Occupational Mobility and Wage Inequality*

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Abstract

We argue that the increase in the variability of productivity shocks to occupations from the 1960s to the 1990s, calibrated to the observed increase in occupational mobility, can account for over 80% of the increase in wage inequality over the period. A distinguishing feature of the theory is that it also accounts for changes in within group wage inequality and the increase in the variability of transitory earnings.

We document that the fraction of workers switching occupations has increased from 15% a year in the early 1970s to 19% in the early 1990s. Our empirical finding that human capital is occupation specific motivated the development of an island economy general equilibrium model with occupation specific human capital and heterogeneous experience of workers within occupations. A higher rate of occupational mobility leads to a larger destruction of occupational experience, affecting the distribution of human capital and wages in the economy.

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1 Introduction

Despite an active search by economists for the reasons behind a large increase in inequality of hourly wages in the US over the last 30 years, identifying the culprit has proved elusive. In this paper we suggest that the increase in the variability of productivity shocks to occupations from the 1960s to the 1990s can account for most of the increase in wage inequality.

Several facts, documented in detail in section 2, characterize the changes in wage inequality in the US from the late 1960s to the early 1990s.

1. Inequality of hourly wages as measured by the Gini coefficient has increased by 6.6 Gini points, or by 25%.

2. Over half of the increase in wage inequality was due to rising wage inequality within narrowly defined age-education subgroups of the population.

3. The increase in wage inequality reflects changes that affected all parts of the wage distribution. While wages at the bottom of the wage distribution fell - workers at the 10^{th} percentile were receiving 25% less in 1994 than in 1973, wages at the top of the wage distribution increased - workers at the 90^{th} percentile were receiving 10% more.

4. There was an approximately equal percentage increase in the variances of permanent and transitory wages over the period.

Kambourov and Manovskii (2002b) document, using the Panel Study of Income Dynamics, that there was a sharp increase in occupational mobility over the same period. They define occupational mobility in a given year as the fraction of currently employed individuals who report a current occupation different from the one reported when they were last employed. The increase is pronounced for switches defined on all one-, two-, and three-digit US Census Occupational Classifications and across most age-education subgroups of the population.

The link between occupational mobility and wage inequality is established by the finding in Kambourov and Manovskii (2002a) that human capital is specific to the occupation an individual works in (e.g., truck driver, cook, accountant, chemical engineer). They show that occupational experience is considerably more important in determining wages than either industry or employer tenure. This is intuitive: one would expect the wage loss of a truck driver who loses a job in some food industry and finds another one in the furniture industry to be lower than the losses of a truck driver who becomes a cook. It is also intuitive to expect an increase in occupational mobility to affect wage inequality through the destruction of human capital generated by the occupation specific experience.

To study the connection between occupational mobility and wage inequality, we build a general equilibrium model based on the island economy abstractions developed by Lucas and Prescott (1974), and further advanced by Alvarez and Veracierto (2000). The main innovations in our model are to introduce a heterogeneity of workers with respect to their experience levels, and to allow for island-specific human capital. The main features of the model are as follows. When an individual arrives on an island, she has no island-specific experience. Then, given that she remains on the island, her level of experience stochastically increases. When an individual switches islands, she loses the experience accumulated on her previous island. Output and wages on each island are a function of the employed amount of effective labor. Islands are subject to the idiosyncratic productivity shocks. We argue that the variability of these shocks has increased from the late 1960s to the early 1990s.

We quantify the effects of the increased variability of the occupational productivity shocks in the following experiment. We calibrate the parameters of the model to match a number of observations for the early 1970s. Next, keeping the rest of the parameters fixed, we recalibrate the parameters governing the variability of the productivity shocks to occupations in order to match the facts on occupational mobility for the early 1990s. At no point in the calibration we target wage inequality.

The results of this experiment imply that the increase in the variability of productivity shocks to occupations from the 1960s to the 1990s, calibrated to the observed increase in occupational mobility, can account for over 80% of the increase in wage inequality, the decline in wage stability, and is consistent with the other facts mentioned above.

The assumption that occupations experience idiosyncratic productivity shocks, we believe, is not controversial. The occupational mix used in the economy varies substantially over time. New occupations arise and old ones disappear. The rate of this process depends on many factors, such as changes in technology, international trade arrangements, the demographic composition of the population, government regulations, labor market institutions, etc. Aside from the turnover, many occupations exhibit substantial changes in their sizes over time (see Kaboski (2000)). One of the many examples that come to mind is the experience of typesetters in the late 1970s - early 1980s. Many of these highly skilled workers had to switch occupations with the advent of computerized typesetting. Needless to say, the started in their new occupations as inexperienced relatively low paid workers.

A number of papers, including Bertola and Ichino (1995) and Ljungqvist and Sargent (1998), have argued that the economy became more "turbulent" in the 1980s as opposed to the 1970s. The term 'turbulence' is typically defined as an unobservable increase in the rate of skill depreciation upon a job switch during the two decades. Despite the intuitive appeal of the notion of increased economic turbulence over the last three decades, identifying it in the data has proved difficult. We suggest that an observable increase in occupational mobility over the period may serve as a measurable manifestation of the increased turbulence.[1] We identify the increase in turbulence with the increased variability of the occupational productivity shocks.

Most of the research on the increase in wage inequality was concentrated on explaining the rise in the college premium (e.g., Krusell *et al.* (2000) among many others). The increase in the college premium, however, accounts for less than a third of the overall increase in inequality. A distinguishing feature of this paper is that it provides a theory of within group inequality. In a nut shell we argue that a substantial part of the variance of wages for individuals from the same age-education group is explained by the heterogeneity of their occupational experience. Changes in occupational mobility over time account for the changes

[1] Other papers, including Lilien (1982), DiPrete and Nonnemaker (1997), and Rissman(1997), also suggest that economic turbulence may manifest itself in the level of intersectoral reallocation of labor.

in within-group inequality.

Typically, the existing theories of within group inequality rely on *ex-ante* differences in workers' abilities (see Violante (2002) for a survey). This assumption implies that the increase in inequality should manifest itself in the increase in the dispersion of the persistent component of wages, a prediction that is grossly at odds with the data on the increase in transitory variance of wages. One theory that does not suffer from this criticism and is related to our theory is proposed in Violante (2002). In his model workers are randomly matched with machines that embody technologies of different vintages. Skills are vintage specific, and the amount of skills that can be transfered to a newer machine depends on the technological distance between the vintages. The experiment consists of increasing the productivity gap between vintages. Since by assumption workers receive wages proportional to the productivity of their machine, this immediately leads to an increase in wage inequality. Wage dispersion is further increased due to the decline in skill transferability. The calibrated model accounts for about 30% of the rise in within group inequality. In another related paper, Amaral (2002) argues that the increase in economic turbulence in the framework of Ljungqvist and Sargent (1998) cannot account for the rising inequality within groups.

The remainder of the paper is organized as follows. In section 2 we document the empirical facts motivating this paper. We present the general equilibrium model with specific human capital and define its equilibrium in sections 3 and 4, respectively. After discussing the calibration of the model and the experiment we perform in section 5 we present the results in section 6. We discuss the results in section 7 and investigate their robustness in section 8. We evaluating some alternative explanations for the rising occupational mobility and wage inequality in section 9. Some concluding remarks are provided in section 10.

2 Empirical Facts

2.1 Changes in the US Labor Market from the 1960s to the 1990s

From the late 1960s till the early 1990s, the US labor market underwent significant changes along several dimensions - wage inequality increased, wages became more volatile, and individuals were switching their occupations more often. In this subsection we document these developments.

2.1.1 Increase in Wage Inequality

Wage inequality in the US has increased substantially in the 1968-1993 period. Table 1 shows that the Gini coefficient of hourly wages for male workers has increased from 0.26 in the early 1970s to 0.33 in the early 1990s - a significant 25% increase. While some of the increase is due to the fact that workers with college degrees nowadays receive more than workers with high-school degrees and that workers with more labor market experience receive higher wages than those with less experience, wage inequality increased even within the same age-education groups. In other words, if one restricts the sample only to, say, college graduates with the same amount of labor market experience, wage inequality within this group would be higher in the early 1990s as compared to the late 1960s. Indeed, Juhn, Murphy, and Pierce (1993) estimate that over a half of the increase in wage inequality was due to rising inequality within age-education groups.

Figure 1, which is reproduced from Gottschalk (1997), reveals that the increase in wage inequality reflects changes that affected all parts of the wage distribution. The figure suggests that between 1973 and 1994 real weekly wages have declined for almost 80% of American men, and have increased only for the top 20%. In particular, while workers at the 10^{th} percentile of the wage distribution were receiving 25% less in 1994 than in 1973, workers at the 90^{th} percentile were receiving 10% more. These findings are similar to those reported in Topel (1997).

2.1.2 Decline in Wage Stability

Gottschalk and Moffitt (1994) document that during the 1980s the variance of transitory earnings as well as the variance of permanent earnings were higher than in the 1970s and were approximately equally important in accounting for the increase in overall wage inequality.

Formally, let y_{it} denote the log wages of individual i in period $t = 1, 2, ..., 9$. We can decompose wages into a permanent and a transitory component in the following way:

$$y_{it} = \pi_i + \eta_{it},$$

where π_i is the mean log wage of individual i over 9 periods, while η_{it} is the deviation of y_{it} from the individual mean log wage in period t. Denote by $var(\eta_i)$ the variance of η_{it} for individual i over the 9 periods. Table 2, reproduced from Gottschalk and Moffitt (1994), shows that the variance in permanent annual log wages increased by 41% from the 1970s to the 1980s. Similarly, the average variance of transitory wages increased by 42% over the period. The latter result implies that workers faced higher wage variability in the 1980s than in the 1970s.

2.1.3 Increase in Occupational Mobility

Kambourov and Manovskii (2002b) document that occupational mobility in the US, at the 3-digit level[2], has increased from 15% in the early 1970s to 19% in the early 1990s (see Figure 2 and Table 3). Occupational mobility is defined as the fraction of currently employed individuals who report a current occupation different from the one reported when they were last employed (see Appendix II for a discussion). The 3-digit classification defines more than 400 occupations - an architect, carpenter, truck driver, cook, and mining engineer are a few examples. Figure 2 also shows that even at the 1-digit level - a classification that consists of nine broad occupational groups - the increase in occupational mobility is quite substantial. These results are consistent with the findings in Parrado and Wolff (1999). Rosenfeld (1979) suggests that occupational mobility did not exhibit any trend in the 1960s.

[2]Appendix VII contains the description of the 3-digit occupation codes. These codes may be further aggregated into a two- and one-digit codes, with the details of the aggregation we use presented in Appendices VIII and IX.

Further, Kambourov and Manovskii (2002b) show that occupational mobility has increased for most age-education subgroups of the population - it increased for those with a high-school degree as well as for those with a college degree, and for workers of different ages. The increase was not caused primarily by low occupational tenure workers switching more often - mobility has increased in all parts of the occupational tenure distribution. Finally, the increase in occupational mobility was not driven by an increased flow of workers into or out of a particular one-digit occupation. Therefore, the increase in occupational mobility was pervasive and has significantly affected the labor market.

2.2 Occupational Specificity of Human Capital

Using a Mincer-style regression, Kambourov and Manovskii (2002a) find substantial returns to tenure in an 3-digit occupation - as high as 19% after 10 years. Table 4 summarizes their main finding and the estimation procedure. Furthermore, they find that when experience in an occupation is taken into account, tenure within an industry or with an employer have virtually no effect on worker's wages. In other words, as long as a worker remains in the same occupation her wages will keep growing regardless of the fact whether she switches her industry or her employer. This finding is consistent with human capital being occupation-specific.

3 An Equilibrium Model with Occupation-Specific Experience

In this section we develop an equilibrium model based on the island economy abstractions of Lucas and Prescott (1974) and Alvarez and Veracierto (2000). In difference to the earlier models we introduce a heterogeneity of workers with respect to their experience levels. Experience is island-specific. The model provides a natural setting in which to study the effects of the increased variability of the occupation-specific productivity shocks on occupational mobility and wage inequality.

