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GOOD JOBS VERSUS BAD JOBS: THEORY AND SOME EVIDENCE

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ABSTRACT

Good Jobs versus Bad Jobs: Theory and Some Evidence*

This paper offers a model of the interaction between composition of jobs and labour market regulation. *Ex-post* rent-sharing due to search frictions implies that 'good' jobs which have higher creation costs must pay higher wages. This wage differential distorts the composition of jobs, and in the unregulated equilibrium there are too many bad jobs relative to the number of good jobs. Minimum wages and unemployment insurance encourage workers to wait for higher wages, and therefore induce firms to shift the composition of employment towards good jobs. As a result, such regulations, even though they will often increase unemployment, will increase average labour productivity and may improve welfare. The paper then briefly investigates the empirical importance of this interaction using data from the United States. The results suggest that the composition of jobs improves considerably in response to higher minimum wages and more generous unemployment benefits.

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NON-TECHNICAL SUMMARY

In market economies identical workers appear to receive widely different wages. These wage differentials cannot be easily explained by unobserved worker heterogeneity; workers who change jobs experience the wage differential between their previous and new job. Moreover, workers are not indifferent between different jobs: high wage paying jobs have lower quits, and more strikingly, workers queue up for these jobs. Thus, empirical evidence supports the common impression that there are *good jobs* and *bad jobs*, and whether a worker ends up with a good/high-wage job appears to be partly a matter of luck. Given the widely different incomes that identical workers receive, it is therefore an important policy question whether the *composition of jobs* is inefficiently biased towards bad jobs. This concern may have become more significant over the past fifteen years as many high-wage manufacturing jobs are destroyed in the United States and replaced by lower-pay service jobs.

This paper offers a theory which explains why good and bad jobs exist. The main ingredient of the theory is the plausible assumption that workers have to search for jobs, and wages are determined by some rent-sharing arrangement. Different industries and occupations use different capital equipment. Those jobs which require more expensive investments, i.e. those which cost more *to create*, will have to generate more rents *ex post* to cover their expenses. Rent-sharing then implies that workers employed in these jobs will be able to obtain higher wages. In this economy good jobs will thus be those which cost more to create. Workers will search for jobs aware of the presence of wage dispersion, but will accept bad as well as good jobs if the wage differential is not too large.

An immediate implication of this theory concerns the efficiency of job composition. Because firms opening good jobs do not take into account the higher rents (thus higher utility), they provide their workers with, there will be too few good jobs and too many bad jobs. In other words, the composition of jobs will be inefficiently biased towards bad jobs.

Labour market policies will have very different implications in this world compared to a standard model with exogenous job composition. Higher unemployment benefits will encourage workers to wait longer for good jobs, and will thus force bad jobs to pay higher wages to attract workers. As a result, the composition of jobs will improve in response to higher unemployment benefits. Minimum wages will work similarly: because they force bad jobs to

pay higher wages, they will reduce their profitability, thus increasing the proportion of good jobs. These comparative static results therefore suggest that a more regulated labour market with higher unemployment benefits and minimum wages, like Europe, even with higher unemployment, may have higher output and welfare compared to a less regulated labour market, like the United States. The main difference between the standard models is that higher wages not only increase unemployment, but also improve the composition of jobs, and thus labour productivity. This difference is responsible for the radically different predictions of this theory.

How plausible is all this? To answer this question I turn to an empirical investigation of the mechanism proposed in this paper. I study the composition of jobs across US states over an eleven-year period. I classify jobs into good, bad and very bad according to the occupations. I decide which occupations are bad and very bad, by running a big wage regression with all the usual controls and occupation dummies. Those with large negative dummies are bad (and very bad) occupations. I then calculate the fraction of workers who are in the labour-force and are in good, bad and very bad occupations. I run panel data regressions with state-level job composition as the dependent variable. The independent variables are measures of unemployment benefit generosity and state-level minimum wages. There is significant across-state and across-time variability in both of these variables, and the minimum wage variable is at least partly exogenous to the economic situations of the states. The largest increase came in 1991 through a federal minimum wage hike and before this hike, different states had different minimum wages.

The results are very encouraging for my theory. Higher minimum wages and more generous unemployment benefits increase the number of good jobs, and reduce the number of bad and very bad jobs. In response to minimum wages, the increase in the number of good jobs is so large that there is no increase in unemployment. In response to more generous unemployment insurance there is increased unemployment, but this is partly due to increased labour-force participation. Overall, the empirical results suggest that labour market regulations have an important impact on the composition of jobs, and this impact should be taken into consideration in discussions of labour market policy and reform.

1. Introduction

One of the most striking and robust stylized facts of labor markets is the presence of persistent and large wage differentials among identical workers in different industries and occupations. These differentials are not only remarkably stable over time but also highly correlated across countries (see Krueger and Summers, 1987). Neither can these wage differentials be easily explained by unobserved worker heterogeneity; workers who change jobs experience the wage differential between their previous and new job (Krueger and Summers, 1988, Gibbons and Katz, 1992). Furthermore, workers are not indifferent between different jobs: high wage paying jobs have lower quits (Krueger and Summers, 1988), and more strikingly, workers queue up for high wage jobs (Holzer, Katz and Krueger, 1991). Casual empiricism also suggests that the proportion of 'good' (i.e. high wage) jobs for workers without college degrees may have declined in the U.S. economy from early 1970s to the 1980s.[1] During this period, the real wages of unskilled workers fell by as much as 30% (e.g. Freeman, 1995), and high wage manufacturing jobs which used to hire non-college graduates have declined in numbers and raised their skill requirements substantially (see Levy and Murnane, 1995). An eye-balling comparison of the U.S. and Europe also reveals significant differences. The proportion of low pay appears higher in the U.S. but unemployment considerably lower. Also, over the past two decades, labor productivity has increased much faster in Europe than the U.S (see for instance, OECD, 1994). These observations invite the following questions: What determines the composition of jobs? Is it optimal? Why does it change over time? Why do some labor markets have more bad jobs than others?

This paper presents a theory in which the composition of jobs is always suboptimal, and there are too many low wage/bad jobs. In the model economy, minimum wages and unemployment insurance are among the key determinants of the composition of employment. In particular, higher minimum wages and more generous benefits, as well as their usual impact on unemployment, will improve job composition and may also improve welfare.

To expose the main ideas I use a search framework which is a natural tool to model a situation in which identical workers can end-up in different jobs with very different compensation patterns. I first show that if different types of jobs

[1] See Bluestone and Harrison, 1986 on this view, and Dickens and Lang, 1987, for a critique.

have different *creation (capital) costs*, then those which cost more to create will have to pay higher wages due to rent-sharing; therefore, there will naturally exist good and bad jobs in this economy.[2] Second, I establish that in an unregulated market, the composition of jobs is inefficiently biased towards bad jobs. The reason for this inefficiency is that good jobs cost more to create but firms do not necessarily receive the full marginal product of their investments because with higher productivity, they also have to pay higher wages.

To see how labor market regulations work, first consider an unregulated labor market where despite the fact that good jobs cost more, it is socially efficient to open a large number of good jobs. Due to ex post rent-sharing, good jobs will be forced to pay higher wages, and firms will only open a few because they make higher profits from bad/low wage jobs. Now suppose that unemployment benefits increase. Then a number of workers who were previously accepting bad jobs will prefer to wait for good jobs to arrive (since waiting has become less costly). This change in search behavior induces more good jobs to be created. However, this substitution away from bad to good jobs is only part of the story. There is also an indirect –general equilibrium– effect: as more good jobs are created, the value of being unemployed increases because workers anticipate a higher probability of getting a high wage/good job, and they become even less willing to accept bad jobs.

The minimum wage has the same overall effect but works somewhat differently. Recall that the reason why bad jobs are profitable is that they can pay low wages whereas good jobs, due to rent-sharing, are forced to pay high wages. A binding minimum wage increases the wage that bad jobs have to pay, therefore it makes them less profitable and increases the proportion of good jobs.

The theoretical section of the paper also establishes the possibility of multiple equilibria which again demonstrates the strength of the general equilibrium forces at work. In an equilibrium with a high proportion of good jobs, the value of being unemployed is high, therefore bad jobs cannot attract workers unless they pay unprofitably high wages, and as a consequence, most firms create good jobs. Conversely, when there are many bad jobs, the value of unemployment is low, thus workers are willing to take bad jobs and in equilibrium, there is only a low proportion of good jobs.

If the theoretical forces which appear powerful in the model are indeed strong in practice, the conventional wisdom regarding the impact of unemployment ben-

[2] Dickens and Katz (1987) document evidence indicating that industries which pay higher wages have higher R&D and capital per worker, and higher profits.

efits and minimum wages would need to be somehow reevaluated. It is often argued that the high levels of unemployment in Europe are mainly caused by labor market regulations in these countries (e.g. Layard et al, 1991, OECD, 1994 or Phelps, 1995). If the mechanism suggested in this paper is empirically important, a crucial trade-off may exist (as suggested by the comparison of European and American unemployment and growth of labor productivity numbers over the past two decades): on the one hand, the society may choose high employment but also, a high proportion of low pay jobs and low labor productivity; on the other, it may opt for an equilibrium with more good jobs, high productivity but also higher unemployment.

In order to get a sense of the extent of these forces, in the second part of the paper I turn to an empirical investigation of these effects. Two important challenges confront such an investigation: how to define good versus bad jobs? And how to isolate the impact of unemployment benefits and minimum wages? To deal with the latter issue, I use a panel of fifty U.S. states from 1983 to 1993 as separate labor markets and use the variation in minimum wage and unemployment insurance legislation across states and years to identify their effects.

To determine which jobs are 'good', I use the Current Population Survey to run individual wage regressions with occupation and industry dummies as well as all the standard variables and state and year dummies. Using the values that these occupation dummies take in the wage regression, I classify jobs into *very bad*, *bad* and *good*. Approximately 10% of all employees with less than a college degree are in very bad jobs, 34% are in bad jobs. Very bad jobs have average hourly wages close to the minimum wage and include household and private services, servants and farm workers. Mean wages and the value of the occupation dummies are considerably higher in bad jobs than the very bad group, and include, among others, the occupations of cashiers, food service workers, record clerks, sales workers, communication operators, textile workers and laborers (see Table 3 for details). Using these definitions, I construct the proportion of very bad, bad and good jobs in the labor force in every state and year. I then run a number of regressions with these proportions as dependent variables and replacement ratios and minimum wages as well as a set of controls as regressors. The results are interesting. Higher replacement ratios and minimum wages significantly reduce the number of bad jobs, and increase the *number* of good jobs. I also find that labor productivity in a state increases with higher minimum wages and more generous unemployment benefits. Overall, though it may be possible to find different explanations for these empirical findings (see discussion in section 4), the results suggest that in the U.S. the impact of higher unemployment benefits and minimum wages may be to increase unemployment somewhat but also to improve the composition of jobs substantially.

The papers most closely related to this work are Acemoglu (1996a,b), Davis (1995) and Marimon and Zilibotti (1996). Acemoglu (1996a) and Davis (1995) also analyze a search model with an endogenous distribution of jobs. Both papers obtain the result, shared by this paper, that the investments of firms will be suboptimal. However, none of these papers discuss the impact of labor market regulation on the composition of jobs which is the main focus of this paper. Marimon and Zilibotti (1996) construct a search model to analyze the impact of unemployment benefit on the allocation of workers to jobs according to comparative advantage. They show that higher unemployment benefits may increase match quality by encouraging workers to wait, which is somehow similar to the effect of unemployment benefits derived here, but the general equilibrium interactions emphasized in this paper are absent as there are no quality differences between jobs. Also, the key result of this paper that there will be too few good jobs has a similar intuition to Grout (1984) who pointed out that in the presence of rent-sharing, there will be inefficiently low investment. In this paper firms do not invest directly but choose the type of the jobs to open, and good jobs which have larger creation costs suffer more from this effect than bad jobs. Finally, Diamond (1981) also makes the point that in a search equilibrium an increase in unemployment benefit may improve welfare by inducing workers to wait for better jobs. However, in Diamond's model there is only ex post heterogeneity and the efficiency results are driven by the fact that when the number of unemployed and vacancies increase, average match quality increases, therefore, increasing returns to scale in the matching function which is absent in this paper is the key to Diamond (1981)'s result.

The plan of the paper is as follows. Next section offers a theoretical model which formalizes the equilibrium determination of job composition and exposes the link between labor market regulation and the mix of jobs. Section 3 briefly discusses alternative models that can be used to formalize the same effects. Section 4 conducts the empirical analysis and discusses alternative interpretations. Section 5 concludes. Appendix A contains an example of multiplicity. Appendix B analyzes transitional dynamics, and Appendix C gives the details of the data sources and variable definitions.

2. Theory

2.1. Technology and Preferences

There are three produced commodities. Labor and capital are used to produce two non-storable intermediate goods which are then sold in a competitive market and immediately transformed into the final consumption good of this economy. Preferences of all agents are defined over the final consumption good alone. Throughout the paper, I will normalize the price of the final good to 1.

