

Minimum Wage Laws and Unemployment Benefits, when Labor Supply is a Household Decision

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Abstract

If people's labor-supply decisions are taken at the level of the household, it is natural to expect aggregate demand and unemployment to influence the supply curve of labor. An increase in unemployment could prompt households to send more workers out in search of work to insure against the risk of the primary worker getting unemployed (the "added worker effect"). But it could also discourage people from wasting energy searching for work (the "discouragement effect"). The present paper presents a number of surprising results that arise when the first effect dominates, such as the possibility of multiple equilibria in the labor market and how the announcement of a minimum wage policy can result in an overall lowering of wages and also give rise to an equilibrium which displays, simultaneously, excess demand and excess supply of labor. The model shows how the empirical literature may have a bias in overestimating the strength of the discouragement effect. It also provides a framework for analyzing the effects of minimum wage policy and the provision of unemployment benefits. It is argued that *certain* kinds of unemployment benefits can be justified on grounds of *efficiency*.

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1. INTRODUCTION

In economics textbooks one learns to derive supply curves and demand curves in separate chapters. Such compartmentalization, however, renders the textbook model of markets unusable in many domains of real life in which demand and supply turn out to be interdependent. As early as 1950, Harvey Leibenstein, motivated by Thorstein Veblen's classic **The Theory of the Leisure Class**, had noted that, for many goods, a fall in supply may boost demand because there is "snob value" in being able to have what others cannot.

Nowhere is this interdependence more important than in labor markets. This happens because in labor markets each household takes decisions for several individuals, and within each household there occurs a certain amount of cooperation and consumption sharing. Suppose aggregate demand for labor falls. It is then quite natural to expect that a household which had thus far kept its women and children out of the labor force may now send them out in search of work to provide 'insurance' against the risk of the adult male members becoming unemployed. On the other hand, a lower likelihood of finding a job may discourage some potential workers from searching for work. The aim of this paper is to demonstrate how in the presence of these effects standard labor market policies may give rise to paradoxical market response.

It is easy for labor market policy debates to get polarized between those who argue for leaving it all to the market and those who see little role for the market. In the spirit of Mrinal Datta Chaudhuri's important paper (1990), we show how market incentives need to be blended with government action and forward the unusual argument that it is possible to justify unemployment benefits purely on grounds of efficiency, that is, even without having

to go into issues of equity.

The fact that an increase in unemployment can cause an increase in labor supply, thereby exacerbating the unemployment problem, has long been known. It is called the "added worker effect". From the forties till recent times, numerous empirical studies have investigated the effect of unemployment on labor supply. But the theoretical foundations of these works have not been spelled out adequately. As a consequence some very natural implications of the added worker effect seem to have gone unnoticed in the literature. Assume, as seems natural, that a greater likelihood of unemployment (for instance, among adult males) prompts women and children to join the labor force. Now start from a full-employment situation, with wage at some level, say w . It is shown in the paper that, if a legal minimum wage is announced at some wage rate \hat{w} , which is below w , then market wage can fall from w to \hat{w} and this can give rise to unemployment. Conversely, the abolition of a legal minimum wage can cause the market wage to rise. Moreover, a rise in the legal minimum wage can actually lead to a fall in unemployment despite the model being that of competition.

At first sight such results may seem academic, for we may wonder why governments would ever impose a legal minimum wage below the prevailing market wage. In reality labor markets are often segmented, with different wages prevailing in different markets – for instance, agricultural wages may be lower than the wages that prevail in the manufacturing sector. Suppose that in some fringe sector wage happens to be low. Now, minimum wage laws are typically used to boost wages in such "depressed" sectors. So a legal minimum wage below the wage that prevails in the main labor market but above the wage in the fringe market is not at all uncommon. This is obviously true for countries, such as the United

States, where there is a unique minimum wage that applies to all sectors. But even when that is not the case and the minimum wage is made sector or region specific it is arguable that there is so much variation in any real economy that even within a single sector or region there will be sub-segments of the labor market where the free market wage exceeds the legal minimum wage, as is in fact the case in India. In addition, our analysis also applies to models where the wage rigidity comes from an endogenous efficiency wage argument, instead of a legal minimum wage. For this reason we believe that the effect we are writing about is likely to be important in reality.

The plan of the paper is as follows. In Section 2, we recapitulate some of the related literature and empirical findings. Section 3 presents the model and establishes the paradoxical result concerning the effects of minimum wage legislation. In Section 4, we investigate other extensions and policy implications of our such as how giving unemployment benefits can increase *efficiency*.