Environment and Preferences. The economy consists of a continuum of islands (occupations) of measure one, and a measure one of ex-ante identical individuals. Individuals die each period with probability δ and are replaced by newly-born ones. They are risk-neutral[3] and maximize:

$$E\sum_{t=0}^{\infty}\beta^t(1-\delta)^t c_t, \tag{1}$$

where β is the time-discount factor and c_t denotes consumption in period t.

There are two experience levels on each island - workers are either inexperienced or experienced. Experience is island-specific and newcomers to an island, regardless of the experience they had in their previous islands, begin as inexperienced workers. Each period

[3]This is equivalent to assuming risk-averse individuals that have access to complete insurance markets.

an inexperienced worker on an island becomes experienced with probability p. Those who, at the beginning of the period, decide to leave their island search for one period and at the beginning of next period arrive to a new island. Search is undirected in the sense that the probability of arriving on a specific island is the same across all islands.

Production. All islands produce the same homogeneous good. Output y on an island is produced with the production technology

$$y = z\left[a g_1^{\rho} + (1-a) g_2^{\rho}\right]^{\frac{\gamma}{\rho}}, \tag{2}$$

where $\rho \leq 1,\ 0 < \gamma < 1,\ 0 < a < 1$, g_1 is the measure of inexperienced individuals working on the island, g_2 is the measure of experienced individuals working on the island, and z denotes the idiosyncratic productivity shock.[4] The productivity shocks follow an AR(1) process

$$\ln(z') = \alpha + \phi \ln(z) + \epsilon', \tag{3}$$

where $0 < \phi < 1$ and $\epsilon' \sim N(0, \sigma_\epsilon^2)$. We denote the transition function for z as $Q(z, z')$.

There is a large number of competitive employers on each island and the wages that the inexperienced and experienced workers receive on an island are equal to their respective marginal products.[5]

Island Population Dynamics. Let $\psi = (\psi_1, \psi_2)$ denote the beginning of the period distribution of workers present on an island, where ψ_1 is the measure of inexperienced workers while ψ_2 is the measure of experienced workers. At the beginning of the period the idiosyncratic productivity shock z is realized. Some individuals on an island (ψ, z) could decide to leave the island and search for a better one. Denote by $g(\psi, z) = (g_1, g_2)$, the end of the period distribution of workers on an island, where g_j is the measure of workers with experience $j = 1, 2$ that decide to stay and work on island (ψ, z).

Let S be the measure of workers in the economy who are searching for a new island. Then, S and $g(\psi, z)$ determine next period's starting distribution on an island. In particular, the law of motion for ψ on an island is

$$\psi'(\psi, z) = (\delta + (1-\delta)S + (1-p)(1-\delta)g_1, p(1-\delta)g_1 + (1-\delta)g_2). \tag{4}$$

In the beginning of next period, the number of inexperienced workers that will start on an island is equal to all those who are inexperienced this period, are employed, survive, and do

[4]The production function implies that it is possible for experienced workers in an island to receive lower wages than the inexperienced if $\rho < 1$. As we discuss below, in the calibrated model this almost never happens.

[5]The production function implies that there is a fixed factor on each island. It is implicitly assumed that there are competitive spot markets for the fixed factor on each island so that the return to it equals its marginal product. The returns to the fixed factor are redistributed lump-sum back to the workers. Since we only study the inequality of wages in this paper, without loss of generality we do not explicitly model this redistribution.

not advance to the next experience level plus the newly arrived workers. Similarly, in the beginning of next period the measure of experienced workers is equal to all those who are experienced this period, are employed and survive, plus those who are inexperienced this period, are employed, survive, and become experienced next period.

Individual Value Functions. Consider the decision problem of an individual on an island (ψ, z) who takes as given $g(\psi, z)$ - the measure of workers of each experience level that will decide to stay and work on the island this period, S - the measure of workers that are searching for a new island, and V^s - the value of leaving an island and searching for a new one. Denote by $w_1(\psi, z)$ the wage (marginal product) of the inexperienced workers on island (ψ, z). Then $V_1(\psi, z)$, the value of an inexperienced worker on an island (ψ, z), is

$$V_1(\psi, z) = \max\left\{V^s, w_1(\psi, z) + \beta(1-\delta)\int \left[(1-p)V_1(\psi', z') + pV_2(\psi', z')\right] Q(z, dz')\right\}. \quad (5)$$

If the worker leaves the island, her expected value is equal to V^s. The value of staying and working on the island is equal to the wage received this period plus the expected discounted value from next period on, taking into account the fact that with probability p she will become experienced next period and with probability δ she will die.

Similarly, $V_2(\psi, z)$, the value of an experienced worker on an island (ψ, z), is

$$V_2(\psi, z) = \max\left\{V^s, w_2(\psi, z) + \beta(1-\delta)\int V_2(\psi', z')Q(z, dz')\right\}. \quad (6)$$

As in the case of the inexperienced workers described above, if the worker leaves the island, her expected value is equal to V^s. The value of staying and working on the island is equal to the wage received this period plus the expected discounted value from next period on, taking δ - the probability of death - into account.

Stationary Distribution. We are focusing on a stationary environment which is characterized by a stationary, island-invariant distribution $\mu(\psi, z)$:

$$\mu(\Psi', Z') = \int_{\{(\psi,z):\psi'\in\Psi'\}} Q(z, Z')\mu(d\psi, dz), \quad (7)$$

where Ψ' and Z' are sets of experience distributions and idiosyncratic shocks, respectively.

4 Equilibrium

Definition. A stationary equilibrium consists of value functions $V_1(\psi, z)$ and $V_2(\psi, z)$, island employment rules $g_1(\psi, z)$ and $g_2(\psi, z)$, an island-invariant measure $\mu(\psi, z)$, the value of search V^s, and the measure S of workers switching islands, such that:

1. Given V^s, $g(\psi, z)$, and S, $V_1(\psi, z)$ and $V_2(\psi, z)$ maximize individual's utility.

2. Wages on an island are competitively determined, i.e. a worker with a given level of experience is paid her marginal product.

3. The island employment rule $g(\psi, z)$ is consistent with individual decisions:

   (a) If $g_1(\psi, z) = \psi_1$ and $g_2(\psi, z) = \psi_2$, then $V_1(\psi, z) \geq V^s$ and $V_2(\psi, z) \geq V^s$.

   (b) If $g_1(\psi, z) < \psi_1$ and $g_2(\psi, z) = \psi_2$, then $V_1(\psi, z) = V^s$ and $V_2(\psi, z) \geq V^s$.

   (c) If $g_1(\psi, z) = \psi_1$ and $g_2(\psi, z) < \psi_2$, then $V_1(\psi, z) \geq V^s$ and $V_2(\psi, z) = V^s$.

   (d) If $g_1(\psi, z) < \psi_1$ and $g_2(\psi, z) < \psi_2$, then $V_1(\psi, z) = V^s$ and $V_2(\psi, z) = V^s$.

4. Individual decisions are compatible with the invariant distribution

$$\mu(\Psi', Z') = \int_{\{(\psi,z):\psi' \in \Psi'\}} Q(z, Z')\mu(d\psi, dz).$$

5. For an island (ψ, z), the feasibility conditions are satisfied:

$$0 \leq g_j(\psi, z) \leq \psi_j \qquad \text{for } j = 1, 2.$$

6. The aggregate feasibility condition is satisfied:

$$S = 1 - \int \left[g_1(\psi, z) + g_2(\psi, z)\right] \mu(d\psi, dz).$$

7. V^s is generated by $V_1(\psi, z)$ and $\mu(\psi, z)$:

$$V^s = (1 - \delta)\beta \int V_1(\psi, z)\mu(d\psi, dz).$$

The computational algorithm for computing equilibrium in this model is presented in appendix VI.

5 Calibration and the experiment

5.1 The Experiment

The model parameters to be calibrated are:

1. δ - the probability of an individual dying,

2. β - the time discount rate,

3. p - the probability of an inexperienced individual becoming experienced,

4. γ - the curvature parameter of the production function,

5. a - the distribution parameter of the production function,

6. ρ - the substitution parameter of the production function,

7. α - the unconditional mean of the stochastic process generating shocks z,

8. ϕ - the persistence parameter of the stochastic process generating shocks z,

9. σ_ϵ - the standard deviation of the white noise innovations in the stochastic process generating shocks z.

The main experiment we perform in this paper is as follows. The first six parameters above are assumed to be invariant over the 1968-1993 period. They are calibrated to the targets described below. The properties of the idiosyncratic occupational productivity shocks governed by the last three parameters above are assumed to be different in the late 1960s and early 1990s. Thus we calibrate α, ϕ, and σ_ϵ to match the properties of occupational mobility separately in the 1969-72 and 1990-93 periods. At no point in the calibration we target wage inequality.

5.2 Calibration Details

The model is calibrated to the economic experience of the United States. We chose the model period to be six months. Most of the parameters are imputed from the data. Other parameters are chosen to match observed moments (e.g. occupational mobility) in the data. The description of the data used to calibrate the parameters of the model is presented in appendix I.

The values for the parameters above are selected in the following way. We choose $\delta = 0.0125$ to generate an expected working lifetime of 40 years (or 80 model periods). We use $\beta = 0.9804$ since $\beta = 1/(1+r)$, where r represents an annual interest rate of 4% computed as an average of the return on bonds and the return on equity in the United States for the 1968-1993 period.

The parameter p - the probability of an inexperienced individual becoming experienced - does not have a directly observable counterpart in the data. However, an investigation of the estimated returns to occupational tenure suggests that the rate of growth of wages slows down considerably once an individual reaches roughly ten years of occupational experience. Thus we choose $p = 0.05$, which implies that it take on average 10 years for a newcomer to an occupation to become experienced in that occupation. We investigate the sensitivity of the results with respect to p ranging from 0.03 to 0.1 below.

5.2.1 Production Function Parameterization

We select the curvature parameter $\gamma = 0.68$ to match the labor share implicit in the NIPA accounts. To obtain a and ρ - the distribution and the substitution parameters of the production function, respectively - we employ the following procedure. Taking the ratio of the wages paid to the experienced and inexperienced workers in an occupation, one obtains:

$$\left(\frac{w_2}{w_1}\right) = \frac{1-a}{a}\left(\frac{g_2}{g_1}\right)^{\rho-1}. \tag{8}$$

This implies, that the parameters a and ρ can be estimated from the data, using the following regression model:

$$\ln\left(\frac{w_2}{w_1}\right)_{it} = \xi_0 + \xi_1 \ln\left(\frac{g_2}{g_1}\right)_{it} + \nu_{it}, \tag{9}$$

where i indexes occupations and t indexes time. The parameters of interest are then obtained from the following relations: $a = 1/(\hat{\xi_0} + 1)$ and $\rho = \hat{\xi_1} + 1$. The estimation procedures are summarized in appendix III. The estimation results imply that $a = 0.45$ and $\rho = .75$. In order to analyze the sensitivity of our findings to the choice of ρ, we also calibrate a version of the model with $\rho = 1$.

5.2.2 Stochastic Process Calibration

The parameters calibrated above are assumed to be fixed in both periods that we analyze. Their values are summarized in Table 5. The remaining three parameters - the unconditional mean of the productivity shocks, α, their persistence, ϕ, and the standard deviation of their innovations, σ_ϵ - are allowed to be different across the two periods.

We determine the shock values z_i and the transition matrix $Q(z, \cdot)$ for a 15-state Markov chain $z = \{z_1, z_2, ..., z_{15}\}$ intended to approximate the postulated continuous-valued autoregression.[6] We restrict $\overline{z}$ and $\underline{z}$ as implied by three unconditional standard deviations of $\ln(z)$ above and below the unconditional mean of the process, respectively.

Consistent with the experiment we conduct, we first choose ϕ and σ_ϵ to match the following observations for the 1969-72 period:[7]

1. The average annual rate of occupational mobility at a three-digit level over the 4 year period.

2. The average number of switches for those who switched a 3-digit occupation at least once over the 4 year period.

Next, we choose ϕ and σ_ϵ to match the corresponding observations for the 1990-93 period. We normalize α to be equal to zero in the first period and adjust it in the second period to match the documented change in real average wages.