There is a continuum of identical workers with measure normalized to 1. All workers are infinitely lived and risk-neutral.[3] They derive utility from the consumption of the unique final good and maximize the present discounted value of their utility. Time is continuous and the discount rate of workers is equal to r. On the other side of the market, there is a larger continuum of firms which are also risk-neutral with discount rate r.

The technology of production for the final good is:

$$Y = AY_g^{\alpha}Y_b^{1-\alpha} \tag{2.1}$$

where Y_g is the aggregate production of the first input, and Y_b is the aggregate production of the second input. The reason for the use of the subscripts g and b will become clear later. This formulation captures the idea that, there is some need for diversity in overall consumption/production.[4]

Since good and bad inputs are sold in competitive markets, their prices are:

$$p_g = \alpha A\left[\frac{Y_b}{Y_g}\right]^{1-\alpha} \quad \text{and} \quad p_b = (1-\alpha)A\left[\frac{Y_g}{Y_b}\right]^{\alpha}$$

The technology of production for the inputs is Leontieff. One worker and one firm with an equipment (capital) that costs k_g will produce 1 unit of the first input, and one worker with a firm with the equipment that costs k_b will produce 1 unit of the second input.[5] Throughout the paper, I assume that $k_g > k_b$.

Before we move to the search economy, it is useful to consider the perfectly competitive economy. In this case, all workers will sell their labor services at some

[3]The assumption that workers are risk-neutral obviously leaves out the most important role of unemployment insurance, but it also helps to highlight that the impact of unemployment benefits on job composition is distinct from their insurance role.

[4]It is also equivalent to assuming that (2.1) is the utility function defined over the two goods.

[5]Since utility is linear whether we think of k_b and k_g as capital costs or not is immaterial.

wage w. Since capital costs are higher in the production of one of the inputs, that is $k_g > k_b$, in equilibrium, we will have $p_g > p_b$. But firms irrespective of their sector will hire workers at the same wage, w. Thus, there will be neither wage differences nor bad nor good jobs.

2.2. Search: The Main Idea

Before I move to a detailed analysis of this economy, I can heuristically describe the main result. As soon as we enter the world of search, there will be some rent-sharing.[6] This implies that a worker who produces a higher valued output will receive a higher wage. As above, because $k_g > k_b$, the input which costs more to produce will cost more, thus in equilibrium $p_g > p_b$. Then from rent-sharing, there will be wage differentials across identical workers: $w_g > w_b$, that is workers in the production of input 1 will receive higher wages than those producing input 2. Hence the terms *good* and *bad* jobs. Identical workers will receive different wages because the goods they produce sell at different prices due to different non-labor costs. Next, it is intuitive that since good jobs are facing higher labor costs than bad jobs (as compared to the economy with competitive labor markets), their relative production will be less than optimal. In other words, the proportion of good (high-wage) jobs will be too low compared to what a social planner would choose.

The rest of this section will formally analyze the search economy and establish these claims.

2.3. The Technology of Search

Firms and workers come together via a matching technology $M(u, v)$ where u is the unemployment rate, and v is the vacancy rate (the number of vacancies) (see Diamond, 1982, Mortensen, 1982 and Pissarides, 1990 for this basic framework). The underlying assumption here is that both types of vacancies have the same probability of meeting workers, thus it is the total number of vacancies that enters the matching function. $M(u, v)$ is twice differentiable and increasing in its arguments and exhibits constant returns to scale. This enables me to write the flow rate of match for a vacancy as $\frac{M(u,v)}{v} = q(\theta)$ where $q(.)$ is a differentiable decreasing function and $\theta = \frac{v}{u}$ is the tightness of the labor market. It also immediately

[6] This is true even if there is no actual bargaining. See Acemoglu and Shimer (1996) for a discussion of rent-sharing with wage posting.

follows from the constant returns to scale assumption that the flow rate of match for an unemployed worker is $\frac{M(u,v)}{u} = \theta q(\theta)$. I also make the standard assumptions on $M(u, v)$ which ensure that $\theta q(\theta)$ is increasing in θ, and that $\lim_{\theta \to \infty} q(\theta) = 0$, $\lim_{\theta \to 0} q(\theta) = \infty$, $\lim_{\theta \to \infty} q(\theta)\theta = 0$ and $\lim_{\theta \to 0} q(\theta)\theta = \infty$.

Finally, I assume that all jobs come to an end at the exogenous rate s, and that there is free entry into both good and bad job vacancies, therefore both types of vacancies should expect zero profit.

Next, I denote the flow return from unemployment by z which will be thought as the level of unemployment benefit.[7] I assume that wages are determined by bargaining a la Rubinstein-Shaked-Sutton whereby $w = \min\{y - \bar{\pi}, \max(\beta y, \bar{w})\}$ where y is the value of output produced, $\bar{w}$ is the outside option of the worker and $\bar{\pi}$ is the outside option of the firm. In other words, wages are equal to a constant proportion of output unless the outside option of one of the parties binds. When a party would do better by not taking part in the employment relation, i.e. when his (its) outside option binds, he (it) receives the outside option, and the other party gets the rest of output.[8] The important feature is the presence of some bargaining in wage determination so that the rents created by jobs are *shared* with the workers.

Firms can choose either one of two types of vacancies: *(i)* a vacancy for a intermediate good 1 - a *good job*; *(ii)* a vacancy for an intermediate good 2 - *a bad job*. Therefore, before opening the vacancy a firm has to decide which input it will produce, and at this point, it will have to incur the *creation* cost, k_b or k_g. Throughout this section I assume that these costs have to be incurred when the firm opens the vacancy and are not recovered thereafter. This is a reasonable assumption since k corresponds in reality to the costs of machinery (which are sector and occupation specific), and investments in know-how (see section 3 for alternative assumption). Also, as commented above, both types of vacancies face the same probability of meeting a worker, and produce a flow of 1 unit of their respective goods if filled. Therefore, to reiterate the main point: the only

[7] Naturally, unemployment insurance and assistance in the real world do not take this simple form (see for instance, Atkinson and Micklewright, 1991). First, benefits depend upon past employment history and earnings; second, there is a time limit; and third, there are additional eligibility requirements. Including these complications will not change the main qualitative implications of the analysis (see Mortensen, 1977, for a detailed analysis of the impact of unemployment insurance on search decisions).

[8] Also it can be argued that this wage bargaining rule has better microfoundations than Nash bargaining. See Binmore, Rubinstein and Wolinsky (1985), Acemoglu (1996a) Appendix A, or Costain (1996).

difference between these two jobs is that the first good has higher *creation* costs than the second.

2.4. The Basic Bellman Equations

I will solve the model via a series of Bellman equations. I denote the discounted value of a vacancy by J^V, of a filled job by J^F, of being unemployed by J^U and of being employed by J^E. I will use subscripts b and g to denote good and bad jobs. I also denote the proportion of bad job vacancies among all vacancies by ϕ. Then:

$$rJ^U - \dot{J}^U = z + \theta q(\theta) \left[\phi J_b^E + (1-\phi) J_g^E - J^U\right] \tag{2.2}$$

Since this type of equation is rather standard (e.g. Pissarides, 1990), I will only give a brief explanation. Being unemployed is similar to holding an asset; this asset pays a dividend of z, the unemployment benefit, and has a probability $\theta q(\theta)\phi$ of being transformed into a *bad* job in which case, the worker obtains J_b^E, the asset value of being employed in a bad job, and loses J^U; it also has a probability $\theta q(\theta)(1-\phi)$ of being transformed into a good job. Finally, during the short instant that the worker is holding this asset, it can appreciate or depreciate in value (basically because some of these variables like θ or ϕ will be different in the future), and hence the term $\dot{J}^U$.

Note that this equation is written under the implicit assumption that workers will not turn down jobs. If p_b were sufficiently small relative to p_g, workers would not take bad jobs. However, in this case, from the optimization of firms, there would be no bad jobs, i.e. $Y_b = 0$, and the price of their output, p_b, will be infinite. Thus this additional qualification is ignored.[9]

Next, the firm's outside option will never be binding because it is equal to zero from the free-entry condition ($J_i^V = 0$). Also, the worker's outside option is simply rJ^U. Then equilibrium wages are determined as:

$$w_i = \max\{\beta p_i, rJ^U\} \tag{2.3}$$

[9] There is another possibility: if $rJ^U = \beta p_b$, then workers may accept these jobs with some probability $\zeta < 1$. However, such an allocation cannot be a stable equilibrium: if a small measure of bad jobs close their vacancies, this would imply a lower Y_b, and thus p_b would increase and all workers would accept these jobs with probability 1. Since I am only interested in stable equilibria, I ignore this possibility.

In other words, the worker gets a proportion β of the return of the job, p_i, unless βp_i happens to be less than his outside option rJ^U. Then, the discounted present value of employment can be written as:

$$rJ_i^E - \dot{J}_i^E = \max\left\{rJ^U, \beta p_i\right\} + s(J^U - J_i^E) \tag{2.4}$$

for $i = b, g$. (2.4) has a similar intuition to J^U, thus I omit the explanation.

Finally, since, when matched, both vacancies produce 1 unit of their goods, we also have for $i = b, g$[10]:

$$rJ_i^F - \dot{J}_i^F = p_i - \max\left\{rJ^U, \beta p_i\right\} + s(J_i^V - J_i^F) \tag{2.5}$$

$$rJ_i^V - \dot{J}_i^V = -\gamma_i + q(\theta)\left[J_i^F - J_i^V\right] = 0 \tag{2.6}$$

where the last equality that $J_i^V = 0$ is from the free-entry condition.

Because both types of vacancies meet workers at the same rate, and in equilibrium a worker will accept both types of jobs, we have $\frac{Y_b}{Y_g} = \frac{\phi}{1-\phi}$. Thus, we can determine the product prices (and the value of production) of the two inputs as

$$p_g = \alpha A\left[\frac{\phi}{1-\phi}\right]^{1-\alpha} \quad \text{and} \quad p_b = (1-\alpha)A\left[\frac{1-\phi}{\phi}\right]^{\alpha} \tag{2.7}$$

Finally, the evolution of the unemployment rate is given by:

$$\dot{u} = s(1-u) - \theta q(\theta)u. \tag{2.8}$$

In words, the change in unemployment is equal to the flow of workers into unemployment (due to destroyed jobs) minus the creation of new employment relations.

2.5. Characterization of Steady State Equilibria

A steady state equilibrium is defined as a proportion ϕ of bad jobs, tightness of the labor market θ, outside option of workers J^U, prices for the two goods, p_b and p_g such that equations (2.2), (2.4), (2.5), (2.6) and (2.7) are satisfied with $\dot{J}^U = \dot{J}_i^E = \dot{J}_i^F = 0$. Then wages are given by (2.3) and the unemployment rate by (2.8) with $\dot{u}$ set equal to 0.

[10] In writing (2.4) and (2.5), I have ignored the possibility of a job being destoryed voluntarily. It is straightforward to check that this will not happen in equilibrium.

Proposition 1. *A steady state equilibrium always exists and is characterized by (2.2), (2.4), (2.5), (2.6) and (2.7). In equilibrium, for all $k_g > k_b$, we have $p_g > p_b$ and $w_g > w_b$.*

The rest of this section will prove this proposition, and in the process, will derive some useful equations for the analysis later. From now on, I set all time derivatives equal to zero in this section. Let me first multiply the equation for J_b^E by ϕ and the equation for J_g^E by $(1-\phi)$, then add these two together and subtract (2.2). This gives:

$$\phi J_b^E + (1-\phi)J_g^E - J^U = \frac{\phi w_b + (1-\phi)w_g - z}{r+s+q(\theta)\theta}$$

which then implies:

$$rJ^U = \frac{(r+s)z + q(\theta)\theta\left[\phi\max\{rJ^U, \beta p_b\} + (1-\phi)\max\{rJ^U, \beta p_g\}\right]}{r+s+q(\theta)\theta} \tag{2.9}$$

rJ^U can now be expressed as a function of the two endogenous variables in (2.9):

$$rJ^U = G(\theta, \phi) \tag{2.10}$$

where $G(.,.)$ is continuous in both of its arguments. It can easily be verified that $G(.,.)$ is weakly decreasing in ϕ and strictly increasing in θ. Intuitively, as the tightness of the labor market, θ, increases workers find jobs faster, thus rJ^U is higher. Also as ϕ decreases, the proportion of good jobs among the open vacancies increases, and since $w_g > w_b$, the value of being unemployed increases. The dependence of rJ^U on ϕ is the general equilibrium effect mentioned in the introduction: as the composition of jobs changes, the option value of being unemployed changes too.

Next, by combining (2.5) and (2.6), we have:

$$\frac{k_i}{q(\theta)} = \frac{p_i - \max\{rJ^U, \beta p_i\}}{r+s} \tag{2.11}$$

for $i = b, g$.