2. THE BACKGROUND

The effect of one person's employment status on the decision of other members of the household to look or not look for employment was recognized and attempted to be measured by Woytinsky (1940a, see also 1940b). In the words of Humphrey (1940, p. 412), what Woytinsky was getting at was "the familiar story of the head of the family losing his job whereupon his wife and children also start looking for work so that two or more persons appear to be unemployed and are reported to be unemployed by most censuses".

Starting with this exchange in the forties, this topic became a subject of considerable empirical investigation and debate (see, for instance, Mincer, 1962; Belton and Rhodes,

1976; Ashenfelter, 1980; Layard, Barton and Zabalza, 1980; Bardhan, 1984; Lundberg, 1985; Maloney, 1987, 1991; and Tano, 1993). This effect, of one person's (the 'primary' worker) unemployment, or potential unemployment, prompting other family members (the 'secondary' workers) to seek work, came to be known as the 'added worker effect'.

Economists subsequently went on to argue about an opposing force, which has come to be called the 'discouragement effect'. This is the response of potential workers losing hope and ceasing to search for jobs, when they see a lot of unemployment around them. The strength of these two effects is a matter of debate.

The empirical results are mixed. There seems to be some consensus, or at least a majority opinion among those involved in empirical research in this area, that the discouragement effect is very strong and frequently offsets entirely the added worker effect. Tano (1993) for instance finds that both effects are significant and coexist (see also Humphrey, 1940; the discussion in Layard et al., 1980; and Maloney, 1991). However there is reason to believe that the empirical literature has tended to underestimate the added worker effect. Cullen and Gruber (2000) point out that the previous studies have ignored the potentially important role of the unemployment insurance program. Looking explicitly at this issue, they find that unemployment insurance significantly reduces the labor supply of family members during the unemployment spell. Moreover most studies investigate the effect of actual unemployment of husbands on the actual employment of women. First, it is important to realize that a more meaningful approach is to investigate the *desired* hours of work of the wife, since the wife's actual employment may also be affected by the increase in unemployment (that is, she may not be able to actually find work). Once this is done, the results can already look different. Maloney (1987), for instance, using reported data on

underemployment finds a significant added worker effect. Second, the added worker effect does not arise solely because of *actual* unemployment of the primary worker, but might be a response to the worsening job *prospects* of the primary worker. It is on the former that most empirical studies have been in effect focusing. A major conceptual difference between our model and the standard literature is that we emphasize the households' and their secondary workers' response to the worsening job *prospects* of the primary worker.¹

One way to empirically differentiate between the two would be to take two points of time where macro unemployment rates are significantly different. Then by focusing on households for which the primary worker's status is unchanged between these two time periods, we can check if there is a systematic change in the labor supply of the secondary workers of these households. Note that, it is in this spirit that Lundberg (1985) studies the effect of employment uncertainty and credit constraint in creating short-run participation and employment patterns. The estimates are based on employment transition probabilities rather than static measures of labor supply and the results show a small but significant added worker effect.

Finally, we shall show below that once a theoretical model of household supply response is constructed, we could add plausible features to it which can explain why the added worker effect can create an empirical illusion of there being a discouragement effect. In reality we would expect both effects (added worker and discouragement) to be present, but our analysis explains why the discouragement effect may appear larger than it actually is.

Surprisingly little has been written on this specific topic theoretically. An early attempt is Ashenfelter (1980) that analyzed the comparative static effect of one person's

labor supply being constrained on another household member's supply. This paper fits into the growing literature emphasizing the inter-dependence of decisions within households. For instance, in Basu and Van (1998) and Basu, (1999) the effect of adult labor market conditions on the incidence of child labor is analyzed, using a model of household-based decision making.

This paper builds on the results in Basu, Genicot and Stiglitz [2002], which tries to explicitly model the added-worker and discouraged-worker effects, and show why the discouragement effect may be, in part, illusory. The present paper highlights some paradoxical results that arise in the presence of this effect, and relates these ideas to other areas of research such as efficiency wage and inflation, unemployment benefits, and race and gender issues.

3. MINIMUM WAGE AND UNEMPLOYMENT

Let the aggregate demand for labor be the usual downward-sloping function of wage, w , denoted by $D(w)$. What we want to focus on is the 'supply curve'. Let us consider an economy with h households, each household i consisting of m potential workers. When we want to be explicit about the sex and age of the workers we will think of person 1 in each household as the adult male, person 2 as the adult female, and the rest as the children. In case this is a society where children do not work, we may think of a household's members 3, 4, ..., m as the children who are above 16 years of age.

