta_l - \frac{\rho\beta_h}{2}\right); \; c_l < -\ln\xi_l:$

m.r.a	$\ln W < \ln\xi_h$	$\ln\xi_h < \ln W < c_h$	$c_h < \ln W$
$\partial\beta_h$	M_H $-$ M_L $+$	M_H $+$ M_L $+$	
$\partial\beta_l$	M_H $+$ M_L $-$		M_H $-$ M_L $-$

$\ln\xi_h = (1-\rho^2)(1-\gamma)\left(\frac{\beta_l^2}{2}\right);$

$c_h = (1-\rho^2)(1-\gamma)\frac{\beta_l}{\rho}\left(\beta_h - \frac{\rho\beta_l}{2}\right); \; \ln\xi_h < c_h:$

M_i = Mobility of i-people, $i = H; L$:

s.r.a=strong risk aversion, m.r.a= moderate risk aversion.

Table 2b
Effects on mobility, M, of solidarity wage policy

Hierarchia $\beta_h > \rho\beta_l;\ \beta_l < \rho\beta_h$:			
The sign of ∂M_i conditional on the relative wage rate lnW			
s.r.a.	$\ln W < c_l$	$c_l < \ln W < -\ln\xi_l$	$-\ln\xi_l < \ln W$
$\partial\beta_h$	M_H: $+$ M_L: $-$ if β_h big; $+$ otherwise	M_H: $+$ M_L: $-$	
$\partial\beta_l$	M_H: $-$ M_L: $-$		M_H: $-$ M_L: $+$

$-\ln\xi_l = -(1-\rho^2)(1-\gamma)\frac{\beta_h^2}{2};\ \beta_h \text{ big} \to \frac{\rho\beta_h}{2} \geq \beta_l$

$c_l = -(1-\rho^2)(1-\gamma)\frac{\beta_h}{\rho}\left(\beta_l - \frac{\rho\beta_h}{2}\right);\ c_l < -\ln\xi_l.$

m.r.a	$\ln W < \ln\xi_h$	$\ln\xi_h < \ln W < c_h$	$c_h < \ln W$
$\partial\beta_h$	M_H: $-$ M_L: $+$ if β_h big; $-$ otherwise	M_H: $+$ M_L: $\ln W < c_l$ / $c_l < \ln W$ β_h big: $+$ / $-$ otherwise: $-$ / $-$	M_H: $+$ M_L: $-$
$\partial\beta_l$	M_H: $+$ M_L: $+$		M_H: $-$ M_L: $+$

$\ln\xi_h = (1-\rho^2)(1-\gamma)\frac{\beta_l^2}{2};\ \beta_h \text{ big} \to \frac{\rho\beta_h}{2} > \beta_l;\ \ln\xi_h < c_l \text{ if } \frac{\rho\beta_h}{2} > \beta_l$

$c_h = (1-\rho^2)(1-\gamma)\frac{\beta_l}{\rho}\left(\beta_h - \frac{\rho\beta_l}{2}\right);\ \ln\xi_h < c_h;\ c_l < c_h.$

M_i = Mobility of $i-$ people, $i = H; L$.
s.r.a=strong risk aversion, m.r.a= moderate risk aversion.

5. Conclusions and Discussion

I have analyzed the role of family background for occupational choice and the implications for intergenerational mobility of changes in the incentive structure. The results show that policy makers interested in equality of opportunity, need to carefully consider the incentive effects of redistributive policies. I show that even if occupational choices are free in the sense that human capital investments are free, uncertainty about ability to succeed in an unfamiliar occupation is enough to make family background influence talent allocation and earnings. Therefore, equality of outcome in the parent generation or free education do not guarantee that there will be equality of opportunity in the young generation. This also suggests that if earnings do not re‡ect individual productivity, i.e. because of progressive taxation, labor market regulations or union wage setting, measures of intergenerational earnings mobility may not capture signi…cant intergenerational persistence in underlying productivity generated by intergenerational persistence in occupational choice.

The ability uncertainty introduced in this paper in‡uences how people self-select into di¤erent occupations and will generate background dependent di¤erences in mean earnings due to this self-selection. Hence, the model generates a set of testable predictions for how background related earnings di¤erences should look in di¤erent occupations. If there is very little vertical mobility we should expect to …nd that people from a low return background earn more on average in both occupations than people from high return background. If there is high vertical mobility, the high return background people should on average earn more. If the earnings structure is compressed enough, negative sorting of low return background people causes newcomers to earn less in both the high and low return occupations.