It is straightforward to see from (2.11) that because $k_g > k_b$, as in the competitive equilibrium, we have $p_g > p_b$; the output of good jobs will sell for a higher price. More importantly, this difference in prices immediately implies from the wage determination rule, (2.3), that $w_g > w_b$, thus good jobs will pay higher wages than bad jobs.[11] Good jobs are the ones which cost more to create (or have higher capital costs). Because of this higher cost, they sell for a higher price, and this, due to rent-sharing, leads to higher wages. Now using (2.10), and rearranging:

$$\left(\alpha A\left[\frac{\phi}{1-\phi}\right]^{1-\alpha}-\max\left\{G(\theta,\phi),\beta\alpha A\left[\frac{\phi}{1-\phi}\right]^{1-\alpha}\right\}\right)=\frac{(r+s)k_g}{q(\theta)} \tag{2.12}$$

and

$$\left((1-\alpha)A\left[\frac{1-\phi}{\phi}\right]^{\alpha}-\max\left\{G(\theta,\phi),\beta(1-\alpha)A\left[\frac{1-\phi}{\phi}\right]^{\alpha}\right\}\right)=\frac{(r+s)k_b}{q(\theta)} \tag{2.13}$$

Consider these two equations (2.12) and (2.13) in the θ-ϕ plane. It is easy to check that (2.12), the *good job equilibrium* locus, along which a firm that opens a good job vacancy makes zero-profits, is upward sloping (see Figure 2.1): a higher value of ϕ increases the left hand side, thus θ needs to change to increase the right-hand side (and reduce the left-hand side through $G(\theta,\phi)$). Intuitively, a higher value of ϕ implies that p_g goes up from (2.7), and this makes the creation of good jobs more profitable, and thus θ needs to increase to equilibrate the market.

Equation (2.13), the *bad job equilibrium* locus, cannot be shown to be decreasing everywhere. Intuitively, an increase in ϕ reduces p_b, thus requires a fall in θ to equilibrate the market. Therefore, (2.13) can be expected to be downward sloping. However, the general equilibrium effect through J^U (i.e. that a fall in ϕ reduces J^U) counteracts this and may dominate. Nevertheless, it is straightforward to see that as ϕ tends to 1, (2.12) must be above (2.13) since at $\phi = 1$, (2.12) gives $\theta \rightarrow \infty$. Further, as ϕ goes to zero, (2.13) will give $\theta \rightarrow \infty$. Then by the continuity of the two functions they must intersect at least once in the range $\phi \in (0,1)$. Also since (2.13) can be upward sloping over some range, more than one intersections are possible. Hence multiple equilibria cannot be ruled out. Appendix A constructs an example of multiple equilibria with different composition of jobs which illustrates the strength of the general equilibrium effect at work.

[11] Except when z is so high that both jobs pay z. This possiblity is ignored in the statement of Proposition 1 to save space.

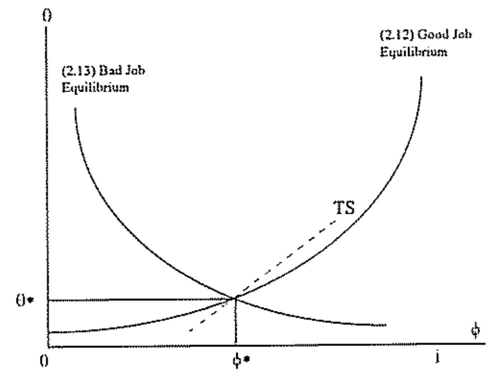

Figure 2.1:

2.6. Welfare

To analyze the welfare properties of equilibrium, I look at the total steady state surplus of the economy, defined as total output minus total costs, i.e. the *net* output of the economy.[12] Total surplus can be written as:

$$TS = (1-u)\left(\phi p_b + (1-\phi)p_g\right) - \theta u\left(\phi k_b + (1-\phi)k_g\right) \tag{2.14}$$

In other words, total surplus is equal to total flow of output which consists of the number of workers in good jobs $((1-\phi)(1-u))$ times their output plus the number of workers in bad jobs $(\phi(1-u))$ times their product minus the flow costs of job creation for good and bad jobs (respectively, $\theta u(1-\phi)k_g$ and $\theta u\phi k_b$).

[12]This is the measure that agents would care about before they decided to 'enter' this economy (hence before they knew which employment path they would follow) and involves the comparison of two steady states. A more satisfactory measure when doing policy analysis can be obtained following Diamond (1980) by explicitly noting the starting point of the economy and considering a policy change which will take us to a new steady state. This will not change the results derived in this paper. Note also that I will interpret z as a pure a transfer. If z had two components, one a transfer from the government, the other ζ utility of leisure, then a term $u\zeta$ would have to be added.

It is straightforward to locate the set of allocations which maximize total social surplus. This set would be the solution to the maximization of (2.14) subject to (2.8) (with $u = 0$). Inspecting the first-order conditions of this problem, it can be seen that decentralized equilibria will not in general belong to this set, thus a social planner can improve over the equilibrium allocation. In regards to the socially optimal amount of job creation, the results of the standard search literature apply (see Hosios, 1990, Pissarides, 1990): if β is too high, there will be too little job creation and if β is too low, there will be too much. Since the concern of this analysis is the composition of jobs, I will not discuss these issues in detail. Instead, I will show that irrespective of the value of θ, in equilibrium ϕ is always too high; that is there are too many bad jobs relative to the number of good jobs.

To prove this claim, consider the derivative of TS with respect to ϕ (note that (2.8) does not depend on ϕ). This gives:

$$A(1-u)\left\{(1-\alpha)(1-\phi)^{\alpha}\phi^{-\alpha} - \alpha(1-\phi)^{\alpha-1}\phi^{1-\alpha}\right\} - u\theta\left\{k_b - k_g\right\}$$

which needs to equal zero for the composition of jobs to be efficient. Let me now evaluate this first-order condition at the decentralized equilibrium. For this purpose, I use(2.7) and (2.8) to substitute for k_i in (2.11). Then:

$$\frac{q(\theta)\theta}{s+q(\theta)\theta}\left(p_b - p_g\right) - \frac{q(\theta)\theta}{s+q(\theta)\theta}\frac{s}{r+s}\left(p_b - p_g + w_g - w_b\right) < 0$$

Because this expression is always negative, *irrespective of the value of θ*, it implies that at the equilibrium, a reduction in ϕ will increase social surplus. Therefore, at the decentralized equilibrium, ϕ is too high and there are too many bad jobs relative to the number of good jobs:

Proposition 2. *Let $\phi^s(\theta)$ be the value of ϕ that the social planner would choose at labor market tightness θ, and $\phi^*(\theta)$ be the equilibrium, then $\phi^*(\theta) > \phi^s(\theta)$ for all θ. That is, in the unregulated equilibrium, the proportion of bad jobs is too high.*

The intuition is simple; it was shown above that in decentralized equilibrium, it is always the case that $w_g > w_b$, but firms do not take into account the higher utility they provide to the workers by creating a good job rather than a bad job, hence there is an uninternalized positive externality, and this leads to too many bad jobs, and not enough good jobs being created in equilibrium.

2.7. The Impact of Minimum Wages and Unemployment Benefits On Steady States

Consider an increase in z which corresponds to the UI system becoming more generous. To simplify the analysis let me distinguish three cases: first $rJ^U < \beta p_b$, second, $rJ^U \in (\beta p_b, \beta p_g)$ and third, $rJ^U > \beta p_g$. If the economy is in the first case, and a small increase in z does not make rJ^U larger than βp_b, then neither curve in Figure 2.1 will shift, thus an increase in unemployment benefit will not affect the equilibrium.[13] Second consider the case $rJ^U \in (\beta p_b, \beta p_g)$. Now, an increase in z will imply that bad jobs have to pay higher wages. Thus (2.13) in Figure 2.1 shifts to the left, and both ϕ and θ fall. Therefore, increased unemployment benefits lead to a better composition of jobs but also to higher unemployment. Is welfare higher? To answer this question, totally differentiate (2.14) after substituting for u. This will give a relation between ϕ and θ such that total surplus, TS, is constant (iso-surplus curves), drawn in Figure 2.1 as the dashed line. Then the welfare impact of the increased unemployment insurance will depend upon whether this iso-surplus curve is steeper or shallower than (2.12). Figure 2.1 draws the case in which it is steeper, thus an increase in z which shifts (2.13) along (2.12) will lead to higher surplus.

As a final point also note that irrespective of whether total surplus increases, a more generous unemployment benefit raises average labor productivity. To see this note that labor productivity is equal to $\phi p_b + (1-\phi)p_g$ which is decreasing in ϕ, thus as the composition of jobs improves, average labor productivity increases.

Finally, there is the case where $rJ^U > \beta p_g$. It is easy to see that this can only be true if $rJ^U = z > \beta p_g$. Then an increase in z shifts both (2.12) and (2.13) to the left, thus θ definitely falls, and also since $p_g > p_b$, the shift in (2.13) will be larger, and ϕ will fall.

Proposition 3. *An increase in z (weakly) decreases both θ and ϕ, thus the composition of jobs and average labor productivity improve, but unemployment increases. The impact on overall surplus is ambiguous.*

Next, consider the imposition of a minimum wage w_M such that $w_b < w_M < w_g$. Therefore, the minimum wage will be binding for bad jobs but not good jobs. This implies that the equation for J_b^F becomes (in steady state):

[13] Of course the caveat here is about the funding of the unemployment insurance system: if the increase in z has to be financed by taxing jobs, there will be an impact on job creation.

$$J_b^F = \frac{p_b - w_M}{r + s}$$

Therefore, again (2.13) shifts to the left, but this time (2.12) also shifts to the left, though again by a smaller amount. The reason for the shift in (2.12) is that the minium wage increases J_b^E and hence J^U for given θ and ϕ. The overall impact is easily seen to be a reduction in both ϕ and θ, thus the qualitative effects are similar to an increase in z. However, compared to the case in which $rJ^U \in (\beta p_b, \beta p_g)$, there is a larger impact on unemployment. Nevertheless, from a government's point of view, a hike in the minimum wage may be preferred since there is no need to raise taxation. Instead with an increase in unemployment benefit, some taxes will have to be increased, and when the impact of these taxes are taken into account, the effect on unemployment may be larger with an increase in unemployment benefit than with the minimum wage. Also, when search effort is endogenized later, it will be seen that minimum wages may have a more favorable impact on search effort than more generous unemployment benefits. Overall:

Proposition 4. *The introduction of a minimum wage $w_M > w_b$ decreases both θ and ϕ, thus the composition of jobs and average labor productivity improve, but unemployment increases. The impact on overall surplus is ambiguous.*

This section only reported the response of the steady state to changes in policy. Transition dynamics may give different answers. Appendix B shows that when dynamics are considered explicitly, nothing changes: both ϕ and θ immediately jump to their new steady state values, and the unemployment rate adjusts slowly.

2.8. Endogenous Search Effort

The conclusion of the above analysis has been that although higher unemployment benefits or minimum wages may increase total output and welfare by shifting the composition of jobs, they always increase unemployment. This is however not a general result. If we include a margin of choice on the worker side as well, this result no longer holds. In this subsection, I briefly outline the simplest way of modeling this by introducing search effort (see for instance Pissarides, 1990).

I assume that the matching function is given as $M(\bar{e}u, v)$ where $\bar{e}$ is the average search effort of unemployed workers. Similar equations can now be written but θ needs to be defined as: $\theta = \frac{v}{\bar{e}u}$ Throughout this section, I will only consider symmetric steady state equilibria in which all workers use the same strategy, thus $e = \bar{e}$. The probability that a worker searching at intensity $\bar{e}$ finds a job is $e\theta q(\theta)$. I also assume that the flow cost of choosing search effort e is $c(e)$ where $c(.)$ is a strictly increasing, differentiable and convex function. Then the Bellman equations for the firm are unchanged and for the worker only (2.2) changes to:

$$rJ^U = z - c(e) + e\theta q(\theta)\left[\phi J_b^E + (1-\phi)J_g^E - J^U\right] \tag{2.15}$$

where $\bar{\theta} = \frac{v}{\bar{e}u}$ Also, (2.8) now becomes:

$$u = \frac{s}{s + \bar{e}\bar{\theta}q(\bar{\theta})}$$

An additional condition will ensure that e is chosen optimally. Differentiating (2.15):

$$\theta q(\theta)\left[\phi J_b^E + (1-\phi)J_g^E - J^U\right] = c'(e)$$

Now solving out for J_i^E and using the fact that in equilibrium $e = \bar{e}$, this equation can be rearranged to read:

$$\bar{\theta}q(\bar{\theta})\left[\phi w_b + (1-\phi)w_g - G(\bar{\theta}, \phi)\right] = (r+s)c'(\bar{e})$$

where $G(\theta, \phi)$ is defined by (2.9). As before, for given $\bar{e}$ an increase in w_b (say due to a minimum wage), will reduce θ, but with endogenous search effort, it will also increase $\bar{e}$. Therefore, the overall impact on u is ambiguous: if the change in e is large enough, unemployment may fall. This model with variable search effort can therefore explain why in the instances studied by Card and Krueger (1995) higher minimum wages appear to have somehow increased employment.

The impact of an increase in unemployment benefit is more complicated because a higher level of z discourages search effort. Nonetheless, it is still possible that unemployment falls due to an increase in unemployment insurance, but this requires a very large general equilibrium effect. Thus, in contrast to the case with fixed search effort, labor market regulation may reduce unemployment. Moreover, in the fixed effort case, unemployment benefit appeared to have a less 'negative' impact on employment, but with endogenous search effort, the introduction of minimum wage is more likely to have small or no effect, or even a positive impact, on employment whereas a higher replacement ratio is likely to discourage search effort and increase unemployment.