Note that there is no direct analytical relation between these three parameters and the corresponding observations. We search numerically over these parameters' space until a good fit is found. The values for each of these observations in the data as well as the corresponding observations generated by the calibrated model are summarized in table 6.[8] Table 7 contains the values of α, ϕ, and σ_ϵ that result in the best fit of the model in each period with respect

[6] To discretize the shock process, we use the method described in Tauchen (1986). A 15-state Markov chain results in a fairly good approximation of the process as measured by the difference between the theoretical and simulated variances of $\ln(z)$.

[7] See appendicies II and IV for the details of the procedures used to obtain the values of these targets in the data.

[8] To be consistent with the PSID data used to obtain the targets that has annual frequency, we pretend that we observe each individual in the model only every second period.

to the targets specified above. See tables 8 for the values of the shocks and the stationary distribution of islands over shocks in each of the two periods.

6 Results

Below we describe the performance of the calibrated model in accounting for the stylized facts documented in section 2.1.

6.1 Accounting for Wage Inequality

The effects of the increase in economic uncertainty on wage inequality are summarized in Table 9. The first important observation is that the model calibrated to the occupational mobility of the 1960s generates a level of wage inequality that is over 90% of that in the data. This implies that the model is an appropriate one for the study of wage inequality.

The model is also successful in accounting for the increase in wage inequality over the period. In fact, it accounts for over 80% of the increase. In order to look deeper at the increase in wage inequality we use the calibrated to model to construct a graph similar to that of Gottschalk (1997) reproduced in Figure 1. As Figure 3 illustrates, the model does an excellent job matching the observation that the increase in wage inequality in the data reflected changes that affected all parts of the wage distribution. In particular, as in the data, the model predicts a decline of wages for almost 80% of the individuals, and an increase only for the top 20% or so.[9]

6.2 Variance of Permanent and Transitory Wages

With respect to wage stability, the model generates a large increase in the transitory variance of wages comparable to that in the data.[10] The 13% increase in the permanent variance is smaller than that in the data. Note, however, that we have assumed that individuals are ex-ante identical, a feature that makes it difficult to match the level or the increase in the permanent variance of wages in this model. Nevertheless, we find it suggestive that the model generates the level and the increase of the permanent variance that are both almost a half of the corresponding observations in the data without relying on ex-ante heterogeneity.

[9]As mentioned above, the production function with $\rho < 1$ permits experienced workers to receive lower wages than the inexperienced individuals get on the same island. This indeed happens occasionally in the calibrated model. The fraction of populations that works on the islands where this happens is very small, however, - at less than 1%. Eliminating such islands from the analysis altogether leaves all of our results virtually unchanged. As the we document in section 8.2 the results in the model with $\rho = 1$ are very similar to the results presented here.

[10]In computing the variance decompositions we follow Gottschalk and Moffitt (1994) and use wages over 8 consecutive years. To avoid life-cycle effects we use individuals with 20-27 years of labor market experience.

6.3 Matching Other Dimensions of the Data.

The calibrated model also matches another dimension of occupational mobility. The fraction of individuals who do not switch a 3-digit occupation throughout a 4 year period in the PSID data has fallen from 63% in the early 1970s to 50% in the early 1990s. The corresponding statistic in the model falls from 62% to 53%.

The model qualitatively matches some other aspects of the data as well. We cannot make quantitative statements about them since we do not have data on occupational tenure of workers in the late 1960 - early 1970s. In particular, over the 1973-1993 period the share of workers with occupational experience of at least 5 years declined by 16% in the PSID data. The fraction of experienced workers in the model declines by 8%. The decline in the share of experienced workers is consistent with the evidence in Farber (1998), who reports that the fraction of employed workers who reported more than ten years of tenure was around 0.41 in the 1979-1983 period, declined to 0.38 in 1987, and further dropped to 0.35 in 1996.

Consistent with the data, the model predicts an increase in inequality of wages among inexperienced workers of 26%, among experienced workers of 27%, within occupations of 7%, and between occupations[11] of 35%. The model does not generate enough within-occupation inequality. This may, however, be an artifact of restricting to only two occupational experience levels.

7 Discussion of the Results

7.1 Fixed Policy Experiments

The important question that the results raise is what fraction of the increase in wage inequality is driven by the increase in the variance of the occupational productivity shocks and does the endogenous occupational mobility dampen or amplify the response of wage inequality to the changes in the shock process. In order to address this issue we conduct the following experiment. After the shock process is calibrated to the observations in the 1960's we fix the island employment rules as well as the stationary distribution μ and change the shock process to the one calibrated to match the 1990's.

Performing this fixed policy experiment we find that the endogenous response of the economy (occupational mobility) to the higher degree of economic uncertainty accounts for 25% of the overall increase in wage inequality. In other words, the increase in inequality would have been 25% smaller if workers were not to adjust their behavior.

One of the channels that lead to this effect is as follows. The relative wages of experienced and inexperienced workers in an occupation depend of the numbers of workers of each type. When an occupation is hit by a good productivity shock, a large number of inexperienced workers come to that occupation. This decreases wages of the experienced workers but by less than wages of the inexperienced ones (since $\gamma < \rho$). Thus some inexperienced workers may

[11] The inequality of wages between occupations is measured by the Gini coefficient of average wages in each occupation.

be induced to work on a highly productive island despite receiving low wages in expectation of gaining experience and receiving higher wages in the future.

7.2 Intuition behind the Results

In order to understand the results it is instructive to study the changes in the distributions of employed workers across productivity shocks in the calibrated model. Figure 4 summarizes these distributions in the 1960s and 1990s. The corresponding values of the productivity shocks are provided in table 8.

Figure 4 suggests that the distribution of workers over productivity shocks is shifted to the left in the 1990s relative to the corresponding distribution in the 1960s. This implies that more workers choose to remain on the relatively unproductive islands. Why would they do so? In the 1990s shocks are more dispersed and are more volatile. An inexperienced worker who finds himself on a relatively unproductive island this period has an option of switching his island and searching one period for a new occupation or remaining on the island accumulating human capital. Since there is a higher chance of this island receiving a high productivity shock next period in the 1990s, more workers choose to remain on the relatively unproductive island. They would leave that island next period, however, if a really low productivity shock hits. Since more island are hit by these really bad productivity shocks, occupational mobility increases. But since high productivity shocks are less persistent, relatively fewer worker end up working on highly productive islands.

8 Robustness of the Results

8.1 Uniqueness of the Calibration

Since the properties of our model are relatively unexplored, one may wonder if the calibration of the model is unique. In order to address this concern we map out the space of all plausible parameter values governing the variability of occupational productivity shocks. Figures 5 and 6 present occupational mobility and the average number of switches for workers switching occupations at least once in a four year period - the two calibration targets - for values of $\phi \in (0.06, 0.96)$ and $\sigma_\epsilon \in (0.06, 1)$. As these figures indicate, the values of both statistics rise with the increase in variance of innovations in the productivity shocks process (axis x) or the increase in persistence (axis y). As one would expect occupational mobility declines sharply (not shown in the graph) as the persistence approaches the value of one, implying the possibility of another equilibrium. The value of the second statistic, however, keeps increasing in this case since occupational switchers become very selective when persistence of the shocks is high. Consequently, no calibration that matches both of our targets with persistence approaching the value of one is possible.

Figure 7 describes the level of wage inequality as measured by the Gini coefficient over the parameter space. The figure implies that inequality is positively correlated with both persistence of the shocks and the variance of their innovations. This means that occupational mobility and wage inequality are positively correlated, but the coefficient of correlation varies over the space.

8.2 Sensitivity of the Results with Respect to ρ

In order to discern the effect of the estimated substitution parameter, ρ, in the production function on our results, in this subsection we analyze the sensitivity of the findings to the choice of $\rho = 1$.

The preliminary calibration of the model with $\rho = 1$ suggest that the results are very similar to those obtained in the benchmark model with $\rho = 0.75$. A more detailed discussion of the results of this sensitivity analysis are forthcoming in the next draft.

8.3 Sensitivity of the Results with Respect to p

As discussed above, the parameter p - the probability of an inexperienced individual becoming experienced - does not have a directly observable counterpart in the data. In the benchmark calibration of the model we chose $p = 0.05$, which implies that it takes on average 10 years for a newcomer to an occupation to become experienced in that occupation. In this subsection we investigate the sensitivity of the results with respect to p ranging from 0.03 to 0.1.

The results of this sensitivity analysis are forthcoming in the next draft.

9 Evaluating Alternative Explanations for the Rising Occupational Mobility and Wage Inequality.

9.1 Could Have Declining Search Costs Caused the Increase in Occupational Mobility and Wage Inequality?

It may be argued that the increase in occupational mobility from the 1960's to the 1990's was driven not by a change in the process generating idiosyncratic occupational productivity shocks but by a decline in the cost of switching occupations. To evaluate this hypothesis, we ask the following question. Suppose that the only change in the economic environment between the 1960's and the 1990's was the decline in search costs. Is this consistent with the stylized facts motivating this paper?

Formally, we perform the following experiment. The model is calibrated to match the targets in the 1960's. Then we decrease the model period to be 3 months instead of 6 months. We recompute all the time invariant parameters of the model to be consistent with the new model period. Since the model period is now half of what it used to be, we rescale the persistence of the productivity shocks $\phi^{new} = \sqrt{\phi^{old}}$ and the standard deviation of its innovations, $\sigma_\epsilon^{new} = \sigma_\epsilon^{old}/\sqrt{1 + (\phi^{new})^2}$. The rationale for this rescaling is that we want to keep the environment constant in the following sense. Conditional on a realization of the shock in period t we keep the expected value and the expected variance of the shock in period $t+2$ identical to what they would have been in period $t+1$ with a twice longer model period.

The results of this experiment are presented in table 11. They indicate that a substantial decline in search costs is compatible with the data on occupational mobility. The predictions about wage inequality, however, are strongly counterfactual: wage inequality and the transitory variance of wages decline substantially. We conclude from this experiment that if the cost of switching occupations did decrease over the period, the observed increase in wage inequality is substantially lower than what it would have been otherwise. If this is true, economists have a considerably more difficult puzzle to tackle.

9.2 Could Have Skill-Biased Technical Changed Caused the Increase in Occupational Mobility and Wage Inequality?

A popular explanation for the increase in wage inequality suggested in the literature is based on the assumption that the technological change over the last three decades was 'skill biased'. In other words, it is hypothesized that the productivity differential between skilled and unskilled workers has increased. Typically skills are associated with the education level of an individual.

Our model allows us to test a different version of the skill biased technical change hypothesis. In particular we examine if the increase in wage inequality could have been driven by an increase in returns to occupational experience. In order to test if such a theory is consistent with the stylized facts presented above we conduct the following experiment. We calibrate the model to the economic experience of the 1960's. Then, holding everything else constant, we decrease a from 0.45 to 0.4. This is equivalent to increasing the productivity of experienced workers in an occupation relative to the productivity of the inexperienced ones by 22.73%. To summarize, in this experiment we ask the following question. Suppose that the only change in the economic environment between the 1960's and the 1990's was this form of the skill biased technical change. Is this consistent with the stylized facts above?

The results of the experiment are summarized in table 10. As one would expect, skill-biased technical change does increase inequality, especially within occupations. The increase, however, is not "too large" given the substantial increase in the productivity differential between the experienced and inexperienced workers. The major counterfactual prediction of this theory has to do with occupational mobility. Occupational mobility falls by 12.3% instead of rising by 24.3% as observed in the data. Counterfactually, the fraction of experienced workers increases by 10% instead of declining. And the fraction of individuals who never switch their occupation in a four year period rises by 4.7% instead of declining by 24.19%. These results are intuitive. If the returns to occupational experience increase, individuals respond by accumulating more human capital and switching their occupations less often.

To summarize, a skill biased technical change is capable of generating some increase in wage inequality, but has strongly counterfactual predictions regarding occupational mobility.