I can conclude that there is no simple answer to the question posed in the title of this paper: Does wage equality nail the cobbler to his last? Thus, our analysis provides no whole hearted support for increased wage dispersion as a means to increase the e¢ciency of the talent allocation through improved mobility even in the absence of capital market imperfections. Whether there is a trade o¤ or not between redistributive policies and intergenerational mobility depends on a number of factors. However, in the case of a redistributive welfare system, the joint e¤ect of reducing the di¤erence in return to ability and the di¤erence in wage rates either total reduces vertical mobility and the relative size of the h-occupation or increases vertical mobility at the cost of a smaller h-occupation.

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A. Appendix

A.1. The expected value in the unfamiliar occupation

The expected value in the unfamiliar occupation, i, is $E[V_i] = \frac{1}{1-\gamma}\int_{-\infty}^{\infty} (W_i A_i^{\beta_i})^{1-\gamma} f(a_i \mid a_j) da_i$. Given the utility function and the conditional distribution function I have

$$E[V_i] = \frac{W_i^{1-\gamma}}{(1-\gamma)\sqrt{2\pi(1-\rho^2)}}\int_{-\infty}^{\infty} (A_i^{\beta_i})^{1-\gamma} \exp\left\{-\frac{1}{2(1-\rho^2)}(a_i-\rho a_j)^2\right\} da_i.$$

Because $(A_i^{\beta_i})^{1-\gamma} = \exp\{(1-\gamma)\beta_i a_i\}$ I can write the integral:

$$I = \int_{-\infty}^{\infty} \exp\left\{\frac{2(1-\rho^2)(1-\gamma)\beta_i a_i - (a_i-\rho a_j)^2}{2(1-\rho^2)}\right\} da_i.$$

Separating out terms which do not contain the integrand I can write the integral:

$$I = \int_{-\infty}^{\infty} \exp\left\{\frac{-(\rho a_j)^2}{2(1-\rho^2)}\right\} \exp\left\{\frac{-a_i^2 + 2[(1-\rho^2)(1-\gamma)\beta_i + \rho a_j]a_i}{2(1-\rho^2)}\right\} da_i.$$

Complete the square in

the second exponent by multiplying and dividing by $\exp\left\{\frac{-[(1-\rho^2)(1-\gamma)\beta_{u1}+\rho a_j]^2}{2(1-\rho^2)}\right\}$ in the second and first exponent respectively:

$$I=\int_{-\infty}\exp\left\{\frac{[(1-\rho^2)(1-\gamma)\beta_i+\rho a_j]^2-(\rho a_j)^2}{2(1-\rho^2)}\right\}\exp\left\{\frac{-a_i^2+2[(1-\rho^2)(1-\gamma)\beta_i+\rho a_j]-[(1-\rho^2)(1-\gamma)\beta_i+\rho a_j]^2}{2(1-\rho^2)}\right\}da_i.$$

This can be simplified to:

$$I=\int_{-\infty}\exp\left\{\frac{[(1-\rho^2)(1-\gamma)\beta_i]^2+2(\rho a_j)(1-\rho^2)(1-\gamma)\beta_i}{2(1-\rho^2)}\right\}\exp\left\{\frac{-(a_i+[(1-\rho^2)(1-\gamma)\beta_i+\rho a_j])^2}{2(1-\rho^2)}\right\}.$$

Moving the first exponent out of the integral gives:

$$E[V_i]=\gamma\frac{W_i^{1-\gamma}}{(1-\gamma)}\exp\left\{(1-\rho^2)(1-\gamma)^2\frac{\beta_i^2}{2}+\rho a_j(1-\gamma)\beta_i\right\}$$
$$\frac{1}{\sqrt{2\pi(1-\rho^2)}}\int_{-\infty}\exp\left\{\frac{-(a_i+[(1-\rho^2)(1-\gamma)\beta_i+\rho a_j])^2}{2(1-\rho^2)}\right\}da_i.$$