3. Alternative Models

In this section, I will briefly discuss some alternative formulations which would give the same or very similar qualitative results.

1. **Creation Costs Paid After Match:** (rather than at the time of vacancy creation). In this case, both vacancies would incur the same cost of advertising γ, but after the match they would have to buy equipments costing different amounts. This modification would not change any of the results as long as fully binding wage contracts are not possible. In the absence of such fully binding contracts, the higher marginal value product of labor in good jobs would, at some point, translate into higher wages.

2. **Wage Posting:** It may be conjectured that bargaining rather than search is responsible for all our results, and also the importance of explicit rent-sharing in the U.S. labor market can be questioned. Acemoglu and Shimer (1996) investigate a model with wage posting and heterogeneous firms. High productivity firms have higher creation costs. It is shown that the composition of jobs is not optimal. It is also straightforward to carry out the comparative statics with respect to unemployment benefit and minimum wage, and obtain similar results as here. Essentially, high product firms value a higher likelihood of attracting workers more than low product firms, thus they are willing to offer higher wages. Given this distribution of wages, a higher level of unemployment benefit would make it more attractive to wait for good jobs, thus bad jobs would be induced to increase their wages by more, and as a result, the composition of employment would shift towards high productivity jobs.

3. **Efficiency Wages:** The same intuition can be captured using efficiency wage models; in particular, the turnover version of efficiency wage models would give very similar results. High product firms would pay higher wages in order to reduce turnover which is more costly for them than low product firms. If higher unemployment benefits encourage quit as it seems plausible, they will force low product firms to increase wages by more, and again shift the composition of jobs.

The most original result of this paper is the impact of labor market regulations on job composition and welfare. I formalized the links between creation costs and job composition using a search model with ex post rent-sharing and the creation costs paid upfront. The brief discussion in this section shows that although these links have been ignored so far in the literature, they would also be predicted by other models.

4. Empirics

Does the composition of jobs respond to the changes in labor market regulations? If so by how much? And is the response larger than that of unemployment so as to suggest possible output and welfare gains from such labor market regulations? These are policy relevant questions which cannot be answered by theory alone. Moreover, since the macro and labor literatures do not often treat the composition of jobs as endogenous, in order to be convincing, this paper needs to provide some evidence to this effect. This is the purpose of this section.

4.1. Empirical Strategy

As noted in the introduction, there are two main problems in undertaking such an empirical investigation:

1. How to identify the impact of changes in labor market regulation on endogenous variables?

2. How to define good and bad jobs?

To deal with the first question, I will use the variation across U.S. states between 1983 and 1993. Both unemployment insurance and minimum wage legislations have significant state level components, and this will provide sufficient variation for my purpose. For minimum wages, I will use the legislated state level minimum wage (divided by the CPI) for the period 1979-1993 (see the Data Appendix). For unemployment benefits, I will use the simulation program developed by Jonathan Gruber which uses state level legislation to replicate the exact rules that states use to determine replacement ratios (see Gruber, 1995, Gruber and Cullen, 1996). This approach requires the choice of a 'standard' worker whose replacement ratio will be used as a measure of the generosity of the UI system. The reasoning for the choice I make will be clear later. For now, it suffices to note that I am mostly interested in unskilled or semi-skilled workers who have a significant career choice, thus I use a 28 year old married male with one child (see below for the earnings assignment).

The reason for using the simulation program of the states for a specific group of worker rather than simply use the actual replacement ratio (unemployment insurance payments divided by total earnings in a given state) is that, as discussed by Gruber (1995), the actual replacement ratio will vary due to reasons unrelated to policy, for instance when the composition of unemployment changes between high and low wage workers, or when take-up rates vary. Since this paper's interest is with the changes in unemployment insurance *generosity*, the use of the simulation program appears to be the right choice.[14]

Table 1 gives the across-state variation by year for the legislated minimum wage and replacement ratio (*rep*), and suggests that there is sufficient variation across states and years to enable identification.

Table 1: Variations in Minimum Wages and Replacement Ratios

	Av. minw	*Sd. of minw*	*Av. rep*	*Sd. of rep*
1983	3.373	0.070	0.509	0.0573
1984	3.234	0.068	0.508	0.0547
1985	3.124	0.066	0.508	0.0544
1986	3.069	0.068	0.508	0.0545
1987	2.973	0.079	0.508	0.0538
1988	2.880	0.113	0.512	0.0549
1989	2.795	0.194	0.508	0.0553
1990	2.954	0.114	0.507	0.0554
1991	3.135	0.072	0.505	0.0543
1992	3.052	0.081	0.505	0.0533
1993	2.988	0.143	0.508	0.0541

Notes: The first columns gives the mean of minimum wage across states. The second column gives the standard deviation across states. The third and fourth columns are for replacement ratio. *minw* is obtained by dividing the legislated state level minimum wage by national CPI. *rep* is obtained from the simulation program of the state level UI system. It is the replacement ratio of a 28 year old married male worker with one child and no other income after working four quarters at the national mean wage of the very bad occupations (as defined in Table 3). All averages and standard deviations are calculated with each state having equal weight.

[14] All of the regressions below were repeated using the actual replacement ratios obtained from the Department of Employment (I thank Rob Vosovitch for these data), both with OLS and also instrumented by the replacement ratios of standard workers calculated here. The results were similar, but the standard errors were larger which is expected since the actual replacement ratios have considerable variations uncorrelated with the generosity of UI at the bottom of the wage distribution.

Another question which needs to be addressed at this stage is whether U.S. states can be treated as 'separate labor markets' where the impact of labor market legislation in one state will mainly affect labor market outcomes in that state. This presumption is called into doubt by the findings of Blanchard and Katz (1992) who show that there are significant labor flows across states. Nevertheless, the relatively high across states variance of the unemployment rates for workers with less than 12 years of schooling as shown in Table 2 suggest that migration is not always very fast and may not be a viable possibility for many of the workers who I am most interested in (those who are unskilled or semi-skilled). Hence, the effects that I am interested in should be present, though somehow weakened by interstate migration. More convincingly, I will report in Table 7 regressions on how the labor force responds to changes in labor market regulations. The results suggest that flows into the labor force (either from out of labor force or from other states) are responsive to changes in unemployment insurance, but not to minimum wage hikes. Therefore, the results using minimum wages appear not to suffer from across state labor flows, and may be more reliable than the regression with the replacement ratios.

Table 2: Mean and Standard Deviation of Unemployment Rates

	Av unem1	*Sd. unem1*	*Av. unem2*	*Sd. unem2*
1983	15.72	3.695	9.38	2.580
1984	12.90	3.977	7.20	2.436
1985	12.95	4.071	7.03	2.115
1986	13.06	4.512	6.90	2.292
1987	11.71	4.450	6.13	2.169
1988	10.42	4.070	5.34	1.893
1989	8.17	2.842	4.32	1.201
1990	8.32	2.628	4.48	1.070
1991	10.40	3.265	5.34	1.402
1992	11.74	3.730	5.75	1.675
1993	11.71	3.600	5.37	1.474

Notes: The first column is the average unemployment rate for workers with 11 years of schooling or less across states. The second column is the standard deviation across states for the same variable. The third and fourth columns are for the unemployment rate of those with schooling between 12 and 15. All averages and standard deviations are calculated with each state having equal weight.

A final point worth discussing is the *endogeneity* of labor market regulations to the economic conditions in the state. Throughout this section, I will interpret changes in the state level minimum wage legislations and unemployment insurance generosity as exogenous changes. The problem of endogeneity is unlikely to be serious for minimum wage legislation because a large part of the variation comes from the introduction of the federal minimum wage in 1991 (see Card and Krueger, 1995). But in the case of UI generosity some more care needs to be taken. States may increase replacement ratios at times of recession which would introduce a spurious positive correlation between unemployment and UI generosity. This caveat again suggests that minimum wage results are likely to be more reliable.

The second question is in many ways more fundamental. There are significant wage differentials across workers, and many economists interpret these as due to unobserved worker or job heterogeneity (e.g. Murphy and Topel, 1987). Therefore, simply looking at the market wages as a measure of the composition of jobs would not be a satisfactory approach. Instead, I identify bad jobs with those occupations which affect the earnings of workers negatively after controlling for standard individual characteristics and human capital variables. However, this approach does not completely circumvent the problem of unobserved heterogeneity. To the degree that all individuals working in an occupation possess less 'unobserved skills', this particular occupation will appear as a 'bad job' whereas in essence it only attracts workers who have less of this 'unobserved skill'. Nevertheless, there is reason to believe that this problem is not very serious. First, the number of workers in each occupation is very large, thus the only problem will arise from a systematic tendency to attract workers with less 'unobserved skills'. However, to the extent that unobserved skills are likely to be correlated with observed skills, a large part of this will be captured by other variables in the wage regression. Moreover, Table 3 shows that the educational composition of some of these occupations is not very different from some of the good occupations. Second, the findings of the inter-industry studies which show that wage differentials are very persistent (Krueger and Summers, 1987), that when workers change jobs, they are subject to the same differentials (Krueger and Summers, 1988, and Gibbons and Katz, 1992) and that job queues at high wage are longer and quits are lower (Holzer et al, 1991, and Krueger and Summers, 1988) suggest that most of these differences cannot be explained by unobserved heterogeneity. Third and perhaps most important, if indeed all I am capturing with these occupation dummies is unobserved heterogeneity, then the proportion of these occupations should not be responsive to labor market regulations.

Table 3: Occupations

Occupation	Coeff. from Wage Reg.	Mean Wage in 1991	10% Wage in 1991	% in Occ. in 1991	Sch. ≤ 11	Sch. $12-15$	Sch. ≥ 16	
Admin.	0.00	17.52	7.5	2.83	1.70	38.54	59.76	
Manager	0.002	16.36	6.25	5.69	3.12	53.56	43.32	
Accountant	-0.016	15.19	7.5	1.30	0.54	31.05	68.42	
Rel. Man.	-0.007	15.28	7.33	2.28	1.25	50.86	47.88	
Engineer	0.106	20.56	11	1.82	0.56	24.63	74.81	
Math Comp	0.199	19.45	10	0.86	0.07	29.59	70.34	
Nat. Sci.	-0.012	17.85	8.1	0.45	0.57	9.92	89.52	
Medical	-0.070	21.16	6.5	0.35	0.36	7.01	92.63	
Health Occ	0.125	16.66	8.75	2.33	0.43	39.38	60.18	
Teacher	-0.207	14.49	6	4.86	0.56	12.96	86.48	
Soc.Spc.Occ.	-0.181	12.81	5.34	1.37	1.35	23.85	74.80	
Law	-0.070	23.83	10	0.47	0.13	5.09	94.78	
Artists	-0.154	13.77	5.16	1.36	2.06	41.67	56.27	
HealthTec	-0.102	11.78	6.25	1.41	1.21	73.79	25.00	
Eng. Tec	-0.087	13.50	7	0.93	1.50	75.41	23.09	
Sci. Tec	-0.201	12.52	5.54	0.27	2.63	67.22	30.14	
Mech Tec	0.069	17.14	7.5	0.99	0.96	40.69	58.35	
Legal Asst	-0.015	13.45	7.11	0.22	0.58	54.49	44.93	
Sales Sup.	-0.099	12.16	5.36	2.51	4.85	68.29	26.85	
Sales Fin.	-0.138	15.10	6	1.65	1.31	51.86	46.83	
Sales Eng.	-0.077	15.22	6.65	1.37	1.48	55.03	43.48	
Sales Workers	-0.369	7.64	4	2.69	6.46	76.03	17.51	B
Cashier	-0.425	6.19	4	2.19	11.33	81.76	7.00	B
Door Sales	-0.404	8.66	3.94	0.28	9.63	68.35	22.02	B
Other Sales	0.009	14.70	4.38	0.04	6.67	68.33	25.00	
AdminSup	-0.033	14.26	7.25	0.76	2.50	70.11	27.39	
Comp Equip	-0.184	10.61	5.68	0.75	2.13	78.66	19.22	
Secretary	-0.191	9.66	5.25	4.28	1.41	86.57	12.02	
Inf. Clerk	-0.297	8.26	4.75	1.41	3.87	82.31	13.82	
Rec. Clerk	-0.288	9.17	4.5	0.84	3.34	79.76	16.91	
Fin. Clerk	-0.208	9.63	5.25	2.11	2.70	83.59	13.71	
Mail Mac Op	-0.369	8.03	4.52	0.07	5.98	86.32	7.69	B
Comp. Op	-0.307	9.77	4.73	0.21	3.35	89.02	7.62	B
Postal Emp	-0.177	13.86	8.33	0.63	2.81	82.35	14.84	
Other Mail	-0.386	8.73	4.8	0.27	8.13	80.86	11.00	B

Table 3 (continued)