9.3 What if the Skilled Biased Technical Change Happened Simultaneously with a Decline in Search Cost?

In the previous two subsections we found that our notion of skill biased technical change results in higher inequality and lower occupational mobility while a decline in search costs leads to an increase in occupational mobility and a decline in wage inequality. Here we jointly introduce a skill biased technical change and lower mobility costs in the model to see if taken together they would be capable to generate the predictions compatible with the economic experience of the 1990's. The results of this experiment are presented in table 12. While the increase in occupational mobility is as large as in the data, wage inequality remains virtually unchanged.

10 Concluding Remarks

10.1 Summary

In this paper we have shown that the increase in the variability of productivity shocks to occupations from the 1960's to the 1990's, calibrated to the observed increase in occupational mobility, can account for the decline in wage stability, for over 80% of the increase in wage inequality and is consistent with a number of other facts characterizing the US labor market performance.

In contrast to most of the existing literature we provide a unified framework for studying changes in within group wage inequality. This is achieved in a framework that includes endogeneity of wages and occupation separation rates as well as endogenous destruction of sector-specific human capital in the economy. That enables us to shed more light on the particular channels through which the increased uncertainty in the economy led to a higher earnings inequality. The key friction in the market that we draw attention to is the fact that it takes time to build occupation-specific experience.

10.2 Extensions

There are two major extensions of this project that we are interested in pursuing. These extensions will also constitute a check on our theory. First, it would be important to obtain direct evidence on the increase in the variability of occupational productivity shocks. Second, available data implies clear differences in the wage inequality trends across countries (see Gottschalk and Smeeding (1997) for a review of the evidence). It would be interesting to obtain cross-country evidence on levels and trends in occupational mobility as well. This is not a trivial task, however, since occupational classification systems and coding methodologies differ across countries.

What caused the increase in variability? Answering this question is well beyond the scope of this paper. The answer is crucial, however, for our understanding of the underlying forces manifesting themselves in the rate of occupational mobility. The search for these forces, we believe, will provide a very fruitful avenue for future research.

10.3 Applications of the Theory

Our theory potentially has a number of implications for some other actively researched issues in economics.

Flattening Life-Cycle Wage Profiles. Beaudry and Green (1997) demonstrate that over the period from 1971 to 1993, age-earnings profiles of college as well as high school educated Canadian men have been deteriorating for more recent cohorts in comparison to older cohorts. They find that age-earnings profiles have become "flatter" for the cohorts entering the labor market more recently. The US data studied in MaCurdy and Mroz (1995) exhibits similar patterns. This evidence is surveyed in Heckman *et al.* (1998). Our theory suggests that a substantial fraction of the average life-cycle profile of wages can be explained by rising average occupational experience over the life-cycle of a cohort of workers who entered labor market at the same time. An increase in occupational mobility results in lower average occupational experience at every point in the cohort's life-cycle.

The College Premium. It is well-known that the college premium has increased sharply during the 1980s. We do not explicitly model education in this paper. One may think of our model as representing only a subgroup of the population, say, only high school educated workers, or only those with a college degree. In this case the model could be used to study the evolution of inequality within that group. A natural extension of the model would be to model education decisions explicitly.

The Slowdown of the Productivity Growth. An intriguing research question is to relate changes in occupational mobility to changes in the growth rate of productivity. It may not be a coincidence that the increased destruction of specific human capital associated with the increase in occupational mobility we have documented has coincided with a much discussed slowdown in productivity growth.

Effects of Labor Market Policies. The policy implications of our analysis have not been explored yet.[12] However, it is clear that any government policy that affects the sectoral reallocation of labor would have an impact on wage inequality and labor productivity. For example, various labor income taxation or unemployment insurance (UI) schemes would have different impacts on workers' incentives for accumulating sector-specific experience and on sectoral switches conditional on tenure in that sector. We conjecture that the differences in the dynamics of wage inequality and unemployment between the US and European countries may be due to differences in their UI schemes through their impact on occupational mobility.

In conclusion, macroeconomic consequences of occupational mobility have been neglected in economics. We suggest that it may prove productive to pay a closer attention to these issues.

[12] We start out on this path in Kambourov (2002) and Manovskii (2002).

Table 1: Inequality of Hourly Wages

	1969-72	1990-93	Change
Gini Coefficient	0.264	0.330	25.00%

Source: authors' calculations from the PSID. For sample restrictions, see appendix I.

Table 2: Decline in Wage Stability

	1970-78	1979-87	Change
Variance of π_i	0.201	0.284	41.29%
Average $var(\eta_i)$	0.104	0.148	42.31%

Source: Gottschalk and Moffitt (1994). For definitions of the variables, see the discussion in section 2.1.2 and appendix V.

Table 3: Occupational Mobility

	1969-72	1990-93	Change
Occupational mobility	0.152	0.189	24.3%

Source: Kambourov and Manovskii (2002b). For definitions of the variables, see the discussion in section 2.1.3 and appendix II.

Table 4: Occupational Specificity of Human Capital

	Returns to Experience (based on a Mincer regression)		
	2 years	5 years	10 years
Occupation	.0535	.1188	.1900
	(.0068)	(.0154)	(.0258)
Industry	-.0030	-.0086	-.0207
	(.0071)	(.0149)	(.0226)
Employer	.0012	.0027	.0079
	(.0096)	(.0136)	(.0212)

Source: Kambourov and Manovskii (2002a). Standard errors are in parentheses.
The results are from the following econometric model:

$$\begin{aligned}\ln w_{ijmnt} &= \beta_0 Emp\_Ten_{ijt} + \beta_1 OJ_{ijt} + \beta_2 Occ\_Ten_{imt} + \beta_3 Ind\_Ten_{int} \\ &\quad + \beta_4 Work\_Exp_{it} + \mu_i + \lambda_{ij} + \xi_{im} + \upsilon_{in} + \epsilon_{it},\end{aligned}$$

where w_{ijmnt} is the real hourly wage of person i working in period t with employer j in occupation m and industry n. Emp_Ten, Occ_Ten, and Ind_Ten denote tenure with the current employer, occupation, and industry, respectively. OJ is a dummy variable that equals one if the individual is not in the first year with the current employer. $Work\_Exp$ denotes overall labor market experience. The regression includes an individual-specific component μ_i, a job-match component λ_{ij}, an occupation-match component ξ_{im}, and an industry-match component υ_{in}. Other variables in the regression include an intercept term, one-digit occupation and industry dummies, a union dummy, a marital status dummy, year dummies, region dummies, education, as well as unemployment rate and lagged unemployment rate in the county of residence. The model also contains the square term of employer tenure and education, and the square and cube terms of occupation and industry tenure and overall work experience. The model is estimated using an IV-GLS procedure proposed by Altonji and Shakotko (1987) and employed in Parent (2000).

Table 5: Calibrated Parameter Values

δ	γ	β	a	p
0.0125	0.68	0.9804	0.45	0.05

Table 6: Targets

	Target	1969-72		1990-93	
		Data	Model	Data	Model
1.	3d occupational mobility	0.152	0.152	0.189	0.189
2.	The average number of switches for those who switched a 3-digit occupation at least once in a 4 year period	1.56	1.54	1.62	1.61

Note.- The data is computed by the authors from the PSID. For definitions of the targets, see the discussion in appendix II and IV.

Table 7: Calibrated Parameter Values, Productivity Shocks Process

	Parameter	1969-72	1990-93
1.	ϕ	0.928	0.890
2.	σ_ϵ	0.247	0.352
3.	θ	0.664	0.771
4.	α	0.000	-0.100

ϕ - persistence of the log shocks.
σ_ϵ - standard deviation of the white noise.
θ - standard deviation of the log shocks.
α - unconditional mean of the process.

Table 8: Shock Values and the Stationary Distribution of Occupations over Shocks.

	1960s		1990s	
	z	$\zeta(z)$	z	$\zeta(z)$
1.	0.136	0.004	0.090	0.003
2.	0.181	0.008	0.125	0.007
3.	0.241	0.021	0.173	0.020
4.	0.320	0.043	0.241	0.042
5.	0.426	0.077	0.336	0.076
6.	0.566	0.117	0.467	0.117
7.	0.752	0.149	0.650	0.152
8.	1.000	0.162	0.905	0.165
9.	1.329	0.149	1.259	0.152
10.	1.767	0.117	1.752	0.117
11.	2.349	0.077	2.438	0.076
12.	3.122	0.043	3.392	0.042
13.	4.150	0.021	4.720	0.020
14.	5.517	0.008	6.568	0.007
15.	7.334	0.004	9.139	0.003

z - values of the shocks.
$\zeta(z)$ - stationary distribution of occupations over shocks.

Table 9: Results from the Calibrated Model.

	1960s	1990s	Change
Gini coefficient	0.237	0.297	22.8%
Variance of permanent log wages, $var(\pi_i)$	0.076	0.085	13.2%
Average variance of transitory log wages, average $var(\eta_i)$	0.169	0.259	49.1%

Note.- For the Gini coefficient the 1960s refer to the period 1969-72 while the 1990s refer to the period 1990-93. For the variance of the permanent and transitory components of wages, the 1960s and the 1990s refer to the periods 1970-78 and 1979-87, respectively. For definitions of the variables, see the discussion in section 2.1.2 and appendix V.

Table 10: The Effects of a Skill-Biased Technical Change.

	1960s (1)	1990s (2)	Change (%) (3)
Gini coefficient	0.237	0.263	11.0
Variance of permanent log wages	0.076	0.099	30.3
Variance of transitory log wages	0.169	0.173	2.4

	1960s (1)	1990s (2)	SBTC Model (3)
Occupational mobility	0.152	0.189	0.123
The average number of switches for those who switched a 3-digit occupation at least once in a 4 year period	1.56	1.62	1.54

Note.- The 1960s and the 1990s refer to the periods 1969-72 and 1990-93, respectively. The table reports the results of an experiment in which after the model is calibrated to the performance of the economy in the 1960's, a skill-biased technical change, modeled as a decrease in a from 0.45 to 0.40, is introduced. Column (1) in the top panel shows statistics for the economy calibrated to the 1960's. The new levels of these statistics after the introduction of the skill-biased technical change are described in column (2). Column (3) reports the percentage change in those statistics. Column (1) in the bottom panel shows the level of the targets in the 1960's, while column (2) shows their level in the 1990's. Column (3) describes the level of these variables after a skill-biased technical change is introduced.

Table 11: The Effects of a Decline in the Cost of Search.

	1960s (1)	1990s (2)	Change (%) (3)
Gini coefficient	0.237	0.224	-5.5
Variance of permanent log wages	0.076	0.091	19.7
Variance of transitory log wages	0.169	0.125	-26.1
	1960s (1)	**1990s (2)**	**LCS Model (3)**
Occupational mobility	0.152	0.189	0.217
The average number of switches for those who switched a 3-digit occupation at least once in a 4 year period	1.56	1.62	1.73

Note.- The 1960s and the 1990s refer to the periods 1969-72 and 1990-93, respectively. The table reports the results of an experiment in which after the model is calibrated to the performance of the economy in the 1960's, the cost of search is reduced by half. Column (1) in the top panel shows statistics for the economy calibrated to the 1960's. The new levels of these statistics after the cost of search is reduced are described in column (2). Column (3) reports the percentage change in those statistics. Columns (1) in the bottom panel show the level of the targets in the 1960's, while column (2) shows their level in the 1990's. Columns (3) describes the level of these variables after the cost of search is reduced by half in the model.