But $\frac{1}{\sqrt{2\pi(1-\rho^2)}}\int_{-\infty}\exp\left\{\frac{-(a_i+[(1-\rho^2)(1-\gamma)\beta_i+\rho a_j])^2}{2(1-\rho^2)}\right\}da_i$ is the integral of a normal distribution with mean $[(1-\rho^2)(1-\gamma)\beta_i+\rho a_j]$ and variance $(1-\rho^2)$ which is equal to one. This gives: $E[V_i]=\frac{W_i^{1-\gamma}}{(1-\gamma)}\exp\left\{(1-\rho^2)(1-\gamma)^2\frac{\beta_i^2}{2}+\rho a_j(1-\gamma)\beta_i\right\}$ which can be rewritten as: $E[U_i]=\frac{1}{(1-\gamma)}\left(W_iA_j^{-\beta_i\rho}e^{\frac{\beta_i^2}{2}(1-\rho^2)(1-\gamma)}\right)^{1-\gamma}.$

A.2. Expected earnings

The expected earnings in the unfamiliar occupation is: $E[Y_i]=\int_{-\infty}W_iA_i^{\beta_i}f(a_i|a_j)da_i$; which following the steps above is : $E[Y_i]=W_iA_j^{-\beta_i\rho}e^{\frac{\beta_i^2}{2}(1-\rho^2)}$.

A.3. Earnings patterns

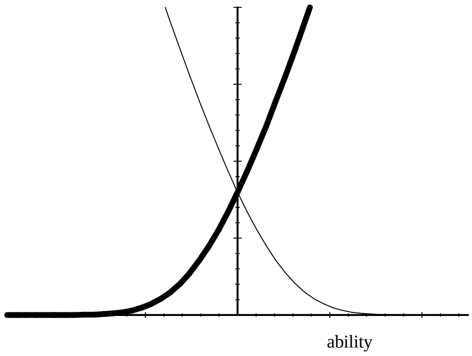
Condition 3.1 holds when: $\frac{f(a_H^*)}{1-F(a_H^*)}-\rho\frac{f(a_L^*)}{1-F(a_L^*)}<(1-\rho^2)\frac{\beta_h}{2}$; where we have used that if $X\sim N(0,1)$; then $E[X|X\geq c]=\frac{f(c)}{1-F(c)}$ and $E[X|X\leq c]=\frac{-f(c)}{F(c)}$.

Condition 3.2 holds when: $\rho\frac{f(a_H^*)}{F(a_H^*)}-\frac{f(a_L^*)}{F(a_L^*)}>(1-\rho^2)\frac{\beta_l}{2}$.

Condition 3.3 holds when: $\frac{f(a_H^*)}{1-F(a_H^*)}+\rho\frac{f(a_L^*)}{F(a_L^*)}>(1-\rho^2)\frac{\beta_h}{2}$.

Condition 3.4 holds when: $\frac{f(a_L^*)}{1-F(a_L^*)}+\rho\frac{f(a_H^*)}{F(a_H^*)}>(1-\rho^2)\frac{\beta_l}{2}$.

Figure A1



The thick curve in figure A1 is $\frac{f(a)}{1-F(a)}$: The thin drawn curve is $\frac{f(-a)}{1-F(-a)} = \frac{f(a)}{F(a)}$: With strong risk aversion, a_H^* is negative and always smaller than a_L^*; which is positive unless wage rates are very different. Hence the condition 3.2 will tend to hold since the LHS is negative unless ρ is very small. Condition 3.1 will also tend to hold unless the RHS is too large. With moderate risk aversion, a_L^* is negative and always more extreme than a_H^*. Then both conditions are likely to be violated.

A.4. Comparative statics on a^*

1) $\frac{\partial a_i^*}{\partial t} = -\frac{(1-\rho^2)(1-\gamma)\frac{\beta_j^2}{2}}{(\beta_i - \rho\beta_j)}$

2) $\frac{\partial a_i^*}{\partial \beta_i} = -\frac{\ln(W) + (1-\rho^2)(1-\gamma)\frac{\beta_j^2}{2}}{(\beta_i - \rho\beta_j)^2}$

3) $\frac{\partial a_i^*}{\partial \beta_j} = \frac{(1-\rho^2)(1-\gamma)\beta_j}{(\beta_i - \rho\beta_j)} + \rho\frac{\ln(W) + (1-\rho^2)(1-\gamma)\frac{\beta_j^2}{2}}{(\beta_i - \rho\beta_j)^2}$