Occupation	Coeff. from Wage Reg.	Mean Wage in 1991	10% Wage in 1991	% in Occ. in 1991	Sch. < 11	Sch. 12-15	Sch. ≥ 16	
Mat. Clerk	-0.286	9.65	5	1.75	8.53	80.98	10.49	
Adjuster	-0.133	10.56	6	1.17	1.47	74.77	23.76	
Gen.Off.Cl	-0.285	9.05	4.95	3.29	3.10	80.60	16.29	
Pri.Services	-0.951	4.57	1.5	0.28	21.48	69.80	8.72	VB
Servants	-0.538	5.78	2.5	0.30	44.68	50.94	4.38	VB
Protect. Ser.	-0.318	11.88	5	1.88	5.63	76.98	17.39	B
Food Ser.	-0.511	6.47	3.68	4.76	19.88	71.65	8.47	VB
Health Ser.	-0.379	7.88	4.38	2.12	13.66	79.31	7.03	B
Cleaning	-0.460	7.66	4.25	2.64	31.44	64.94	3.62	B
Person. Ser.	-0.400	7.79	3.85	1.48	9.77	78.10	12.13	B
Farm Oper.	-0.508	7.85	3.57	0.07	18.75	61.61	19.64	VB
Farm Occ.	-0.521	6.22	3.15	0.73	43.11	52.71	4.19	VB
Other Farm	-0.409	7.63	4.25	0.71	30.35	62.56	7.10	B
Forestry	-0.299	9.24	3.75	0.09	36.30	57.53	6.16	
Mech. Sup	0.072	14.80	7	0.24	8.05	82.34	9.61	
Auto Mec	-0.187	11.13	5.4	1.50	17.84	78.70	3.47	
Indust.Mec	-0.205	11.97	6.72	0.52	16.81	79.08	4.11	
Elect. Rep	-0.118	13.77	7	0.84	6.18	83.63	10.18	
Oth. Repair	-0.206	12.21	6.15	0.78	11.89	82.36	5.74	
Super Constr.	0.018	15.55	7.75	0.46	12.10	76.91	10.99	
Constr. Trade	-0.161	13.14	6	3.10	19.96	74.06	5.97	
Extract. Occ	-0.091	14.78	7.5	0.16	16.15	75.38	8.46	
Sup. Precision	-0.071	14.04	7.08	1.23	12.81	73.71	13.48	
Prec Metal	-0.182	12.64	7	0.83	11.12	83.78	5.10	
Oth.Precis	-0.260	10.02	5	1.47	18.32	75.38	6.31	
Metal	-0.350	10.30	5.26	0.61	26.89	70.63	2.48	B
Woodwork	-0.363	9.13	4.75	0.14	34.42	64.19	1.40	B
Printing	-0.289	10.83	5.21	0.41	9.75	82.82	7.43	
Textile	-0.459	6.75	4.24	1.18	40.46	57.40	2.14	B
Other Mach	-0.331	9.39	5	2.53	25.89	70.20	3.90	B
Assembler	-0.345	9.52	5	1.69	25.80	70.87	3.34	B
Prod. Insp	-0.317	10.18	5	0.75	17.91	73.56	8.53	B
Truck Sup	-0.205	11.24	5.74	0.06	5.56	75.93	18.52	
Truck Driver	-0.335	10.22	5	2.32	22.27	73.30	4.43	B
Other Driver	-0.357	9.22	4.58	0.74	13.66	76.80	9.54	B
OtherTransp	-0.251	11.86	5.83	1.38	23.21	73.62	3.17	
Const.Labor	-0.340	11.01	5	0.66	26.30	69.10	4.61	B
Handlers	-0.407	8.32	4.25	1.40	15.62	78.20	6.18	B
Vehicle Serv	-0.500	6.58	4.07	0.38	24.79	71.74	3.47	VB
Laborer	-0.397	7.58	4.35	0.26	23.50	74.10	2.40	B
Hand Packer	-0.395	8.51	4.46	1.15	22.97	71.76	5.27	B

Notes: The first column gives the coefficient from the wage regression reported in Table 4. The omitted group is 'administrators'. Thus, these are wage differentials relative to an administrator with the same controls. Column 2 is the average wage of this occupation in 1991. Column 3 is the lowest decile wage in this occupation. Column 4 gives the proportion of employment in this occupation. The next three columns give the proportion of the workers in this occupation who have less than 11 years, between 12 and 15 years and more than 16 years of schooling. The last column gives the classification. *VB* denotes *very bad* and *B* denotes *bad*.

Table 3 reports the 76 occupations which are used in the wage regressions, mean wages for each occupation and 10% of the wage distribution of this cell (both of these using the 1991 data), proportions of workers with less than (or equal to) 11 years of education, with schooling between 12 and 15, and those with more than 16 years of education employed in this occupation, and the proportion of total employment corresponding to this cell. The data are pooled from the CPS March from 1983 to 1991.[15] The 76 occupation groups are an extended version of the two-digit occupational categories that I compiled from the three digit codes by separating some two digit occupations into more than one (see Appendix C for more detailed data descriptions, and a list of the occupation categories).

4.2. Wage Regressions

The wage regression that I use to classify jobs into good and bad categories is reported in Table 4. It regresses the logarithm of nominal hourly wage[16] on the years of schooling, experience, experience squared, race, sex, and union dummies, the full set of the two-digit industry dummies, 51 state dummies, year-dummies, the interaction of time dummies and years of schooling variable, and finally the 76 occupations dummies. Whether individuals who have less than $1 and more than $100 per hour are dropped or not does not affect the results, and in the reported results, these outliers are not included. Also, I restrict the sample to workers with less than or equal to 15 years of schooling because this paper is mainly interested in the labor market fortunes of unskilled and semi-skilled workers, not those who have college degrees, and throughout I will limit attention to workers with 15 years or less of schooling (non-college graduates) — again including these workers does not alter the results at all. The values of the occupation dummies are reported in Table 3 and plotted in Figure 4.1.

[15] 1992 and 1993 are excluded because the educational definitions are different. The years before 1983 are excluded because occupational categories are different. The years 1992 and 1993 are included in the rest of the analysis where the educational classifications do not play as important a role. Only March CPS's are used since otherwise the number of observations was too large. Throughout the rest of the analysis all CPS months are used.

[16] Since there are year dummies, the use of nominal rather than real wage does not cause any problem.

Table 4: Wage Regression

	coefficient	t-statistic
grade	0.0292	13.17
black	-0.056	11.42
female	-0.193	51.03
union	0.209	50.31
experience	0.025	61.55
experience^2/100	-0.042	42.54

$Adj. R^2 = 0.4493$

Sample=1983-1991

No. of Observations=118,198

Notes: Dependent variable log of nominal hourly wages. Grade is last grade completed. Black is a dummy for black, female is a dummy for female and union is a dummy for covered by union. Experience is defined as age-grade-6. Other variables in the regression include 76 occupation dummies, 51 industry dummies, 8 year dummies and the interaction of the year dummies with grade.

Six occupations have mean wages around the average minimum wage. These are also the occupations with the lowest dummies (the cut-off level for very bad is -0.50, and there are no occupations between -0.50 and -0.43). These occupations which make up approximately 10% of total employment and are classified as *"very bad"* Then, there are the occupations with an average wage above the minimum wage, and dummies considerably higher than the *very bad* group but lower than the rest (the cut-off level is[17] -0.30). These occupations make up approximately 33% of employment and are the *"bad"* occupations in the analysis. The rest of the occupations are referred to as *"good"* occupations.

[17]This cut-off level is chosen because it is a 'round' number. There is naturally a degree of arbitrariness in constructing the categories of good and bad jobs. This is why rather than experimenting with different cut-offs, I repeated the same exercise with the measure *index* introduced at the end of this section which does *not* give any room for arbitrary choices.

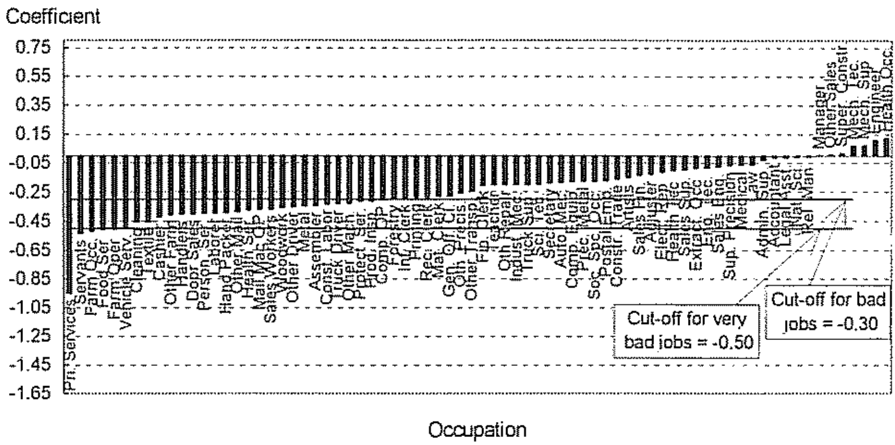

Figure 4.1

Breaking occupations into *very bad* and *bad*, as well as capturing the clustering in the data, has an advantage: an increase in minimum wage (and to a lesser extent a higher replacement ratio) is likely to reduce the proportion of jobs that used to pay below or just around the minimum, this is the direct effect of the legislation. This effect is likely to be more powerful for *very bad* jobs since a large proportion of workers in this category have a wage around the minimum wage whereas a much smaller proportion of the workers, 10%, in the *bad* category will be directly influenced by the minimum wage. However, the more novel mechanism suggested in the theoretical section is the indirect or general equilibrium effect. Recall that this effect is due to the fact that the greater proportion of good jobs encourages workers to turn down bad jobs, and thus induces firms to open more good jobs. Therefore, investigating the impact of labor market regulations on the bad group, as well as the very bad group, will give us a way of assessing whether this effect is present at all. As it turns out, the results suggest that *bad* jobs are, if anything,more responsive to changes labor market regulations than *very bad* jobs (especially to minimum wages), suggesting that there is a large component of the general equilibrium effect and/or as commented below, that very bad jobs face inelastic demand curves.

4.3. State Level Regressions

Now that occupations have been classified into *good*, *bad* and *very bad* jobs, changes in the composition of jobs can be studied. I construct the measure of job composition as the number of non-college graduates who are in *very bad* occupations in a certain year and state divided by the total number of non-college graduates in the labor force in that year and state. This variable is called *very*. The proportion of bad jobs is similarly defined (those with less than 15 years in bad occupations divided by total number of workers with less than 15 years who are in the labor force) and denoted by *bad*. I also construct *good* which is the proportion of good jobs similarly defined. Note that all three measures have the labor force (of workers with less than 15 years of schooling) in the corresponding state in the denominator. Therefore, if as the conventional wisdom suggests, a change in the minimum wage or unemployment insurance destroys the low paying jobs, *good* should be unchanged, *very* should fall by a large amount, and *bad* should probably fall by some smaller amount. In contrast, the theory I have proposed suggests that *very* and *bad* should fall and *good* should increase.[18]

The right-hand side variables will be measures of minimum wage and replacement ratio. As controls, the regressors will include the proportion of blacks in the labor force (*pblack*), the proportion of women in the labor force (*pfemale*), the growth rate of total personal income in the state (*dgdp*), and fixed state effects and time effects. Although I have restricted attention to those with less than 15 years of schooling, the skill composition of the labor force may still affect the supply of jobs, and thus what kind of jobs non-college graduates are able to obtain (see Acemoglu, 1996b). Thus, I include two variables school1 and school2, respectively the proportion of the labor force with less than 11 years of schooling and those who have schooling between 12 and 15.

The minimum wage variable minw is the nominal minimum wage in the relevant year and state divided by the CPI of that year. The replacement ratio

[18]My theory predicts that ϕ should fall thus the proportion of good jobs among all jobs should increase. As θ falls too, the total number of good jobs may increase, but this is not guaranteed. Because a competitive labor market model may also predict that the proportion of good jobs increases in response to minimum wages and UI, I test the stronger prediction that the number of good jobs (or the proportion of good jobs in *labor force*) increases.

is more involved. As noted above, this variable is obtained from the simulation program developed by Jonathan Gruber which replicates the procedure the state level unemployment insurance authorities use. Since this paper's interest is with the impact of unemployment insurance (and minimum wages) on relatively low paid workers who are making career choices, I want to capture variations in the generosity of unemployment insurance for workers at the low end of the wage distribution. For this reason, I use the replacement ratio for a 28 year old married man with one child who has been employed for the past four quarters and has no other family income. As for the wage rate of this worker, the mean wage of the very bad occupations in a given year is used. As noted above, the mean wage of very bad occupations is close to the minimum wage ($4.6 averaged over the ten years of sample), thus the measure I use is close to the replacement ratio of a worker who has been employed in low pay jobs with wages around the minimum before being laid-off.[19] The resulting variable is referred to as *rep*.

4.4. Results

All regressions are estimated by OLS and include state fixed effects and year dummies. All reported standard-errors are White's heteroscedasticity robust standard errors.[20] Table 5 reports the regression of *very*, *bad* and *good* on *minw* and various lags using data from 1983 to 1993. Table 6 reports results with the replacement ratios as the key independent variable.

The results from minimum wage regressions support the predictions of the

[19] Using different 'standard' workers to calculate the replacement ratio does not change the results significantly. In particular, the previous version of the paper also reported results which look very similar to the ones here where the mean wage of bad occupations rather than very bad occupations were used to calculate replacement ratios. Using the minimum wage itself for the earnings of the standard worker also gives very similar results.