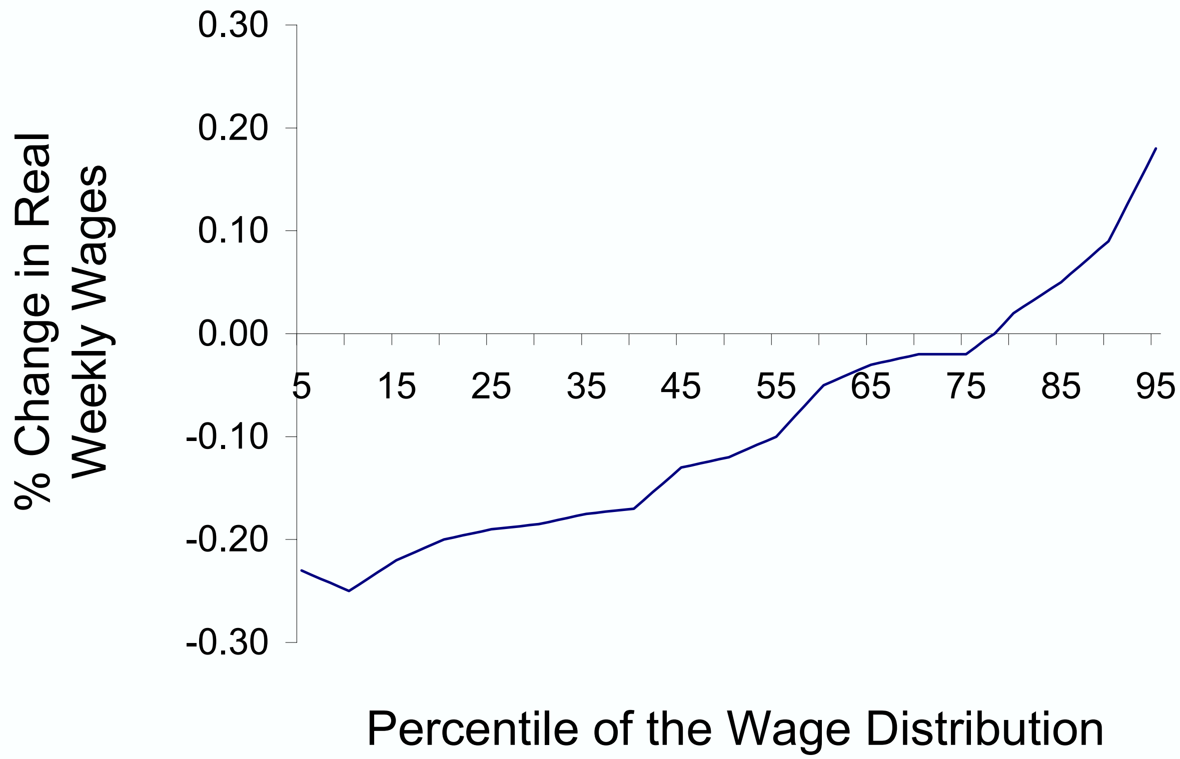
Table 12: The Effects of a Skill-Biased Technical Change and a Decline in the Cost of Search.

	1960s (1)	1990s (2)	Change (%) (3)
Gini coefficient	0.237	0.244	3.0
Variance of permanent log wages	0.076	0.118	55.3
Variance of transitory log wages	0.169	0.128	-24.3

	1960s (1)	1990s (2)	SB-LC Model (3)
Occupational mobility	0.152	0.189	0.189
The average number of switches for those who switched a 3-digit occupation at least once in a 4 year period	1.56	1.62	1.75

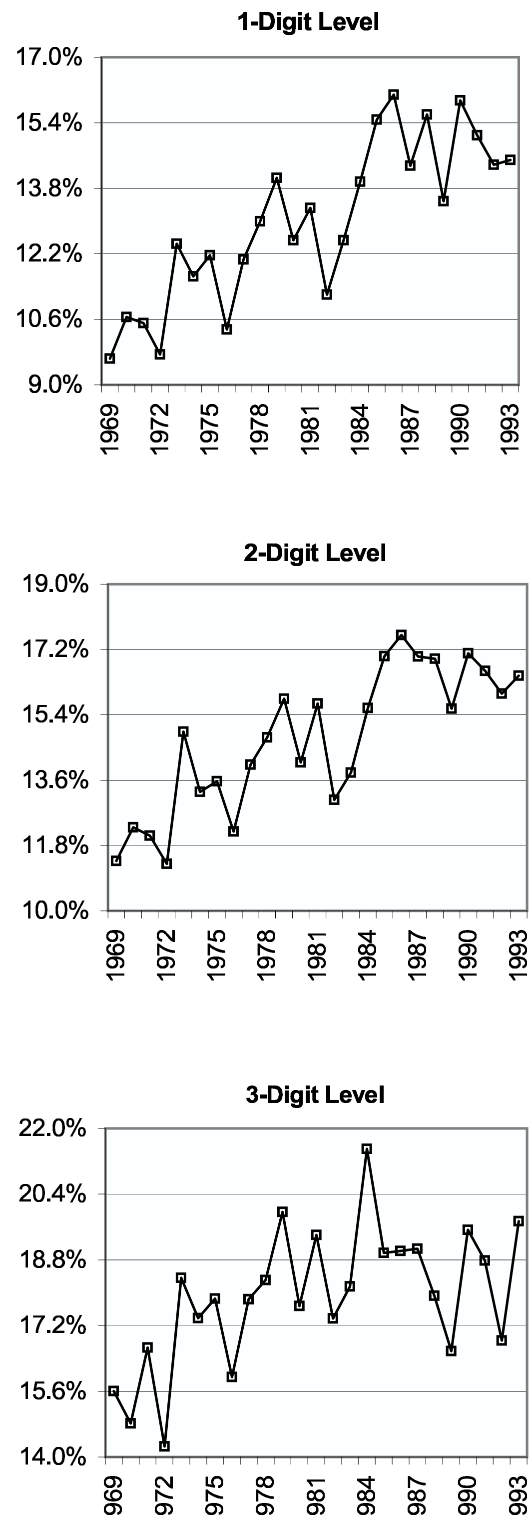
Note.- The 1960s and the 1990s refer to the periods 1969-72 and 1990-93, respectively. The table reports the results of an experiment in which after the model is initially calibrated to the performance of the economy in the 1960's, the cost of search is reduced by half and a skill-biased technical change is introduced. Column (1) in the top panel shows statistics for the economy calibrated to the 1960's. The new levels of these statistics after the change are described in column (2). Column (3) reports the percentage change in those statistics. Column (1) in the bottom panel shows the level of the targets in the 1960's, while column (2) shows their level in the 1990's. Column (3) describes the level of these variables after the cost of search is reduced by half and the skill-biased technical change is introduced in the model.

Figure 1. Percentage Change in Real Weekly Wages by Percentile, 1973/1994



Source: Gottschalk (1997)

Figure 2. Occupational Mobility in the US, 1969-1993



Source: Kambourov and Manovskii (2002b).
Note: Verticale scale is different in each panel.

Figure 3. Percentage Change in Real Weekly Wages by Percentile, Model

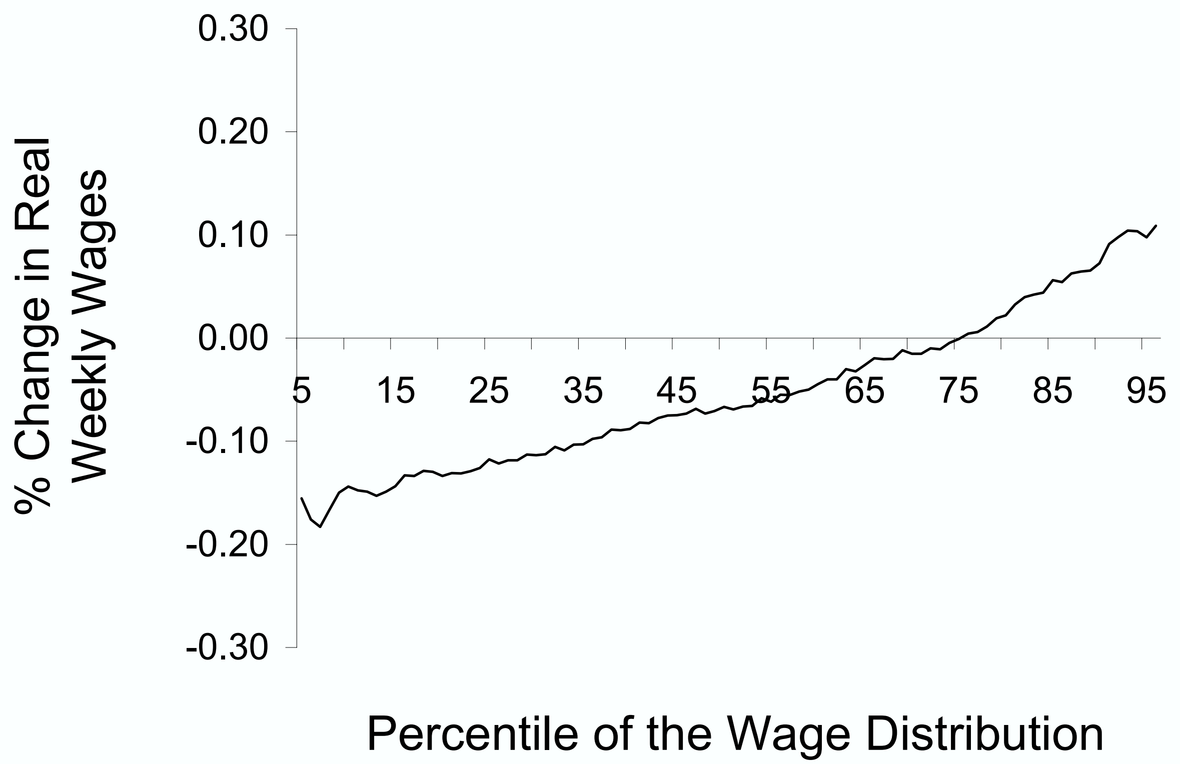


Figure 4. Distribution of Workers over Productivity Shocks, Model, 1960s vs. 1990s