4a) $\frac{\partial a_i^*}{\partial (W)} = \frac{\left(\frac{1}{W}\right)}{(\beta_i - \rho\beta_j)}$

4b) $\frac{\partial a_j^*}{\partial (W)} = \frac{-\left(\frac{1}{W}\right)}{(\beta_j - \rho\beta_i)}$

A.5. The effect of policy on the choice of H-people

$\frac{\partial M_H}{\partial g} = f(a_H^*)\frac{\partial a_H^*}{\partial g}$:

1) $\frac{\partial a_h^*}{\partial t} = -\frac{(1-\rho^2)(1-\gamma)\frac{\beta_l^2}{2}}{(\beta_h - \rho\beta_l)} \gtrless 0$ if $\begin{cases} \gamma < 1 \\ \gamma > 1 \end{cases}$:

2) The sign of $\frac{\partial a_h^*}{\partial \beta_h}$:

strong risk aversion, $\gamma > 1$:

$$\frac{\partial a_h^*}{\partial \beta_h} = -\frac{\ln\left(\frac{w_l}{w_h}\right) + (1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_l^2}{2}}{(\beta_h - \rho\beta_l)^2} > 0.$$

moderate risk aversion, $\gamma < 1$:

$$\frac{\partial a_h^*}{\partial \beta_h} = -\frac{\ln\left(\frac{w_l}{w_h}\right) + (1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_l^2}{2}}{(\beta_h - \rho\beta_l)^2} \lesseqgtr 0 \text{ if}$$

$$\ln\left(\frac{w_h}{w_l}\right) \lesseqgtr (1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_l^2}{2}.$$

3) The sign of $\frac{\partial a_h^*}{\partial \beta_l}$:

strong risk aversion, $\gamma > 1$:

$$\frac{\partial a_h^*}{\partial \beta_l} = \frac{(1-t)\left(1-\rho^2\right)(1-\gamma)\beta_l}{(\beta_h - \rho\beta_l)} + \rho\frac{\ln\left(\frac{w_l}{w_h}\right) + (1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_l^2}{2}}{(\beta_h - \rho\beta_l)^2} < 0.$$

moderate risk aversion, $\gamma < 1$:

$$\frac{\partial a_h^*}{\partial \beta_l} \gtreqless 0 \text{ if } \ln\left(\frac{w_h}{w_l}\right) \lesseqgtr (1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\beta_l}{\rho}\left(\beta_h - \frac{\rho\beta_l}{2}\right).$$

4) $$\frac{\partial a_h^*}{\partial\left(\frac{w_l}{w_h}\right)} = \frac{\frac{w_h}{w_l}}{(\beta_h - \rho\beta_l)} > 0.$$

A.6. The effect of policy on choice of L-people in Egalitaria

$$\frac{\partial M_L}{\partial g} = f(a_L^*)\frac{\partial a_L^*}{\partial g}.$$

1) $$\frac{\partial a_L^*}{\partial t} = -\frac{\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_h^2}{2}}{(\beta_l - \rho\beta_h)} \gtrless 0 \text{ if } \begin{cases} \gamma < 1 \\ \gamma > 1 \end{cases}.$$

2) The sign of $\frac{\partial a_l^*}{\partial \beta_l}$:

strong risk aversion, $\gamma > 1$:

$$\frac{\partial a_l^*}{\partial \beta_l} = -\frac{\ln\left(\frac{w_h}{w_l}\right) + (1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_h^2}{2}}{(\beta_l - \rho\beta_h)^2} \gtreqless 0$$

if $\ln\left(\frac{w_h}{w_l}\right) \lesseqgtr -(1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_h^2}{2}$.

moderate risk aversion, $\gamma < 1$:

$\frac{\partial a_l^*}{\partial \beta_l} < 0$

3) The sign of $$\frac{\partial a_l^*}{\partial \beta_h} = \frac{(1-t)\left(1-\rho^2\right)(1-\gamma)\beta_h}{(\beta_l - \rho\beta_h)} + \rho\frac{\ln\left(\frac{w_h}{w_l}\right) + (1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\sigma_h^2}{2}}{(\beta_l - \rho\beta_h)^2}.$$

strong risk aversion, $\gamma > 1$:

$$\frac{\partial a_l^*}{\partial \beta_h} \gtreqless 0 \text{ if } \ln\left(\frac{w_h}{w_l}\right) \gtreqless -(1-t)\left(1-\rho^2\right)(1-\gamma)\frac{\beta_h}{\rho}\left(\beta_l - \frac{\rho\beta_h}{2}\right)$$

moderate risk aversion, $\gamma < 1$:

$\frac{\partial a_l^*}{\partial \beta_h} > 0.$

4) $\frac{\partial a_l^*}{\partial\left(\frac{w_h}{w_l}\right)} = \frac{\left(\frac{w_l}{w_h}\right)}{(\beta_l - \rho\beta_h)} > 0.$

A.7. The effect of policy on choice of L-people in Hierarchia

$\frac{\partial M_L}{\partial g} = -f(a_L^*)\frac{\partial a_L^*}{\partial g}.$

1) $\frac{\partial a_l^*}{\partial t} = -\frac{(1-\rho^2)(1-\gamma)\frac{\sigma_h^2}{2}}{(\beta_l - \rho\beta_h)} \gtrless 0 \text{ if } \begin{cases} \gamma < 1 \\ \gamma > 1 \end{cases}.$

2) The sign of $\frac{\partial a_l^*}{\partial \beta_l}$:

Strong risk aversion, $\gamma > 1$:

$\frac{\partial a_l^*}{\partial \beta_l} = -\frac{\ln\left(\frac{w_h}{w_l}\right) + (1-t)(1-\rho^2)(1-\gamma)\frac{\sigma_h^2}{2}}{(\beta_l - \rho\beta_h)^2} \gtrless 0$

if $\ln\left(\frac{W_h}{W_l}\right) \lessgtr -(1-t)(1-\rho^2)(1-\gamma)\frac{\sigma_h^2}{2}.$

moderate risk aversion $\gamma < 1$:

$\frac{\partial a_l^*}{\partial \beta_l} < 0.$

3) The sign of $\frac{\partial a_l^*}{\partial \beta_h}$:

strong risk aversion, $\gamma > 1$:

$\frac{\partial a_l^*}{\partial \beta_h} = \frac{(1-t)(1-\rho^2)(1-\gamma)\beta_h}{(\beta_l - \rho\beta_h)} + \rho\frac{\ln\left(\frac{w_h}{w_l}\right) + (1-t)(1-\rho^2)(1-\gamma)\frac{\sigma_h^2}{2}}{(\beta_l - \rho\beta_h)^2}.$

$\frac{\partial a_l^*}{\partial \beta_h} \gtrless 0 \text{ if } \left(\beta_l - \frac{\rho\beta_h}{2}\right) > 0$

and $\ln\left(\frac{W_h}{W_l}\right) \gtrless -(1-t)(1-\rho^2)(1-\gamma)\frac{\beta_h}{\rho}\left(\beta_l - \frac{\rho\beta_h}{2}\right):$

$\frac{\partial a_l^*}{\partial \beta_h} > 0 \text{ if } \left(\beta_l - \frac{\rho\beta_h}{2}\right) \leq 0.$

moderate risk aversion, $\gamma < 1$:

$\frac{\partial a_l^*}{\partial \beta_h} \gtrless 0 \text{ if } \left(\beta_l - \frac{\rho\beta_h}{2}\right) < 0$

and $\ln\left(\frac{W_h}{W_l}\right) \gtrless -(1-t)(1-\rho^2)(1-\gamma)\frac{\beta_h}{\rho}\left(\beta_l - \frac{\rho\beta_h}{2}\right):$

$\frac{\partial a_l^*}{\partial \beta_h} > 0 \text{ if } \left(\beta_l - \frac{\rho\beta_h}{2}\right) \geq 0.$

4) $\frac{\partial a_l^*}{\partial\left(\frac{w_h}{w_l}\right)} = \frac{\left(\frac{w_l}{w_h}\right)}{(\beta_l - \rho\beta_h)} < 0.$

A.8. Steady state share of H-people

Hierarchia:

$$\frac{\partial P_h^{ss}}{\partial t} = \frac{\frac{\partial M_L}{\partial t}M_H - \frac{\partial M_H}{\partial t}M_L}{(M_L + M_H)^2} = -\frac{f(a_L^*)F(a_H^*)\frac{\partial a_L^*}{\partial t} + f(a_H^*)(1 - F(a_L^*))\frac{\partial a_H^*}{\partial t}}{\left(1 - F(a_L^*) + F(a_H^*)\right)^2}$$