The use of the same wage for the 'standard'/reference worker across different states may raise some concern. If a certain state has lower wages than the national average, then the wage I assign to the worker will be relatively high compared to the earnings of workers in the bad occupations in this state, and this will, all other things equal, imply a higher replacement ratio for this state than others. To degree that this low-wage state has higher unemployment and a high proportion of bad jobs, this may bias the results of the regressions of the job composition against the prediction of my theory, and also bias the coefficient of the replacement ratio in the unemployment regressions upward. Although state fixed effects will mitigate this problem to some degree, these potential biases have to be borne in mind in interpreting the regressions with the replacement ratios on the right-hand side.

[20] Instead of White's correction, weighting observations with the size of the labor force in the corresponding state gives similar results.

model proposed here. The proportion of bad jobs falls sharply, and the proportion of good jobs increases. At this point, it is important to recall once again that the denominator of *good* is not just total employment but employment plus unemployment, thus how the labor force responds to changes in the minimum wage is important in interpreting this result. Table 7 shows that the labor force (the employed plus those who report to be unemployed) does not respond to changes in the minimum wage at all. Therefore, an increase in the minimum wage reduces the number of bad jobs and increases the number of good jobs. This finding is in line with the theory offered in this paper, but not with the standard approach. Interestingly, the proportion of very bad jobs responds little to changes in minimum wages. This is surprising since these are the occupations which have mean wages around the minimum wage. This finding may be due to the fact that these occupations which are largely made up from household service workers, servants and farm workers face very inelastic demands.

Table 5: The Impact of Minimum Wages on Job Composition

	very	*very*	*very*	*very*	*bad*	*bad*
mmw	-0.0070	-0.0071	-0.0079		-0.0166	-0.0118
	(1.459)	(1.380)	(1.436)		(2.807)	(2.119)
mmw(-1)		0.0001	0.0018	-0.0030		-0.0139
		(0.029)	(0.316)	(0.634)		(1.449)
mmw(-2)			-0.0032			
			(0.604)			
dgdp	-0.0536	-0.0536	-0.0548	-0.0555	0.1582	0.1532
	(2.461)	(2.442)	(2.473)	(2.560)	(6.538)	(6.325)
pfemale	0.00001	-0.00001	-0.000	-0.0001	0.0003	0.0002
	(0.038)	(0.040)	(0.002)	(0.191)	(0.615)	(0.450)
pblack	0.00037	0.0003	0.0003	0.0003	-0.0004	-0.0003
	(1.113)	(1.131)	(1.133)	(1.109)	(0.739)	(0.667)
school1	-0.0023	-0.0239	-0.0232	-0.0259	0.1639	0.1685
	(0.559)	(0.559)	(0.543)	(0.605)	(2.591)	(2.643)
school2	-0.0694	-0.0694	-0.0700	-0.0656	0.0979	0.0903
	(1.694)	(1.690)	(1.700)	(1.601)	(1.894)	(1.761)
$Adj.R^2$	0.934	0.934	0.934	0.934	0.834	0.834

Table 5 (continued)

	bad	*bad*	*good*	*good*	*good*	*good*
mmw	-0.0161		0.0356	0.0310	0.0291	
	(2.480)		(3.832)	(3.108)	(2.767)	
mmw(-1)	-0.0044	-0.191		0.0134	0.0177	0.0271
	(0.394)	(2.029)		(1.131)	(1.195)	(2.340)
mmw(-2)	-0.0176				-0.0079	
	(1.655)				(0.633)	
dgdp	0.1464	0.1499	0.1806	0.1854	0.1824	0.1940
	(6.200)	(6.178)	(5.580)	(5.722)	(5.598)	(5.922)
pfemale	-0.0001	0.0004	-0.0001	-0.0001	-0.0001	-0.0004
	(1.276)	(0.641)	(0.248)	(0.124)	(0.186)	(0.524)
pblack	0.0003	0.0003	-0.0018	-0.0017	-0.0017	-0.0017
	(0.669)	(0.645)	(3.091)	(3.031)	(3.040)	(2.958)
school1	0.1720	0.1651	-0.4761	-0.4806	-0.479	-0.4717
	(2.676	(2.586)	(6.912)	(6.935)	(6.910)	(6.697)
school2	0.0869	0.0965	-0.1447	-0.1374	-0.1389	-0.1536
	(1.707)	(1.888)	(2.436)	(2.292)	(2.319)	(2.564)
$Adj.R^2$	0.835	0.834	0.8577	0.857	0.857	0.8550

Notes: The first row gives the dependent variable. All equations are estimated using OLS including fixed state and year dummies and White heteroscedasticity corrected t-statistics are given in parentheses. mmw(-1) is mmw lagged by one year. pfemale is the proportion of females in the labor force, pblack is the proportion of blacks in the labor force (again restricted to those with less than or equal to 15 years of schooling). School1 is the proportion of those with less than 11 years of schooling in the labor force. School2 is the proportion of those with schooling between 12 and 15. The number of observations in all the regressions is equal to 550 (because the mmw is available for 1982 and 1981 as well), and also since minimum wages for Washington D.C. are not available, only 50 states are used. All equations include fixed state effects and year dummies.

To get some idea of the magnitude of these effects, consider a $1 increase in (real) minimum wage. This hike in the real value of the minimum wage would reduce the proportion of bad jobs in the labor force by 1.6% (from an average of 32%) and increase the proportion of good jobs by as much as 3.5% (from an average of 53%). Therefore, the impact of the changes in the minimum wage on the composition of jobs appears to be quite large.

Other factors also influence the composition of employment. First, the time effects, not reported here, indicate that the proportion of very bad jobs appears to have fallen by approximately 1% of the labor force from 1983 to 1993 due to reasons not captured by the regressors. In contrast, the proportion of bad jobs appears to have increased from 1983 to 1993 by an amount between 1% and 1.7%. The largest change is seen in the proportion of good jobs which appear to have increased by as much as 3.5% (the other category which has declined is of course unemployment). Second, business cycle effects seem to matter for all groups. *very* is lower and *bad* and *good* are higher when the growth rate of state total personal income is positive. Third, other variables do not seem to have a significant impact on the proportion of very bad jobs, but the proportion of the workforce with less than 12 years of schooling has a significant positive impact on the proportion of bad jobs and a negative impact on the proportion of good jobs. Roughly speaking a 10% increase in the proportion of workers without a high school degree in the labor force increases the proportion of bad jobs by about 2% and reduces the proportion of good jobs by as much as 5%. Also, the proportion of workers in the labor force who are black has a negative impact on good jobs. Combined with the results in Table 7 which indicate that labor force participation is not very responsive to changes in minimum wages, these results suggest a large response in the composition of jobs to changes in minimum wages.[21]

The impact of the unemployment benefit on the composition of jobs (Table 6) is quite similar. The proportions of very bad and bad jobs falls in response to more generous unemployment insurance for workers at the low end of the wage distribution. The impact of *rep* on the proportion of good jobs is weaker: though always positive, *rep* only has a significant impact contemporaneously. However, these results are still highly supportive of the theory because, as Table 7 shows, an increase in the replacement ratios increases the labor force (either through the participation margin or via migration). Therefore, the number of good jobs increases by more than indicated by the results of Table 6.

[21]The result in Table 7 that the labor force does not seem to respond to changes in state level total income is curious. This may be due that labor force is an I(1) variable. Different versions of the regressions in Table 7, for instance, including the level of state total personal income, solve this problem, but do not affect the response of labor force to labor market regulations. I report the results with *dgdp* for uniformity with other tables.

Table 6: The Impact of Replacement Ratios on Job Composition

	very	*very*	*very*	*very*	*bad*	*bad*
rep	-0.0763	-0.1004	-0.1109		-0.975	-0.614
	(3.601)	(3.530)	(3.619)		(2.856)	(-1.464)
rep(-1)		0.0398	0.0536	-0.0341		-0.0713
		(1.488)	(1.450)	(1.440)		(1.579)
rep(-2)			-0.0010			
			(0.032)			
dgdp	-0.0596	-0.0662	-0.693	-0.670	0.1495	0.1421
	(2.774)	(3.100)	(3.365)	(3.131)	(6.333)	(6.262)
pfemale	-0.0002	0.0008	0.0001	0.0002	0.0004	0.0002
	(0.062)	(0.182)	(0.251)	(0.432)	(0.718)	(0.440)
pblack	0.0006	0.0002	-0.0001	0.0001	0.0007	0.0013
	(1.995)	(0.610)	(0.378)	(0.399)	(1.319)	(1.953)
school1	-0.0320	0.0032	0.0035	0.0071	0.1496	0.1393
	(0.761)	(0.080)	(0.082)	(0.173)	(2.364)	(2.057)
school2	-0.0641	-0.473	-0.0360	-0.534	0.1116	0.1227
	(1.572	(1.142)	(0.900)	(1.263)	(2.209)	(2.320)
Adj. R^2	0.935	0.939	0.942	0.939	0.834	0.844

Table 6 (continued)

	bad	*bad*	*good*	*good*	*good*	*good*
rep	-0.0094	-0.0113	0.0887	0.1153	0.0862	
	(1.822)	(1.967)	(2. 197)	(2.069)	(1.502)	
rep(-1)		0.0045		-0.0461	-0.0001	0.0381
		(0.752)		(0.653)	(0.002)	(0.713)
rep(-2)					-0.0645	
					(1.189)	
dgdp			0.1915	0.2032	0.2205	0.2041
			(5.771)	(5.590)	(5.601)	(5.630)
pfemale	-0.00060	-0.00051	-0.0005	-0.0002	-0.003	-0.0003
	(1.120)	(0.285)	(0.732)	(0.305)	(0.400)	(0.467)
pblack	0.00050	0.00051	-0.0021	-0.0018	-0.0019	-0.0018
	(1.256)	(1.277)	(3.433)	(2.535)	(2.235	(2.422)
school1	-00004	-0.00005	-0.452	-0.418	-0.3862	-0.4225
	(0.094)	(0.900)	(6.494)	(5.318)	(4.307)	(5.361)
school2	0.00041	-0.00039	-0.1756	-0.153	-0.1017	-0.1467
	(1.157)	(1.079)	(2.957)	(2.260)	(1.432)	(2.139)
Adj. R^2	0.2297	0.2305	0.8712	0.8419	0.8394	0.8412

Notes: See the notes for Table 5. The only difference is that the number of observations is 450 and 500 when lags are used because replacement ratio is not calculated for 1981 and 82.

Table 7:The Impact of Minimum Wages and Replacement Ratios on Labor Force

minw	-358.1 (0.722)	-560 (0.955)	-639.3 (1.031)					
minw(-1)		586.9 (1.304)	762.5 (1.491)	339.72 (1.179)				
minw(-2)			-327.2 (1.129)					
rep					4001.7 (3.952)	2650.1 (2.432)	1159.3 (1.531)	
rep(-1)						119.3 (0.100)	188.76 0.204)	2071.4 (0.919)
rep(-2)							-1550.1 (-2.091)	
dgdp	-157.2 (0.277)	53.07 (0.087)	-73.77 (0.126)	-102.1 (0.182)	56.13 (0.102)	616.09 (1.083)	476.7 (0.955)	636.8 (1.115)
pfemale	-36.9 (1.640)	-32.76 (1.467)	-34.77 (1.533)	-27.13 (1.232)	-23.15 (1.073)	-25.08 (1.197)	-5.08 (0.365)	-28.13 (1.364)
pblack	-30.565 (1.357	-28.90 (1.280)	-28.83 (1.274)	-29.47 (1.304)	45.60 (2.051)	-32.70 (1.400)	5.30 (0,354)	-30.80 (1.31)
school1	-5588 (2.256)	-5783 (2.351)	-5719 (2.339)	-5943 (2.399)	-5532.58 (2.262)	-2315.7 (0.882)	3230 (1.444)	2418 (0.919)
school2	-1588 (0.878)	-1267 (0.695)	1330 (0.722)	-975.8 (0.544)	-1213 (0.736)	892.22 (0.646)	2573 (2.371)	1053 (0.759)
$Adj.R^2$	0.964	0.964	0.0964	0.0964	0.9645	0.9728	0.9821	0.9727

Notes: Dependent variable is the total number of employed and unemployed workers with 15 or less years of schooling in the relevant state and year. Fixed state and year effects are included. The rest of the comments of Tables 5 and 6 apply.

To give an idea of the impact of these regulations on unemployment rates for different groups of workers Tables 8 and 9 report regressions of the unemployment rate of workers with 11 years or less of schooling and of workers with 12 to 15 years of schooling on the same variables used in the previous regressions. Higher replacement ratios appear to have a large impact on unemployment rates. However, this effect is at least partly due to the very large increase in labor force in response to the increased replacement ratios, and may also be related to the potential biases of regressions using the replacement ratios discussed earlier. The regressions with minimum wages therefore appear more reliable. These show that minimum wage hikes do not have a significant positive impact on unemployment. On the contrary, in many of the regressions, higher minimum wages appear to reduce unemployment. This is consistent with the results of Card and Krueger

(1995) and in terms of the theory presented above, it fits with the case of endogenous search effort where higher minimum wages may reduce unemployment by encouraging more effective search. Overall, together with the results of Tables 5 and 7, these findings suggest that increases in minimum wage may improve the composition of jobs without causing much unemployment.