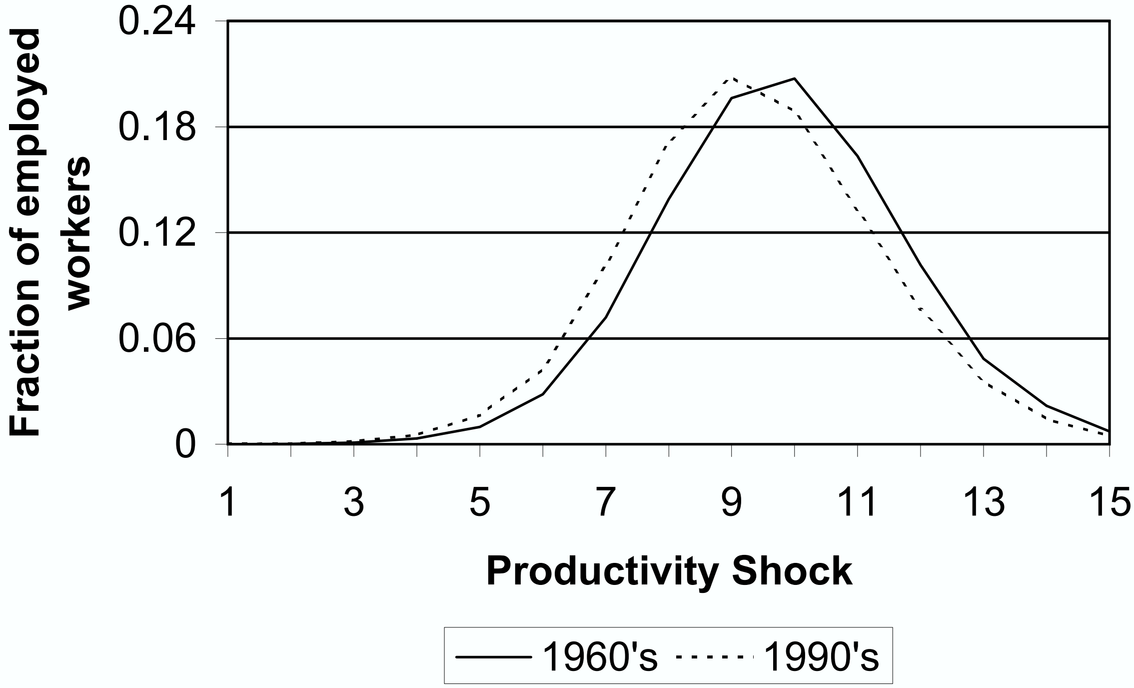


Figure 5. Mapping Occupational Mobility

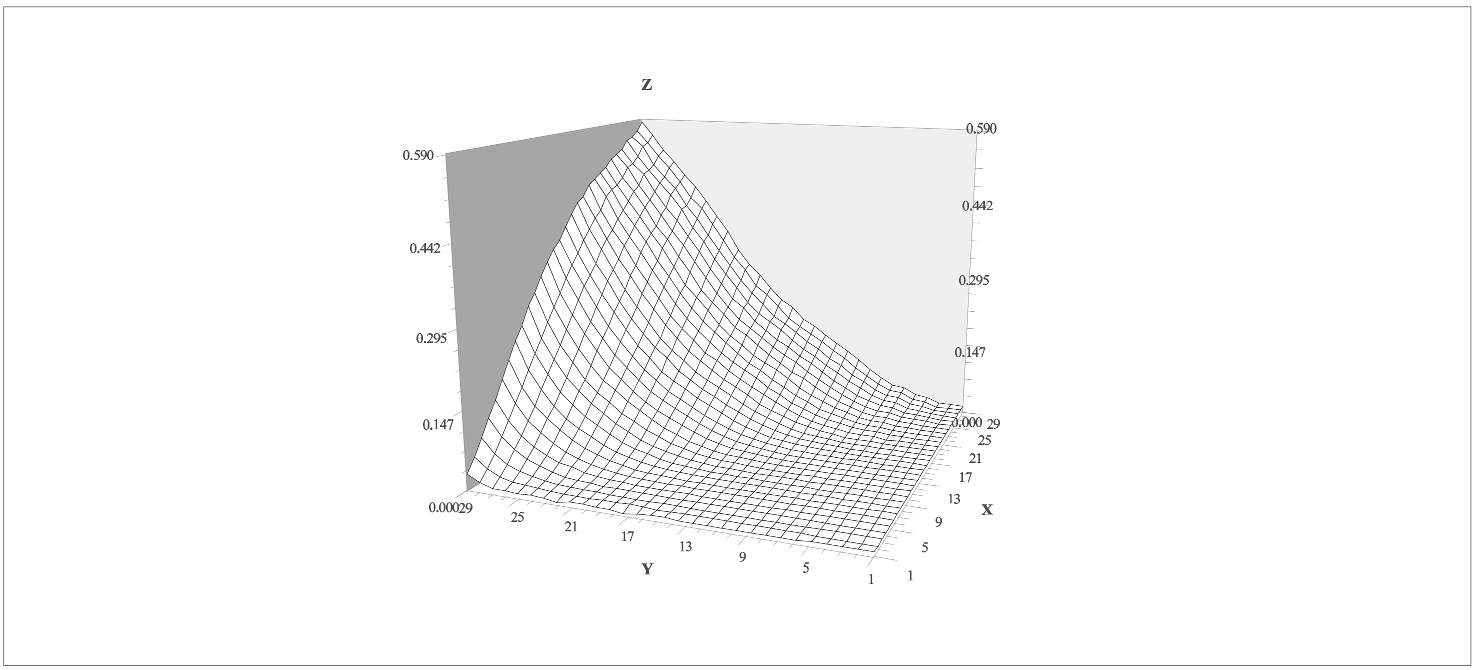


Figure 6. Average Number of Switches

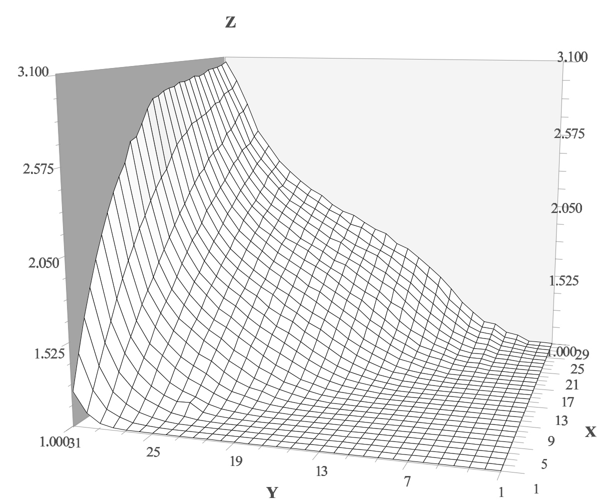
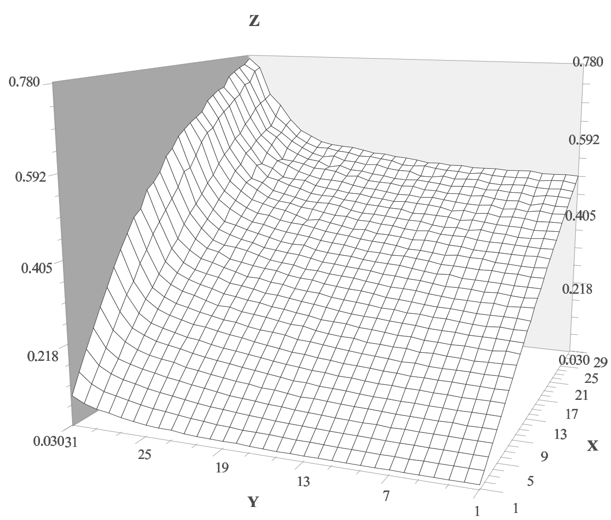


Figure 7. Gini Coefficient



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I The PSID Data

The data we use comes from the Panel Study of Income Dynamics (PSID) for the 1968-1993 period. The Panel Study of Income Dynamics (PSID), begun in 1968, is an annual longitudinal study of a representative sample of U.S. individuals residing in over five thousand family units. The PSID is particularly convenient for the study of the trends in occupational mobility over time since it provides one-, two-, and three-digit 1970 Census occupation codes throughout the 1968-1993 period. Moreover, it is a unique data set in that it allows the construction of measures of tenure with an employer or in a position, as well as consistent measures of the experience in an occupation, for a sample representative of the US population going back as early as 1968. We exploit these features of the data set in our analysis.

I.1 Sample Restrictions.

For most of the analysis the sample is restricted to male heads of household, aged 23-61, who are not self- or dual-employed, and are not working for the government. The resulting sample consists of 59522 observations over the 1968-1993 period, with an average of 2289 observations a year. Additional sample restrictions are imposed in some of the analysis and are discussed when relevant.

I.2 Original vs. Retrospective Occupation Coding by the PSID

The PSID has used the 1970 Census occupation codes from 1968 on. However, one-digit occupation codes were used in 1968-1975, two-digit occupation codes in 1976-1980, and three-digit occupation codes in 1974 and after 1981.

In 1999, the PSID released the Retrospective Occupation-Industry Supplemental Data Files (Retrospective Files, hereafter) that retroactively assign three digit 1970 Census codes to the reported occupations of household heads and wives for the period 1968-1980. This allows for the creation of a series of consistent three-digit occupational codes that runs from 1968 till 1993. Appendix VII contains the description of the three digit occupation codes. Further, these series may be aggregated into a two- and one-digit codes, with the details of the aggregation we use presented in Appendices VIII and IX. Although the PSID did not recode occupations for all the individuals in those years, with our sample restrictions only 398 observations in the sample were not recoded. This had virtually no impact on the average sample characteristics.[13]

There is, however, a significant degree of disagreement between the originally assigned PSID occupation codes and the codes assigned to the same individuals in the Retrospective Files. It is likely that the difference between the originally and the Retrospectively assigned

[13] The number 398 refers to the observations that have a positive PSID sample weight. Since the analysis below is performed on weighted data, this is the relevant statistic.

occupation codes may have been caused by differences in the methodology employed by the PSID in constructing these data. When coding the occupation data in 1981-1993 or when originally coding these data before 1981, the PSID coder did not compare the current year description to the one in the previous year. As a result, for a respondent who is in the same occupation in both years, similar occupational descriptions could end up being coded differently. This was not the case with the constructed Retrospective Files, where as reported in the PSID (1999), "to save time and increase reliability, the coder coded all occupations for each person across all required years before moving on to the next case." Thus in constructing the retrospective files, the coders had access not only to the respondents' description of their current occupation, but also to the description of their past and future occupations. This allowed them to compare these descriptions, decide whether they are similar, and assign the same occupational code where appropriate. It is documented in Kambourov and Manovskii (2002a) that the occupation codes from the Retrospective Files are indeed more reliable, and that there is a significantly higher degree of misclassification of occupations in the originally coded data.

II Documenting occupational mobility

Occupational mobility is defined as the fraction of currently employed individuals who report current occupation different from their most recent previous report of an occupation. For example, an individual employed in two consecutive years, would be considered as switching occupations if she reports a current occupation different from the one she reported in the previous year. If an individual is employed in the current year, but was unemployed in the previous year, a switch in his occupation will be recorded if he reports a current occupation different from the one he reported when he was most recently employed.

III Estimating the Production Function Parameters

In this appendix we discuss the estimation procedure for a_1 and ρ. We postulate the following regression model:

$$\ln\left(\frac{w_2}{w_1}\right)_{it} = \xi_0 + \xi_1 \ln\left(\frac{g_2}{g_1}\right)_{it} + \nu_{it}, \tag{A1}$$

where i indexes occupations and t indexes time.

We considered workers to be experienced if their occupational tenure is over 10 years. This choice is consistent with our parameterization of the probability of an inexperienced individual becoming experienced, $p = 0.05$. The same cut-off point is used for all occupations.[14]

[14] Our approach imposes two important restrictions on the data. First, we do not allow for the permanent differences among occupations. Second, the number of years required to become experienced in an occupation is restricted to be the same across all occupations.

We construct workers' tenure in an occupation in the following way. We allow individuals into the sample after they either switch an occupation for the first time or accumulate more than ten years of occupational experience.[15] Upon an occupational switch workers occupational tenure is set to zero. From then on if a worker is employed in the current year, does not switch her occupation, and reports to have worked more than 1000 hours during the previous year, her occupational tenure is increased by 12 months. If she reports to be unemployed this year or reports less than 1000 hours worked in the previous year, then her occupation tenure remains unchanged.[16] The switches are identified using the Retrospective Files during 1969-1980 and the originally coded data after 1980. Following Kambourov and Manovskii (2002a), on the original data we consider an occupation switch to be a genuine one if there is a corresponding position, or employer, or industry switch. If an individual reports a new occupation but does not indicate an industry, or a position, or an employer change, then no occupation switch is considered to have occurred.

Given our partition of the sample into experienced and inexperienced workers in each occupation we compute $(w_2/w_1)_{it}$ and $(g_2/g_1)_{it}$, for each occupation i in every year t. We consider only occupations that have at least 7 experienced as well as 7 inexperienced individuals in a given year.

The regression model A1 is then estimated using the ordinary least squares.[17]

IV Documenting the average number of occupational switches

In order to compute the average number of occupational switches in the 1969-71 period we restrict the sample to those who satisfy our usual sample restrictions and have an occupational code in every year of the 1968-72 interval. This implies that sample size is constant in every year. Standard errors were obtained by bootstrapping the sample. The procedure used to compute the average number of occupational switches in the 1989-92 period is similar.

V Formulas for Permanent and Transitory Variances

We use the same formulas for computing permanent and transitory variances as the ones used by Gottschalk and Moffitt (1994). Let y_{it} represent the log of wages of individual i in period t. Then y_{it} can be decomposed as follows:

$$y_{it} = \pi_i + \eta_{it},$$

[15]It is not possible to determine the exact occupation tenure of individuals who appear for the first time in the sample, or for individuals who occasionally drop out from the survey, or for the individuals who change their household heads status in some years. These are followed until they switch their occupation or until they accumulate enough tenure in the current one to ensure that they could be considered experienced, and only then they are included in the experiments.

[16]The results are robust to our choice of 1000 hours cut-off.