Then:

$\frac{\partial P_h^{ss}}{\partial t} \gtreqless 0$ if $f(a_L^*)F(a_H^*)\frac{\partial a_L^*}{\partial t} + f(a_H^*)(1 - F(a_L^*))\frac{\partial a_H^*}{\partial t} \lesseqgtr 0$

where

$\frac{\partial a_H^*}{\partial t} = -\frac{(1-\rho^2)(1-\gamma)\frac{\beta_l^2}{2}}{(\beta_h - \rho\beta_l)}$ and $\frac{\partial a_L^*}{\partial t} = -\frac{(1-\rho^2)(1-\gamma)\frac{\beta_h^2}{2}}{(\beta_l - \rho\beta_h)}$

moderate risk aversion $\gamma < 1$:

$\frac{\partial P_h^{ss}}{\partial t} \gtreqless 0$ if $-\frac{\beta_l^2(\beta_l - \rho\beta_h)}{\beta_h^2(\beta_h - \rho\beta_l)} \gtreqless \frac{(1-F(a_L^*))f(a_H^*)}{f(a_L^*)F(a_H^*)}$

Because $\beta_l < \beta_h$ and $(\beta_l - \rho\beta_h) < 0$ we have $0 < -\frac{\beta_l^2(\beta_l - \rho\beta_h)}{\beta_h^2(\beta_h - \rho\beta_l)} < 1$

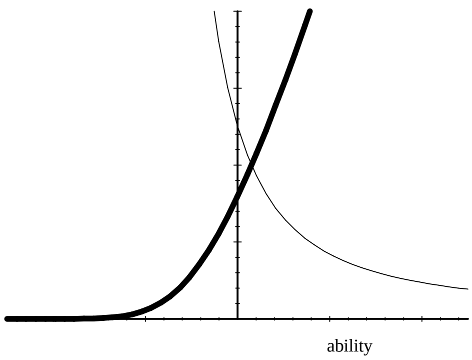
When cut off abilities are symmetrical, $\frac{(1-F(a_L^*))f(a_H^*)}{f(a_L^*)F(a_H^*)} = 1$; but since moderate risk aversion in Hierarchia implies that $a_L^* < 0$ and more extreme than a_H^*; which is positive unless $\frac{W_h}{W_l}$ is large enough. Plots of the functions $\frac{1-F(a)}{f(a)}$ and $\frac{f(-a)}{F(-a)}$(thick) in figure A2 tells us that $\frac{(1-F(a_L^*))f(a_H^*)}{f(a_L^*)F(a_H^*)} > 1$: Hence $\frac{\partial P_h^{ss}}{\partial t} < 0$:

Strong risk aversion, $\gamma > 1$:

$\frac{\partial P_h^{ss}}{\partial t} \gtreqless 0$ if $-\frac{\beta_l^2(\beta_l - \rho\beta_h)}{\beta_h^2(\beta_h - \rho\beta_l)} \lesseqgtr \frac{(1-F(a_L^*))f(a_H^*)}{f(a_L^*)F(a_H^*)}$

Strong risk aversion in Hierarchia implies that $a_L^* > a_H^*$; which is negative, but that a_L^* is more extreme than a_H^* only provided $\frac{W_h}{W_l}$ is not too large. Hence, $\frac{(1-F(a_L^*))f(a_H^*)}{f(a_L^*)F(a_H^*)} < 1$ unless $\frac{W_h}{W_l}$ is large enough. This implies that if $\frac{W_h}{W_l}$ is close to unity, the sign of $\frac{\partial P_h^{ss}}{\partial t}$ is unclear, but if $\frac{W_h}{W_l}$ is large enough, $\frac{\partial P_h^{ss}}{\partial t} < 0$; also when risk aversion is strong. However, the closer $-\frac{\beta_l^2(\beta_l - \rho\beta_h)}{\beta_h^2(\beta_h - \rho\beta_l)}$ is to zero, i.e. the larger is β_h compared to β_l; the more likely is it that $\frac{\partial P_h^{ss}}{\partial t} < 0$ also when wage rates are equal.