Table 8: The Impact of Minimum Wages on Unemployment

	unem1	*unem1*	*unem1*	*unem1*	*unem2*	*unem2*	*unem2*	*unem2*
minw	-0.0390	-0.0395	-0.0307		-0.904	-0.8586	-0.2172	
	(2.965)	(2.730)	(2.140)		(1.653)	(1.504)	(0.374)	
minw(-1)		0.0001	-0.017	-0.015		-0.1335	-1.553	-0.0051
		(0.085)	(0.899)	(0.980)		(0.220)	(2.149)	(0.858)
minw(-2)			0.036				2.645	
			(1.732)				(3.047)	
dgdp	-0.419	-0.418	-0.404	-0.429	-0.266	-0.267	-0.257	-0.2698
	(7.523)	(7.464)	(7.248)	(7.570)	(10.73)	(10.55)	(10.343)	(10.64)
pfemale	0.0004	0.0004	0.0006	0.000	-0.002	-0.0002	-0.0001	-0.001
	(0.342)	(0.347)	(0.512)	(0.671)	(0.366)	(0.382)	(0.076)	(0.221)
pblack	0.0007	0.0007	0.0007	0.0007	0.001	0.001	0.001	0.0010
	(0.796)	(0.799)	(0.790)	(0.753)	(2.296)	(2.289)	(2.285)	(2.270)
school1	0.292	0.291	0.284	0.280	0.292	0.292	0.2874	0.290
	(2.717)	(2.699)	(2.635)	(2.559)	(5.304)	(5.311)	(5.190)	(5.271)
school2	0.251	0.252	0.258	0.272	0.103	0.102	0.1074	0.106
	(2.639)	(2.638)	(2.736)	(2.824)	(2.311)	(2.266)	(2.412)	(2.363)
$Adj. R^2$	0.681	0.680	0.682	0.676	0.806	0.805	0.809	0.805

Notes: Dependent variables are given at the top of the columns. *Unem1* is the unemployment rate of workers with 11 years or less of schooling, *Unem2* is the unemployment rate of workers with schooling between 12 and 15. The rest of the comments of Table 5 apply. In particular, state fixed effects and year dummies are included.

Table 9: The Impact of Replacement Ratios on Unemployment

	unem1	*unem1*	*unem1*	*unem1*	*unem2*	*unem2*	*unem2*	*unem2*
rep	14.53	1.758	7.979		6.507	4.785	6.560	
	(1.841)	(0.172)	(0.760)		(2.220)	(1.241)	(1.594)	
rep(-1)		26.67	4.659	26.47		3.656	-2.161	7.181
		(1.871)	(0.329)	(2.671)		(0.892)	(0.422)	(2.142)
rep(-2)			26.36				6.505	
			(2.711)				(1.556)	
dgdp	-41.53	-41.54	-45.81	-41.53	-26.39	-26.16	-26.87	-26.13
	(7.249)	(6.477)	(6.633)	(6.38)	(10.95)	(9.575)	(9.212)	(9.534)
pfemale	0.133	0.093	0.0751	0.0917	0.0080	-0.018	0.0116	-0.0235
	(1.085)	(0.754)	(0.588)	(0.735)	(0.155)	(0.342)	(0.212)	(0.443)
pblack	0.0205	-0.002	-0.0931	-0.0008	0.0798	0.031	0.0431	0.0349
	(0.223)	(0.020)	(0.767)	(0.008)	(1.652)	(0.609)	(0.793)	(0.677)
school1	28.09	26.67	28.88	26.60	29.15	22.78	16.27	22.60
	(2.590)	(2.225)	(2.100)	(2.214)	(5.291)	(3.70)	(2.645)	(3.681)
school2	28.82	22.25	25.90	22.36	11.20	7.056	3.607	7.348
	(3.004)	(2.095)	(2.181)	(2.116)	(2.549)	(1.536)	(0.807)	(1.592)
$Adj.R^2$	0.6786	0.6535	0.6635	0.6542	0.8068	0.7694	00.774	0.7693

Notes: See Notes for Tables 6 and 8.

4.5. Other Measures of Job Quality and Robustness of Results

The dependent variable which is the proportion of bad and good jobs is a new variable that I constructed for the purposes of this paper, and I had to choose the cut-off between different groups of jobs arbitrarily. Thus, the robustness of results to other measures of job quality needs to be investigated. The first measure I look at is an index calculated from the dummies reported in Table 3 and Figure 4.1. This index, denoted by *index,* is equal to the sum of employment share of occupation i multiplied by the value of the dummy of occupation i in Table 3 summed over all the occupations.[22] Therefore, variations in this index across

[22] Let ω_i be the value of the dummy for occupation i from Table 3, and e_{ist} be the number of the (non-college graduate) workers employed in occupation i in state s at time t divided by the total non-college graduate labor force in state s at time t. Then the value of the index in year t and state s is given as:

$$index_{st} = \sum_i \omega_i e_{ist}$$

years and states come purely from variations in the composition of employment, and this index summarizes the changes in the whole distribution of employment without arbitrary divisions. Results using this index are reported in Table 10. For brevity, only a subset of the results are reported. Again the quality of jobs appears to improve substantially with higher minimum wages and replacement ratios.

The second measure I consider is labor productivity and the growth in labor productivity in a given state and year. These measures have the advantage that they are not constructed for the purposes of this paper. Results are again reported in Table 10, and to control for differences in human capital the ratio of high school graduates and high school dropouts in employment (rather than in the labor force as before) are included in the regressions. The results indicate that, as predicted by the theory of section 2, higher replacement ratios lead to higher average productivity and to faster productivity growth. The results are similar with minimum wages, but the impact of minimum wages on the level of productivity becomes significant only after two years. This is likely to be due to the fact that the introduction of a minimum wage is initially associated with an increase in employment.

Table 10: Index of Job Quality and Labor Productivity

	index	index	prod	prod	Δprod	Δprod
minw	0.0119	0.0118	0.7516	1.577	0.0114	0.0143
	(2.694)	(2.202)	(0.832)	(1.546)	(1.411)	(1.411)
minw(-1)		0.0004		-1.705		-0.0031
		(0.097)		(1.662)		(0.312)
minw(-2)		0.0010		4.134		0.0315
		(0.301)		(3.486)		(3.198)
dgdp	0.0133	0.141	-16.70	-15.127	0.4030	0.4183
	(1.152)	(1.204)	(4.818)	(4.386)	(8.827)	(9.171)
pfemale	-0.0002	-0.0002	-0.3001	-0.268	-0.0016	-0.0013
	(0.757)	(0.707)	(5.314)	(4.722)	(2.931)	(2.341)
pblack	-0.0002	-0.0002	0.1712	0.1706	0.0009	0.0009
	(0.869)	(0.707)	(3.498)	(3.584)	(2.290)	(2.340)
school1	-0.1453	-0.1459	-5.648	-5.2180	-0.1386	-0.1380
or esc1	(5.308)	(5.295)	(0.927)	(0.872)	(2.218)	(2.293)
school2	-0.0090	-0.0083	-22.96	-20.81	-0.1471	-0.1255
or esc2	(0.370)	(0.337)	(-4.629)	(4.138)	(3.057)	(2.678)
$Adj.R^2$	0.0838	0.837	0.959	0.9613	0.6356	0.6474

Table 10 (continued)

	index	index	prod	prod	Δprod	Δprod
rep	0.399	0.0466	5.676	6.054	0.1302	0.1708
	(2.015)	(1.239)	(1.801)	(1.670)	(3.824)	(3.367)
rep(-1)		-0.0621		-6.55		-0.0039
		(-1.608)		(1.756)		(0.071)
rep(-2)		0.0411		7.128		-0.0231
		(1.750)		(2.544)		(0.504)
dgdp	0.0176	0.0250	-16.31	-17.70	0.4111	0.4165
	(1.532)	(1.902)	(4.693)	(4.770)	(9.119)	(7.680)
pfemale	-0.0003	-0.0003	-0.2987	-0.245	-0.0014	-0.0010
	(1.083)	(0.814)	(5.478)	(4.44)	(2.742)	(1.782)
pblack	-0.0003	-0.0005	0.1488	0.1225	0.0004	0.0003
	(1.421)	(0.154)	(2.866)	(1.764)	(1.068)	(0.613)
school1	-0.136	-0.1638	-4.083	-4.967	-0.1073	-0.0811
or esc1	(4.948)	(5.037)	(0.678)	(0.687)	(1.680)	(0.955)
school2	-0.0193	-0.0165	-23.04	-20.28	-0.1450	-0.1201
or esc2	(0.804)	(0.534)	(4.607)	(3.874)	(3.129)	(2.169)
$Adj.R^2$	0.8359	0.8323	0.9599	0.9606	0.6451	0.6475

Notes: In the regressions of productivity, the variables esc1 and esc2 which are used instead of school1 and school2. The difference is that these variables have total employment rather than total labor force in the denominator. The rest of the comments from Table 5 apply.

Finally, I also constructed measures using industry dummies rather than occupation dummies, and repeated the same regressions. The direction of the effects of minimum wages and replacement ratios is unchanged, but most of them are not statistically significant. This is in some sense not too surprising because the industrial composition of output is likely to have varied a lot during the sample period due to other reasons than the ones I am interested in (e.g. international trade and aggregate demand).

To conclude, the empirical work in this section lends support to the idea that the composition of jobs is endogenous, and is influenced by minimum wages and unemployment benefits.

4.6. Alternative Explanations

It is possible to construct alternative explanations based on competitive labor market models whereby minimum wages and unemployment insurance are purely distortionary measures. First, it is straightforward to explain the change in labor productivity and the decrease in the proportion of very bad and bad jobs. Minimum wages and unemployment benefits could be influencing the least productive workers, thus when these workers leave employment, average labor productivity could increase. Also to the degree that these jobs are counted as bad jobs according to my measures, the proportion of bad jobs would decline.

The finding which is more difficult to explain is that the proportion of good jobs (in the labor force, thus *the number of good jobs*) increases in response to minimum wages and more generous benefits. A possible explanation based on competitive labor markets would involve some factor of production which is scarce at the state level, e.g. capital or entrepreneurial talent. As minimum wages destroy bad jobs, the demand for this scarce factor declines and its price falls. This enables other sectors, i.e. good jobs, to hire more of this factor and thus create more employment. Different versions of this story could be constructed with different factors as the scarce one at the state level moving between jobs. However, most factors are *not* scarce at the state level; for instance, it cannot be argued plausibly that capital could play this role. In any case, the magnitude of the impact obtained in this section would require a very large swing in the price, or a rather large elasticity, and none of the scarce factors that we can think of fit this description. Therefore, although it is impossible to reject alternative explanations based on reallocation of some scarce factor within state boundaries, these explanations appear implausible.

5. Conclusion

This paper argues job composition is endogenously determined, and is highly responsive to labor market regulations. The key result is that in an unregulated equilibrium, there will be too small a proportion of good jobs and too many bad jobs. Minimum wages and unemployment benefits can improve this situation by encouraging workers to wait for better jobs, thus reducing the profitability of bad jobs. This shifts the composition of employment towards good jobs. A simple empirical exercise shows that the number of good jobs and labor productivity increase with higher minimum wages and more generous unemployment insurance.

The results in this paper have important policy implications. More empirical work is needed to reconfirm the findings of this paper with other measures and data sets, to better ascertain the magnitudes of the effects, and determine whether these forces should be incorporated into our policy calculations.

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6. Appendix A: Multiple Steady State Equilibria

In this appendix, I will construct an example of multiplicity to further illustrate the general equilibrium forces at work. In the model analyzed in the text, the general equilibrium impact of job composition on outside options created a force towards multiplicity, and the complementarity between the outputs of the two types of jobs created a force towards a unique equilibrium. To have a simple example, I will modify the model in the text and assume that good and bad jobs produce inputs that are perfect substitutes, only that there is a quality difference. Thus, $p_b = y_b$ and $p_g = y_g > y_b$.[23] This will accentuate the tendency toward multiplicity and enable me to explicitly construct two equilibria.

An Equilibrium With Good Jobs: First, let me characterize an equilibrium with good jobs only, that is $\phi = 0$. This implies that $w_g = \beta y_g$ and thus, the tightness of the labor market is determined as:

$$\frac{(1-\beta)y_g}{r+s} = \frac{k_g}{q(\theta_0)} \tag{6.1}$$

where I use the notation θ_0 to refer to the tightness of the labor market with $\phi = 0$. In this case we have:

$$rJ_0^U = \frac{z + q(\theta_0)\theta_0\beta y_g}{r + q(\theta_0)\theta_0}$$

Lemma 1. *If $k_b > q(\theta_0)\frac{y_b - \max\{rJ_0^U, \beta y_b\}}{r+s}$, then there exists a steady state equilibrium in which only good jobs are open, that is $\phi = 0$.*

Intuitively, no bad job will open if either bad jobs are not profitable enough or the wage expectations of the workers are sufficiently high — because they anticipate to get into good jobs.