[17]Equation A1 could also be estimated using a fixed effects panel data estimator.

where π_i is permanent wages which do not vary with t, and η_{it} is transitory wages, which do vary over time. Let N be the number of individuals ($i = 1, ..., N$), and T_i be the number of time periods individual i is in the sample. Let y_i be the mean of T_i values of y_{it} for individual i, and $\bar{y}$ be the mean of y_{it} over all individuals and all time periods. Let also $\bar{T}$ be the mean of T_i over i. The variance of transitory component of wages is computed as the average transitory variance across all individuals:

$$\sigma_\eta^2 = \frac{1}{N}\sum_{i=1}^{N}\frac{1}{(T_i-1)}\sum_{t=1}^{T_i}(y_{it}-y_i)^2.$$

The variance of the permanent component of wages is computed as:

$$\sigma_\pi^2 = \frac{1}{N-1}\sum_{i=1}^{N}(y_i-\bar{y})^2 - (\sigma_\eta^2/\bar{T}).$$

VI Computational Algorithm

1. Guess S and V^s.
2. Define a grid of points on (ψ_1, ψ_2, z).
3. Guess a function $V_1^0(\psi_1, \psi_2, z)$ which is (weakly) decreasing and (weakly) convex in ψ_1, a function $V_2^0(\psi_1, \psi_2, z)$ which is (weakly) decreasing and (weakly) convex in ψ_2, and a function $H^0(\psi_1, \psi_2, z)$ that is (weakly) increasing in ψ_1 and ψ_2.
4. For each point on the (ψ_1, ψ_2, z) grid, find the optimal policies g_1 and g_2 in the following way. Set $G = (\psi_1, \psi_2)$. Then,
   (a) If both $V_1(\psi_1, \psi_2, z) \geq V^s$ and $V_2(\psi_1, \psi_2, z) \geq V^s$, everybody present on the island will choose to stay and thus $g_1 = \psi_1$ and $g_2 = \psi_2$ is a consistent policy. Go to 5.
   (b) If the condition in a) is not satisfied, then
      i. Set $G = (\bar{g}_1, \psi_2)$, where $\bar{g}_1$ solves the following equation:

$$\begin{aligned} &z\gamma a\bar{g}_1{}^{\rho-1}\left[a\bar{g}_1{}^{\rho} + (1-a)\psi_2^{\rho}\right]^{\frac{\gamma-\rho}{\rho}} + \\ &\beta(1-p)\sum_{z'}V_1(\delta+(1-\delta)(S+(1-p)\bar{g}_1),(1-\delta)(p\bar{g}_1+\psi_2),z')Q(z,z') + \\ &\beta p\sum_{z'}V_2(\delta+(1-\delta)(S+(1-p)\bar{g}_1),(1-\delta)(p\bar{g}_1+\psi_2),z')Q(z,z') = V^s. \end{aligned}$$

      Check whether under this policy $V_2(\psi_1, \psi_2, z) \geq V^s$ and whether $\bar{g}_1$ is feasible. If not, then this G cannot be a consistent policy. If yes, then G is a candidate for the optimal policy.

ii. Set $G = (\psi_1, \bar{g}_2)$, where $\bar{g}_2$ solves the following equation:

$$
\begin{aligned}
&z\gamma(1-a)\bar{g}_2{}^{\rho-1}\left[a\psi_1^{\rho} + (1-a)\bar{g}_2{}^{\rho}\right]^{\frac{\gamma-\rho}{\rho}} \\
&+\beta \sum_{z'} V_2(\delta + (1-\delta)(S + (1-p)\psi_1), (1-\delta)(p\psi_1 + \bar{g}_2), z')Q(z, z') = V^s
\end{aligned}
$$

Check whether under this policy $V_1(\psi_1, \psi_2, z) \geq V^s$ and whether $\bar{g}_2$ is feasible. If not, then this G cannot be a consistent policy. If yes, then G is a candidate for the optimal policy.

iii. Set $G = (\bar{g}_1, \bar{g}_2)$ where $\bar{g}_1$ and $\bar{g}_2$ jointly solve the equations in *i* and *ii* above. Check whether $\bar{g}_1$ and $\bar{g}_2$ are feasible. If not, then this G cannot be a consistent policy. If yes, then G is a candidate for the optimal policy.

iv. The optimal policy is a candidate policy from the previous three cases which maximizes the value function $H(\psi_1, \psi_2, z)$[18], where

$$
H(\psi, z) = \max\left\{ z\left[ag_1^{\rho} + (1-a)g_2^{\rho}\right]^{\gamma/\rho} + \beta \sum_{z'} H(\psi', z')Q(z, z') \right\}
$$

5. Given the optimal policy $G = (g_1, g_2)$ obtained above update the value functions and get $V_1^1(\psi_1, \psi_2, z)$, $V_2^1(\psi_1, \psi_2, z)$, and $H^1(\psi_1, \psi_2, z)$.

6. Use the obtained above V_1, V_2, and H as the new guess in step 3.

7. Repeat steps 4 through 6 until convergence in the policy and value functions.

8. Simulate a large number of islands until the distribution of islands generates an invariant V^s and S, scaling at each iteration the economy to have measure one of individuals.

9. Compare the obtained V^s and S with the initial guess in 1. If they are the same, stop. If not, make a new guess in 1, that is a convex combination of the previous guess and the simulated values.

[18] This procedure chooses the equilibrium that maximizes the expected present discounted value of production on an island, or alternatively total wages and the returns to the (unobserved) fixed factor.

VII Three-Digit Occupational Codes

PROFESSIONAL, TECHNICAL, AND KINDRED WORKERS[19]

001 Accountants
002 Architects

Computer specialists

003 Computer programmers
004 Computer systems analysts
005 Computer specialists, not elsewhere classified

Engineers

006 Aeronautical and astronautical engineers
010 Chemical engineers
011 Civil engineers
012 Electrical and electronic engineers
013 Industrial engineers
014 Mechanical engineers
015 Metallurgical and materials engineers
020 Mining engineers
021 Petroleum engineers
022 Sales engineers
023 Engineers, not elsewhere classified
024 Farm management advisors
025 Foresters and conservationists
026 Home management advisors Lawyers and judges
030 Judges
031 Lawyers

Librarians, archivists, and curators

032 Librarians
033 Archivists and curators

Mathematical specialists

034 Actuaries
035 Mathematicians
036 Statisticians

Life and physical scientists

042 Agricultural scientists
043 Atmospheric and space scientists
044 Biological scientists
045 Chemists
051 Geologists
052 Marine scientists
053 Physicists and astronomers
054 Life and physical scientists, not elsewhere classified
055 Operations and systems researchers and analysts
056 Personnel and labor relations workers, Physicians, dentists, and related practitioners
061 Chiropractors
062 Dentists
063 Optometrists
064 Pharmacists
065 Physicians, medical and osteopathic
071 Podiatrists
072 Veterinarians
073 Health practitioners, not elsewhere classified

Nurses, dietitians, and therapists

074 Dietitians
075 Registered nurses
076 Therapists

Health technologists and technicians

080 Clinical laboratory technologists and technicians
081 Dental hygienists
082 Health record technologists and technicians
083 Radiologic technologists and technicians
084 Therapy assistants
085 Health technologists and technicians, not elsewhere classified

Religious workers

086 Clergymen
090 Religious workers, not elsewhere classified

Social scientists

091 Economists
092 Political scientists
093 Psychologists
094 Sociologists
095 Urban and regional planners
096 Social scientists, not elsewhere classified

Social and recreation workers

100 Social workers
101 Recreation workers

Teachers, college and university

102 Agriculture teachers
103 Atmospheric, earth, marine, and space teachers
104 Biology teachers
105 Chemistry teachers
110 Physics teachers
111 Engineering teachers
112 Mathematics teachers

[19]Source: PSID wave XIV - 1981 documentation, Appendix 2: Industry and Occupation Codes.

113 Health specialties teachers
114 Psychology teachers
115 Business and commerce teachers
116 Economics teachers
120 History teachers
121 Sociology teachers
122 Social science teachers, not elsewhere classified
123 Art, drama, and music teachers
124 Coaches and physical education teachers
125 Education teachers
126 English teachers
130 Foreign language teachers
131 Home economics teachers
132 Law teachers
133 Theology teachers
134 Trade, industrial, and technical teachers
135 Miscellaneous teachers, college and university
140 Teachers, college and university, subject not specified

Teachers, except college and university
141 Adult education teachers
142 Elementary school teachers
143 Prekindergarten and kindergarten teachers
144 Secondary school teachers
145 Teachers, except college and university, not elsewhere classified

Engineering and science technicians
150 Agriculture and biological technicians, except health
151 Chemical technicians
152 Draftsmen
153 Electrical and electronic engineering technicians
154 Industrial engineering technicians
155 Mechanical engineering technicians
156 Mathematical technicians
161 Surveyors
162 Engineering and science technicians, not elsewhere classified

Technicians, except health, and engineering and science
163 Airplane pilots
164 Air traffic controllers
165 Embalmers
170 Flight engineers
171 Radio operators
172 Tool programmers, numerical control
173 Technicians, not elsewhere classified
174 Vocational and educational counselors
Writers, artists, and entertainers
175 Actors
180 Athletes and kindred workers
181 Authors
182 Dancers
183 Designers
184 Editors and reporters
185 Musicians and composers
190 Painters and sculptors
191 Photographers
192 Public relations men and publicity writers
193 Radio and television announcers
194 Writers, artists, and entertainers, not elsewhere classified
195 Research workers, not specified

MANAGERS AND ADMINISTRATORS, EXCEPT FARM
201 Assessors, controllers, and treasurers; local public administration
202 Bank officers and financial managers
203 Buyers and shippers, farm products
205 Buyers, wholesale and retail trade
210 Credit men
211 Funeral directors
212 Health administrators
213 Construction inspectors, public administration
215 Inspectors, except construction, public administration
216 Managers and superintendents, building
220 Office managers, not elsewhere classified
221 Officers, pilots, and pursers; ship
222 Officials and administrators; public administration, not elsewhere classified
223 Officials of lodges, societies, and unions
224 Postmasters and mail superintendents
225 Purchasing agents and buyers, not elsewhere classified
226 Railroad conductors
230 Restaurant, cafeteria, and bar managers
231 Sales managers and department heads, retail trade
233 Sales managers, except retail trade
235 School administrators, college
240 School administrators, elementary and secondary
245 Managers and administrators, not elsewhere classified

SALES WORKERS
260 Advertising agents and salesmen
261 Auctioneers
262 Demonstrators
264 Hucksters and peddlers
265 Insurance agents, brokers, and underwriters
266 Newsboys
270 Real estate agents and brokers
271 Stock and bond salesmen
280 Salesmen and sales clerks, not elsewhere classified

Salesmen were divided into 5 categories dependent on industry. The industry codes are shown in parentheses.
281 Sales representatives, manufacturing industries (Ind. 107-399)
282 Sales representatives, wholesale trade (Ind. 017-058, 507-599)
283 Sales clerks, retail trade

(Ind. 608-699 except 618, 639, 649, 667, 668, 688)
284 Salesmen, retail trade
(Ind. 607, 618, 639, 649, 667, 668, 688)
285 Salesmen of services and construction
(Ind. 067-078, 407-499, 707-947)

CLERICAL AND KINDRED WORKERS
301 Bank tellers
303 Billing clerks
305 Bookkeepers
310 Cashiers
311 Clerical assistants, social welfare
312 Clerical supervisors, not elsewhere classified
313 Collectors, bill and account
314 Counter clerks, except food
315 Dispatchers and starters, vehicle
320 Enumerators and interviewers
321 Estimators and investigators, not elsewhere classified
323 Expediters and production controllers
325 File clerks
326 Insurance adjusters, examiners, and investigators
330 Library attendants and assistants
331 Mail carriers, post office
332 Mail handlers, except post office
333 Messengers and office boys
334 Meter readers, utilities

Office machine operators
341 Bookkeeping and billing machine operators
342 Calculating machine operators
343 Computer and peripheral equipment operators
344 Duplicating machine operators
345 Key punch operators
350 Tabulating machine operators
355 Office machine operators, not elsewhere classified
360 Payroll and timekeeping clerks
361 Postal clerks
362 Proofreaders
363 Real estate appraisers
364 Receptionists