Figure A2



Egalitaria:

$$\frac{\partial P_h^{ss}}{\partial t} = \frac{f(a_L^*)F(a_H^*)\frac{\partial a_L^*}{\partial t} - f(a_H^*)F(a_L^*)\frac{\partial a_H^*}{\partial t}}{\left(F(a_L^*)+F(a_H^*)\right)^2}$$

moderate risk aversion:

$$\frac{\partial P_h^{ss}}{\partial t} \gtrless 0; \frac{\beta_l^2(\beta_l - \rho\beta_h)}{\beta_h^2(\beta_h - \rho\beta_l)} \gtrless \frac{f(a_L^*)F(a_H^*)}{F(a_L^*)f(a_H^*)}$$

where $0 < \frac{\beta_l^2(\beta_l - \rho\beta_h)}{\beta_h^2(\beta_h - \rho\beta_l)} < 1.$

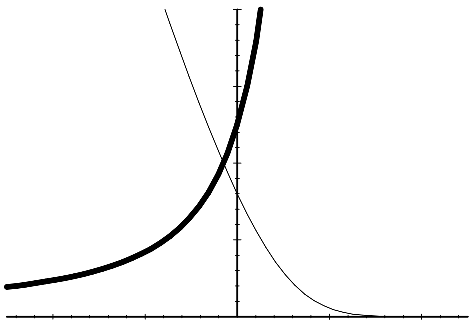
It is easily seen that if $a_L^* = a_H^*$ the right-most term equals unity. When risk aversion is moderate, a_L^* and a_H^* are both positive $a_L^* > a_H^*$. Hence the plots of $\frac{F(a)}{f(a)}$ (thick) and $\frac{f(a)}{F(a)}$ in figure A3 show that $\frac{f(a_L^*)F(a_H^*)}{F(a_L^*)f(a_H^*)} < 1$, which leaves the sign of $\frac{\partial P_h^{ss}}{\partial t}$ undetermined. Again the larger the difference between the occupations in terms of β, the greater is the likelihood that $\frac{\partial P_h^{ss}}{\partial t} < 0.$

Strong risk aversion:

$$\frac{\partial P_h^{ss}}{\partial t} \gtreqless 0; \frac{\beta_l^2(\beta_l - \rho\beta_h)}{\beta_h^2(\beta_h - \rho\beta_l)} \lesseqgtr \frac{f(a_L^*)F(a_H^*)}{F(a_L^*)f(a_H^*)}.$$

With strong risk aversion a_H^* is negative and $a_L^* < a_H^*$ unless $\frac{W_h}{W_l}$ is large enough. Hence if $\frac{W_h}{W_l}$ is small enough, $\frac{f(a_L^*)F(a_H^*)}{F(a_L^*)f(a_H^*)} > 1$ and we know that $\frac{\partial P_h^{ss}}{\partial t} > 0.$

Figure A3



A.9. Steady state mobility

Hierarchia:

$$\frac{\partial M}{\partial W} = \frac{\frac{\partial M_L}{\partial W}M_H^2 + \frac{\partial M_H}{\partial t}M_L^2}{(M_L+M_H)^2} = -\frac{f(a_L^*)F^2(a_H^*)\frac{\partial a_L^*}{\partial W} - f(a_H^*)(1-F(a_L^*)^2)\frac{\partial a_H^*}{\partial W}}{\left(1-F(a_L^*)+F(a_H^*)\right)^2}$$

Then

$$\frac{\partial M}{\partial W} \gtreqless 0 \text{ if } \frac{f(a_L^*)F^2(a_H^*)}{f(a_H^*)(1-F(a_L^*)^2)} \lesseqgtr \frac{\partial a_H^*}{\partial W} / \frac{\partial a_L^*}{\partial W}$$

where

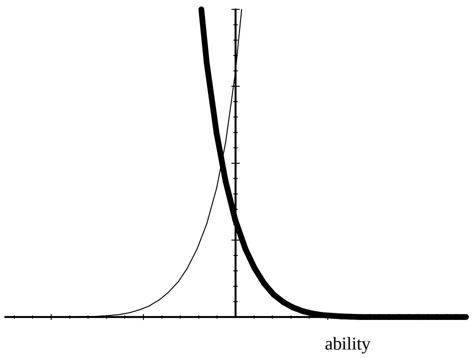
$$\frac{\partial a_H^*}{\partial W} = \frac{1}{W(\beta_h - \rho\beta_l)} \text{ and } \frac{\partial a_L^*}{\partial W} = -\frac{1}{W(\beta_l - \rho\beta_h)}.$$

Hence:

$\frac{\partial a_H^*}{\partial W}/\frac{\partial a_L^*}{\partial W} = -\frac{(\beta_l - \rho\beta_h)}{(\beta_h - \rho\beta_l)} < 1$; but positive or equal to zero.