[23] This version with good jobs costing more but also producing more could have been used an alternative model for the whole analysis. However, first, good jobs producing different products fits better with the empirical work which uses occupations. Second, as the analysis of this subsection will demonstrate because there is no 'decreasing returns' to a job type, the equilibria are corner solutions which makes the analysis less transparent.

An Equilibrium With Bad Jobs: Now consider $\phi = 1$. Then the zero-profit condition is that:

$$\frac{(1-\beta)y_b}{r+s} = \frac{k_b}{q(\theta_1)} \tag{6.2}$$

and

$$rJ_1^U = \frac{z + q(\theta_1)\theta_1\beta y_b}{r + q(\theta_1)\theta_1}$$

Clearly, $\beta y_g > rJ_1^U$; thus, it follows that:

Lemma 2. *$k_g > q(\theta_1)\frac{(1-\beta)y_g}{r+s}$, then there exists a steady state equilibrium in which only bad jobs are open, that is $\phi = 1$.*

Intuitively, when the cost of opening a job is sufficiently high relative to productivity of good jobs, there will only be bad jobs.

Multiple Equilibria: First, it is straightforward to see, using (6.1) and (6.2), that when $rJ_0^U < \beta y_b$, the condition in Lemma 1 and that in Lemma 2 cannot be simultaneously satisfied. However, the situation changes when $rJ_0^U > \beta y_b$; in this case, the condition for the equilibrium with $\phi = 0$ to exist can be written as:

$$\frac{k_b(1-\beta)y_g}{k_g} > \frac{ry_b - z + q(\theta_0)\theta_0\,(y_b - \beta y_g)}{r + q(\theta_0)\theta_0} \tag{6.3}$$

whereas the condition for the equilibrium with $\phi = 1$ to exist can be written as (using (6.2)):

$$\frac{k_b}{y_b} < \frac{k_g}{y_g} \tag{6.4}$$

Suppose (6.4) holds, and let us increase y_g while keeping $\frac{k_g}{y_g}$ constant, then the left-hand side of (6.3) is constant (and so is θ_0 from (6.1)), but the right hand side becomes smaller, hence (6.3) and (6.4) can be simultaneously satisfied. Thus:

Proposition 5. *If $rJ_0^U > \beta y_b$, then both a steady state equilibrium with $\phi = 0$ and one with $\phi = 1$ can coexist.*

The intuition for this multiplicity of equilibria is a good way of illustrating the general equilibrium effect, discussed in the text, which makes worker's acceptance decisions depend on the supply of jobs. When $\phi = 0$, the value of being unemployed rJ^U is low because there are no good jobs around, thus the outside option of workers does not bind, and bad jobs can hire workers at low wages. At these low wages, bad jobs are more profitable than good jobs, and no firm wants to open good jobs. In contrast, when $\phi = 1$, workers know that they can rapidly obtain a good job, and rJ^U is high, and this makes the outside option of a worker bind when he meets a bad job. This implies that a bad job will have to pay relatively high wages to be able to employ the worker (though still lower than good jobs), and at these relatively high wages, bad jobs are not as profitable as good jobs.

What about unemployment? It is straightforward to see that unemployment will be higher in the equilibrium with good jobs. This can be seen from (6.1) and (6.2): since (6.4) has to hold for a bad job equilibrium to exist, we immediately have that $\theta_1 > \theta_0$, thus $u_1 < u_0$, the unemployment rate in the good job equilibrium is higher, but also as discussed in the previous subsection, average labor productivity is higher in this equilibrium.

Corollary 1. *If there exist multiple equilibria, the equilibrium with bad jobs has lower unemployment rate but also lower average labor productivity.*

In general it will be impossible to say whether the good job or the bad job equilibrium has higher total surplus. As the previous subsection established, the composition of jobs is biased towards bad jobs, and this effect is completely avoided in the good job equilibrium. However, depending on the value of β (recall the discussion above and Hosios, 1990), job creation may also be too low, and thus the equilibrium with good jobs which has higher wages and unemployment could end-up with lower welfare. To understand this, recall that there are two externalities counteracting each other. First, as emphasized above, when a firm opens a bad job rather than a good job, it does not take into account that with a good job, the worker would have obtained higher wages, and higher utility, in other words, the firm does not create enough *rents*. The other externality is the *outside option effect*: when a firm opens a good job and we have $rJ^U > \beta y_b$, it is pushing up the wages that firms opening bad jobs have to pay, and this discourages job creation. Which equilibrium has higher output depends on which of these two externalities, the rent creation or the outside option effect, dominates. The higher is y_g relative to y_b, the stronger is the rent creation effect, and therefore, the more likely is the bad job equilibrium to be more inefficient.

Finally, it can be seen that labor market regulations work very similarly. The higher is z, the more likely is (6.3) to hold, and thus the more likely is a good job equilibrium to exist. Also similarly, if a minimum wage w_M is imposed higher than βy_b, bad jobs will be forced to pay higher wages and good jobs will be unaffected, thus creation of bad jobs will be discouraged. Therefore, both higher unemployment benefits and minium wages encourage the creation of good jobs. Moreover, in this case, the general equilibrium aspects of such policy intervention can be seen most clearly: a more generous unemployment benefit does not just create a few more good jobs, but by increasing rJ^U, it makes an equilibrium with only good jobs possible.

7. Appendix B: Local Dynamics

The text characterized how the steady state responded to changes in labor market regulations. This is not necessarily how the economy will respond to a change in policy starting from a steady-state: in other words, there will be some transitory dynamics. This Appendix analyzes local transition dynamics, and shows that basically ϕ and θ, the variables of interests immediately, jump to their new steady state values.

Start by observing that even out of steady state, free-entry imposes that $\dot{J}_i^V = J_i^V \equiv 0$. Then equation (2.6) implies that $q(\theta)J_i^F = k_i$ at all points in time. Then, differentiating this equality with respect to time:

$$\dot{J}_i^F = -\frac{\dot{\theta} q'(\theta) J_i^F}{q(\theta)} \tag{7.1}$$

Now using (7.1) to substitute for $\dot{J}_i^F$ in (2.2) and rearranging, I obtain:

$$\frac{\dot{\theta}}{\theta} = \frac{[k_i - q(\theta)\,(p_i - w_i)]}{\eta(\theta) k_i} \tag{7.2}$$

where $\eta(\theta) = -q'(\theta)\theta/q(\theta)$ is the elasticity of the function $q(\theta)$ which lies between 0 and 1 by the assumptions are made on the matching function $M(u, v)$. The first implication of this equation is that:

$$\frac{p_g - w_g}{k_g} = \frac{p_b - w_b}{k_b} \tag{7.3}$$

Therefore, at all points in time, ϕ will adjust so that the per period profit relative to creation cost from a bad job is equal to that from a good job. This finding is also quite intuitive. Since firms are free to choose ϕ, if good jobs are more profitable, they will not open bad jobs, thus in equilibrium, the profit levels from the two types of jobs, and the prices of the two goods will be aligned. [24]

Then the local dynamics of the system are described by (7.2). Note that in steady state, $k_i = \frac{p_i - w_i}{q(\theta)}$, thus $\dot{\theta} = 0$. Now, if the numerator of (7.2) is positive which corresponds to the costs of creation being too high, then $\dot{\theta} > 0$. Conversely, when the numerator is negative which implies that job creation is profitable, then $\dot{\theta} < 0$. Thus, the adjustments of θ will not take the system back to steady state. Since θ is a non-predetermined variable, this implies that along the adjustment path, the economy should have $\dot{\theta} = 0$, thus after a change in one of the exogenous variables (e.g. z), θ should immediately jump to its new steady state equilibrium level. Then, from (7.3), ϕ will also immediately jump to the new steady state. The only variable to adjust slowly is u which has the dynamics described by (2.8). But because the system is block recursive, the dynamics of the other variables are independent of u. Therefore, after a change, say in z, θ and ϕ will immediately jump to their new equilibrium levels and not change from thereon, and u will slowly adjust to its new level.

8. Appendix C: Data Description and Sources

The data used in this paper come from four different sources. Minimum wages are the May minimum wages in effect in each state in the given year. These data were obtained from Madeline Zvodny, and detailed description can be found in Zvodny (1996). The variable used in the analysis *minw* is the nominal state minimum wage (in May) divided by the national CPI.

As described in the text, the replacement ratio is obtained from the simulation program developed by Jonathan Gruber (Gruber, 1994, Bruber and Cullen, 1996). The standard person we used in all states is married, with one child, no other family income, works 4 hours per week. I also used 12 working weeks per quarter and 48 working weeks per year. For Michigan, the program needs a tax rate and this was set at 25%. As the wage rate, I was the mean of *very bad* occupations in that year across all states.

All the CPS variables are obtained from Annual Earnings File National Bureau

[24] There is one exception. If there was a *large* change, then for a limited period of time, this inequality would be violalted and all firms would open the same type of job, hence the word 'local' in the subsection title.

of Economic Research 50 Uniform Extract, 1979-1993. Only individuals between the ages of 18 and 60 who are employed, unemployed or temporarily out of work are used, and who are between the ages 18-64 are used. Additionally, all workers who report an hourly wage (or the equivalent) above $100 and less than $1 are excluded as outliers. As the wage variable, the hourly wage for workers paid hourly is used. For other workers, it is weekly earning divided by the hours worked per week.

Finally, in line with the interest of the paper, all workers with schooling more than 16 years are excluded from the sample. *laborforce* is defined as the number of workers who are employed and unemployed (looking and with a job but not at work) with less than or equal to 15 years of schooling within a given state. *union* is a dummy which takes the value 1 for union members and 0 otherwise. *black* takes the value 1 for blacks and 0 otherwise. *female* takes the value 1 for female and 0 otherwise. *experience* is defined as age – grade attended – 6.

pfemale, pblack are respectively the proportion of females and blacks (with less than or equal to 15 years of schooling) in the labor force (of workers with less than or equal to 15 years of schooling) in the corresponding state and year. *School1* is the proportion of workers with less than or equal to 11 years to schooling in the total labor force (including those with more than 15 years). *School2* is similarly, the proportion of workers with schooling between 12 and 15 years in the total labor force (including those with more than 15 years). The reporting of educational qualifications changes in 1992-93 to a new variable *grade92* rather than *gradeat* which reported the final grade attended. I converted this variable as follows: *grade92*$\leq$ 37 corresponds to less than 11 years of schooling. 37 < *grade*92 $\leq$ 42 corresponds to between 11 and 15 years of schooling. *grade92*> 47 corresponds to more than 16 years. Running the regressions with sample restricted to 1983-91 does not change the results.

The variables *very, bad* and *good* which are the number of workers with less than or equal to 15 years of schooling in the respective occupation group divided by *laborforce* in that year and state.

The *dgdp* variable is the change in total personal income (rather than gross state product as this was not available for 1992-93). *labor productivity* is defined as total personal income divided by total wage and salary employment. These variables are obtained from *Bureau of Economic Analysis, U.S. Department of Commerce.*

The occupation categories used in the analysis are as follows together with the 1980 Census three digid occupation codes that correspond to each group:

Administrators: 3 to 18
Managers: 19
Accountants: 23
Related Management: 24 to 37
Engineers: 43 to 63
Math and Computer: 64 to 68
Natural Sciences 69 to 83
Health Occupations: 95 to 106
Teachers: 106 to 165
Social Speciality Occupations: 166 to 177
Law: 178 and 179
Artists and Athletes 183 to 199
Health Technicians: 203 to 208
Engineering Technicians: 213 to 218
Science Technicians: 223 to 225
Mechanical Technicians: 226 to 229, 233, 235
Legal Assistants: 234
Sales Supervisors: 243
Sales Finance: 253-257
Sales Engineering: 263-275
Sales Workers: 258-259
Cashiers: 276
Door-to-door Sales: 277-278
Other Sales: 283-285
Administrative Supervisors: 303-307
Computer Engineering: 308-309
Secretaries: 313-315
Information Clerks: 316-323
Record Clerks: 325-336
Financial Clerks: 337-344
Mail Machine Operators: 345-347
Communication Operators: 348-353
Postal Employees: 354-355
Other Mail Employees: 356-57
Material Clerks: 359-374
Adjusters: 375-378
General Office Clerks: 379-389

Private Services: 403-406
Servants: 407
Protective Services: 413-427
Food Services: 433-444
Health Services: 445-447
Cleaning: 448-455
Personal Services: 456-469
Farm Operators: 473-476
Farm Occupations: 477-484
Other Farm: 485-489
Forestry and Fishing: 494-499
Mechanical Supervisors: 503
Auto Mechanics: 505-517
Industrial Machine Repair: 518-519
Electerical Machine Repair: 523-534
Other Repair: 535-549
Supervisor Construction: 553-558
Construction Trade: 563-599
Extractive Occupations: 613-617
Supervisor Precision Products: 633
Precision Metal Work: 633-655
Other Precision 656-699
Metal Working: 703-725
Woodworking: 726-733
Printing: 734-737
Textile Machine Operators: 738-749
Other Machine Operators: 753-779
Assemblers: 783-795
Production Inspectors: 796-799
Truck Supervisors: 803
Truck Drivers: 804-805
Other drivers: 806-814
Construction Laborers: 869
Handlers: 875-883
Vehicle Service: 885-887
Hand Packers: 888
Non-construction Laborers: 889