Secretaries
370 Secretaries, legal
371 Secretaries, medical
372 Secretaries, not elsewhere classified
374 Shipping and receiving clerks
375 Statistical clerks
376 Stenographers
381 Stock clerks and storekeepers
382 Teacher aides, except school monitors
383 Telegraph messengers
384 Telegraph operators
385 Telephone operators
390 Ticket, station, and express agents
391 Typists
392 Weighers
394 Miscellaneous clerical workers
395 Not specified clerical workers

CRAFTSMEN AND KINDRED WORKERS
401 Automobile accessories installers
402 Bakers
403 Blacksmiths
404 Boilermakers
405 Bookbinders
410 Brickmasons and stonemasons
411 Brickmasons and stonemasons, apprentices
412 Bulldozer operators
413 Cabinetmakers
415 Carpenters
416 Carpenter apprentices
420 Carpet installers
421 Cement and concrete finishers
422 Compositors and typesetters
423 Printing trades apprentices, except pressmen
424 Cranemen, derrickmen, and hoistmen
425 Decorators and window dressers
426 Dental laboratory technicians
430 Electricians
431 Electrician apprentices
433 Electric power linemen and cablemen
434 Electrotypers and stereotypers
435 Engravers, except photoengravers
436 Excavating, grading, and road machine operators, except bulldozer
440 Floor layers, except tile setters
441 Foremen, not elsewhere classified
442 Forgemen and hammermen
443 Furniture and wood finishers
444 Furriers
445 Glaziers
446 Heat treaters, annealers, and temperers
450 Inspectors, scalers, and graders; log and lumber 452 Inspectors, not elsewhere classified
453 Jewelers and watchmakers
454 Job and die setters, metal
455 Locomotive engineers
456 Locomotive firemen
461 Machinists
462 Machinist apprentices

Mechanics and repairmen
470 Air conditioning, heating, and refrigeration
471 Aircraft
472 Automobile body repairmen
473 Automobile mechanics
474 Automobile mechanic apprentices
475 Data processing machine repairmen
480 Farm implement
481 Heavy equipment mechanics, including diesel
482 Household appliance and accessory installers and mechanics
483 Loom fixers
484 Office machine
485 Radio and television

486 Railroad and car shop
491 Mechanic, except auto, apprentices
492 Miscellaneous mechanics and repairmen
495 Not specified mechanics and repairmen
501 Millers; grain, flour, and feed
502 Millwrights
503 Molders, metal
504 Molder apprentices
505 Motion picture protectionists
506 Opticians, and lens grinders and polishers
510 Painters, construction and maintenance
511 Painter apprentices
512 Paperhangers
514 Pattern and model makers, except paper
515 Photoengravers and lithographers
516 Piano and organ tuners and repairmen
520 Plasterers
521 Plasterer apprentices
522 Plumbers and pipe fitters
523 Plumber and pipe fitter apprentices
525 Power station operators
530 Pressmen and plate printers, printing
531 Pressman apprentices
533 Rollers and finishers, metal
534 Roofers and slaters
535 Sheetmetal workers and tinsmiths
536 Sheetmetal apprentices
540 Shipfitters
542 Shoe repairmen
543 Sign painters and letterers
545 Stationary engineers
546 Stone cutters and stone carvers
550 Structural metal craftsmen
551 Tailors
552 Telephone installers and repairmen
554 Telephone linemen and splicers
560 Tile setters
561 Tool and die makers
562 Tool and die maker apprentices
563 Upholsterers
571 Specified craft apprentices, not elsewhere classified
572 Not specified apprentices
575 Craftsmen and kindred workers, not elsewhere classified

ARMED FORCES

600 Members of armed forces

OPERATIVES, EXCEPT TRANSPORT

601 Asbestos and insulation workers
602 Assemblers
603 Blasters and powdermen
604 Bottling and canning operatives
605 Chainmen, rodmen, and axmen; surveying
610 Checkers, examiners, and inspectors; manufacturing
611 Clothing ironers and pressers
612 Cutting operatives, not elsewhere classified
613 Dressmakers and seamstresses, except factory
614 Drillers, earth
615 Dry wall installers and lathers
620 Dyers
621 Filers, polishers, sanders, and buffers
622 Furnacemen, smeltermen, and pourers
623 Garage workers and gas station attendants
624 Graders and sorters, manufacturing
625 Produce graders and packers, except factory and farm
626 Heaters, metal
630 Laundry and dry cleaning operatives, not elsewhere classified
631 Meat cutters and butchers, except manufacturing
633 Meat cutters and butchers, manufacturing
634 Meat wrappers, retail trade
635 Metal platers
636 Milliners
640 Mine operatives, not elsewhere classified
641 Mixing operatives
642 Oilers and greasers, except auto
643 Packers and wrappers,except meat and produce
644 Painters, manufactured articles
645 Photographic process workers

Precision machine operatives

650 Drill press operatives
651 Grinding machine operatives
652 Lathe and milling machine operatives
653 Precision machine operatives, not elsewhere classified
656 Punch and stamping press operatives
660 Riveters and fasteners
661 Sailors and deckhands
662 Sawyers
663 Sewers and stitchers
664 Shoemaking machine operatives
665 Solderers
666 Stationary firemen

Textile operatives

670 Carding, lapping, and combing operatives
671 Knitters, loopers, and toppers
672 Spinners, twisters, and winders
673 Weavers
674 Textile operatives, not elsewhere classified
680 Welders and flame-cutters
681 Winding operatives, not elsewhere classified
690 Machine operatives, miscellaneous specified
692 Machine operatives, not specified
694 Miscellaneous operatives
695 Not specified operatives

TRANSPORT EQUIPMENT OPERATIVES
701 Boatmen and canalmen
703 Bus drivers
704 Conductors and motormen, urban rail transit
705 Deliverymen and routemen
706 Fork lift and tow motor operatives
710 Motormen; mine, factory, logging camp, etc.
711 Parking attendants
712 Railroad brakemen
713 Railroad switchmen
714 Taxicab drivers and chauffeurs
715 Truck drivers

LABORERS, EXCEPT FARM
740 Animal caretakers, except farm
750 Carpenters' helpers
751 Construction laborers, except carpenters' helpers
752 Fishermen and oysterman
753 Freight and material handlers
754 Garbage collectors
755 Gardeners and groundskeepers, except farm
760 Longshoremen and stevedores
761 Lumbermen, raftsmen, and woodchoppers
762 Stock handlers
763 Teamsters
764 Vehicle washers and equipment cleaners
770 Warehousemen, not elsewhere classified
780 Miscellaneous laborers
785 Not specified laborers

FARMERS AND FARM MANAGERS
801 Farmers (owners and tenants)
802 Farm managers

FARM LABORERS AND FARM FOREMEN
821 Farm foremen
822 Farm laborers, wage workers
823 Farm laborers, unpaid family workers
824 Farm service laborers, self-employed

SERVICE WORKERS, EXCEPT PRIVATE HOUSEHOLD
Cleaning service workers
901 Chambermaids and maids, except private household
902 Cleaners and charwomen
903 Janitors and sextons

Food service workers
910 Bartenders
911 Busboys
912 Cooks, except private household
913 Dishwashers
914 Food counter and fountain workers
915 Waiters
916 Food service workers, not elsewhere classified, except private household

Health service workers
921 Dental assistants
922 Health aides, except nursing
923 Health trainees
924 Lay midwives
925 Nursing aides, orderlies, and attendants
926 Practical nurses

Personal service workers
931 Airline stewardesses
932 Attendants, recreation and amusement
933 Attendants, personal service, not elsewhere classified
934 Baggage porters and bellhops
935 Barbers
940 Boarding and lodging house keepers
941 Bootblacks
942 Child care workers, except private household
943 Elevator operators
944 Hairdressers and cosmetologists
945 Personal service apprentices
950 Housekeepers, except private household
952 School monitors
953 Ushers, recreation and amusement
954 Welfare service aides

Protective service workers
960 Crossing guards and bridge tenders
961 Firemen, fire protection
962 Guards and watchmen
963 Marshals and constables
964 Policemen and detectives
965 Sheriffs and bailiffs

PRIVATE HOUSEHOLD WORKERS
980 Child care workers, private household
981 Cooks, private household
982 Housekeepers, private household
983 Laundresses, private household
984 Maids and servants, private household

VIII Two-Digit Occupational Codes

PROFESSIONAL, TECHNICAL
AND KINDRED WORKERS (001-195)[20]

10. Physicians (medical + osteopathic), Dentists (062,065)
11. Other Medical and Paramedical: chiropractors, optometrists, pharmacists, veterinarians, nurses, therapists, healers, dieticians (except medical and dental technicians, see 16) (061,063,064,071-076)
12. Accountants and Auditors (001)
13. Teachers, Primary and Secondary Schools (including NA type) (141-145)
14. Teachers, College; Social Scientists; Librarians; Archivists (032-036,091-096,102-140)
15. Architects; Chemists; Engineers; Physical and Biological Scientists (002,006-023,042-054)
16. Technicians: Airplane pilots and navigators, designers, draftsmen, foresters and conservationists, embalmers, photographers, radio operators, surveyors, technicians (medical, dental, testing, n.e.c.) (003-005,025,055,080-085,150-173,183,191)
17. Public Advisors: Clergymen, editors and reporters, farm and home management advisors, personnel and labor relations workers, public relations persons, publicity workers, religious, social and welfare workers (024,026,056,086,090,100-101,184,192)
18. Judges; Lawyers (030,031)
19. Professional, technical and kindred workers not listed above (174,175-182,185,190,193-195)

MANAGERS, OFFICIALS AND PROPRIETORS
(EXCEPT FARM) (201-245)

20. Not self-employed
31. Self-employed (unincorporated businesses)

CLERICAL AND KINDRED WORKERS

40. Secretaries, stenographers, typists (370-372,376,391)
41. Other Clerical Workers: agents (n.e.c.) library assistants and attendants, bank tellers, cashiers, bill collectors, ticket, station and express agents, etc., receptionists (301-364,374-375,381-390, 392-395)

SALES WORKERS

45. Retail store salesmen and sales clerks, newsboys, hucksters, peddlers, traveling salesmen, advertising agents and sales- men, insurance agents, brokers, and salesmen, etc. (260-285)

CRAFTSMEN, FOREMEN,
AND KINDRED WORKERS

50. Foremen, n.e.c. (441)
51. Other craftsmen and kindred workers (401-440,442-580)
52. Government protective service workers: firemen, police, marshals, and constables (960-965)

OPERATIVES AND KINDRED WORKERS

61. Transport equipment operatives (701-715)
62. Operatives, except transport (601-695)

LABORERS

70. Unskilled laborers–nonfarm (740-785)
71. Farm laborers and foremen (821-824)

SERVICE WORKERS

73. Private household workers (980-984)
75. Other service workers: barbers, beauticians, manicurists, bartenders, boarding and lodging housekeepers, counter and fountain workers, housekeepers and stewards, waiters, cooks, midwives, practical nurses, babysitters, attendants in physicians' and dentists' offices (901-965 except 960-965 when work for local, state, or federal government)

FARMERS AND FARM MANAGERS

80. Farmers (owners and tenants) and managers (except code 71) (801-802)

MISCELLANEOUS GROUPS

55. Members of armed forces
99. NA; DK
00. Inap.; No to C42; unemployed; retired, permanently disabled, housewife, student; V7706=3-8; V7744=5 or 9

[20] Numbers in parentheses represent the 3-digit codes from the 1970 Census of Population.

IX One-Digit Occupational Codes

01. Professional, technical, and kindred workers (10-19)[21]
02. Managers, officials, and proprietors (20)
03. Self-employed businessmen (31)
04. Clerical and sales workers (40-45)
05. Craftsmen, foremen, and kindred workers (50-52)
06. Operatives and kindred workers (61-62)
07. Laborers and service workers, farm laborers (70-75)
08. Farmers and farm managers (80)
09. Miscellaneous (armed services, protective workers) (55)

[21] Numbers in parentheses represent 2-digit occupation codes, recoded by the authors based on PSID documentation.