When cut off abilities are symmetrical, $\frac{f(a_L^*)F^2(a_H^*)}{(1-F(a_L^*)^2)f(a_H^*)} = 1$; but since moderate risk aversion in Hierarchia implies that $a_L^* < 0$ and more extreme than a_H^*; which is positive unless $\ln\frac{W_h}{W_l}$ is large enough. Plots of the functions $\frac{(F(-a))^2}{f(-a)}$(thick) and $\frac{f(a)}{(1-F(a))^2}$ in figure A4 tells us that $\frac{f(a_L^*)F^2(a_H^*)}{(1-F(a_L^*)^2)f(a_H^*)} < 1$: Hence $\frac{\partial M}{\partial W}$ is unclear, but $\frac{f(a_L^*)F^2(a_H^*)}{(1-F(a_L^*)^2)f(a_H^*)}$ will tend to be larger than $-\frac{(\beta_l-\rho\beta_h)}{(\beta_h-\rho\beta_l)}$ as $\beta_l - \rho\beta_h$ gets closer to zero, i.e. the more similar the two occupations. With strong risk aversion $a_H^* < 0$ and more extreme if $\ln\frac{W_h}{W_l}$ is large enough. Mobility will decline as long as a_L^* is more extreme than a_H^*;i.e: unless $\ln\frac{W_h}{W_l}$ is large enough. If $\ln\frac{W_h}{W_l}$ is large enough, the effect is unclear, but again if $\beta_l - \rho\beta_h$ is close enough to zero mobility declines.

Figure A4



Egalitaria:

$\frac{\partial M}{\partial W} \gtreqless 0$ if $\frac{f(a_L^*)F^2(a_H^*)}{F^2(a_L^*)f(a_H^*)} \lesseqgtr -\frac{\partial a_H^*}{\partial W}/\frac{\partial a_L^*}{\partial W}$

where

$\frac{\partial a_H^*}{\partial W} = \frac{1}{W(\beta_h-\rho\beta_l)}$ and $\frac{\partial a_L^*}{\partial W} = -\frac{1}{W(\beta_l-\rho\beta_h)}$:

Hence:

$-\frac{\partial a_H^*}{\partial W}/\frac{\partial a_L^*}{\partial W} = \frac{(\beta_l-\rho\beta_h)}{(\beta_h-\rho\beta_l)} < 1$; but positive or equal to zero.

When cut off abilities are equal, $\frac{f(a_L^*)F^2(a_H^*)}{F^2(a_L^*)f(a_H^*)} = 1$; but since moderate risk aversion in Egalitaria implies that $a_L^* > 0$ and more extreme than a_H^*; which is positive unless $\frac{W_h}{W_l}$ is large enough. Plots of the functions $\frac{F^2(a)}{f(a)}$(thick) and $\frac{f(a)}{F^2(a)}$ in figure A5 tells us that $\frac{f(a_L^*)F^2(a_H^*)}{F^2(a_L^*)f(a_H^*)} < 1$: Hence $\frac{\partial M}{\partial W}$ is unclear, but $\frac{f(a_L^*)F^2(a_H^*)}{F^2(a_L^*)f(a_H^*)}$ will tend to be larger than $\frac{(\beta_l-\rho\beta_h)}{(\beta_h-\rho\beta_l)}$ the more similar the two occupations, in which case mobility declines as $\frac{W_h}{W_l}$ becomes smaller. With strong risk aversion $a_H^* < 0$

and more extreme if $\frac{w_h}{w_l}$ is large enough. Mobility will decline as long as a^*_L is more extreme than a^*_H;i.e: if $\frac{w_h}{w_l}$ is small enough. If $\frac{w_h}{w_l}$ is large enough, the effect is unclear, but again if $\beta_l - \rho\beta_h$ is close enough to zero mobility declines.

Figure A5