Recall how the textbook supply curve of labor is derived. We take the market wage, w , to be arbitrarily given and make the household do a maximization exercise and work out the household's labor supply. There is an implicit assumption in such an exercise. The

assumption is that a person who supplies his or her labor gets to work. This assumption becomes unrealistic if there is unemployment in the economy. It is for this reason that some economists have worked out the household's supply, taking as given the fact that some members may be supply-constrained.

We shall proceed in the same spirit but conceive of a different model. We shall assume that the level of unemployment in the economy is public knowledge. If the unemployment rate (expressed as a fraction) is u , then we shall take $1 - u = p$ to be the probability of each worker finding a job. Let us assume that this is the same for those who are currently employed and those who are currently unemployed. This assumption is used in the well-known Harris-Todaro model (Harris and Todaro, 1970) and corresponds to a search model with random matching and short-term employment. If we think of this as a casual labor market with large turnover then this is not an unrealistic assumption. If a fraction p of all those supplying their labor currently find jobs, it seems reasonable to suppose that each worker treats p as the probability of being employed in the next period. We shall assume that just as each household is a wage-taker, each household is a p -taker (that is, it ignores the effect of its own decision on the aggregate unemployment rate in the economy). This being so it is quite reasonable to suppose that individual labor supply decision will depend on w and p (and not only on w). This is especially so when decision making occurs at the level of the household. For ease of thinking, let us suppose each person sees w and p and then has to decide (even if this is a household-based decision) whether to supply his or her labor or not.

It seems reasonable to suppose that if p is low, the household faces a genuine risk of the primary worker not finding a job. It is then reasonable for some of the other members of the household to supply their labor as well (so as to minimize the risk of the household being

left with no one employed).

In this economy each worker is endowed with one unit of labor and has a disutility of labor equal to c . If the total income of the household is Y and the total effort expended by the household is C , then the household's utility, we will assume, is given by $V(Y) - C$, where $V' > 0$, and $V'' < 0$. Hence, if e household members are employed and earn a wage w , the household derives a welfare $V(ew) - ec$ from this employment. In addition there is a sunk cost of θ per person associated with searching for work and we assume that to find work search is a necessary prerequisite. This cost θ can originate from neglected housework, the costs of registering at an agency and subscribing to newspapers and employment gazettes, or acquiring some basic skills such as word processing. These are sunk costs because if one does not find the job one is looking for, the costs cannot be recovered. Assume that turning down an offer (after registering with the employment exchange) is possible but entails a cost of $d(\geq 0)$ units to the household. Let $W(n,p,w)$ denote a household's expected welfare where n is the number of persons who supply labor (that is, search for jobs), p is the probability of each person finding employment and w is the market wage. With this in mind, and using $\pi(k|n,p)$ to denote the probability of k persons finding work (when n go out searching) and p the probability of each person finding work, we have

$$W(n, p, w) = \sum_{k=0}^n \pi(k|n, p) \max_{t \leq k} [V(tw) - tc - (k - t)d] - n\theta \quad (1)$$

where $\pi(k|n, p)$ is the probability of receiving k offers,² and $t \leq k$ is the number of these offers that are accepted. The household's problem is to choose $n \in \{0, 1, \dots, m\}$ so as to

maximize (1). Let the household's choice be denoted by $s(w,p)$. That is,

$$s(w,p) = \arg \max_n W(n,p,w).$$

Hence, the aggregate supply of labor is given by $S(w,p) = hs(w,p)$.

In Basu, Genicot and Stiglitz (2002), we identify a class of models where the added worker effect is invariably present. Whenever $d \geq c$, such that a worker who applies for work never turns down an offer, then

$$S(w,p) \leq S(w,p') \quad \text{for all } 0 < p' < p \leq 1 \quad (2)$$

[Theorem 1 in Basu, Genicot and Stiglitz (2002)]. Assuming that the aggregate supply is continuously differentiable, it means that

$$\frac{\partial S}{\partial p}(w,p) \leq 0 \quad (3)$$

We also show that once transactions or sunk costs are allowed $\frac{\partial S}{\partial p}$ can be positive, thereby creating a general model which can explain both the added worker effect and the discouragement effect.

The textbook supply curve of labor is the relation between w and S when $p = 1$. Figure 1 shows this curve as OA . We do not insist on any particular shape for this. If we want to think of this as perfectly inelastic (with only adult males working) it will be a vertical straight line. If we believe supply curves bend backwards at high wages, we could build that into our model.

[Figure 1 here]

Next note that, for each $p \in [0,1]$, we can draw a supply curve $S = S(w,p)$. We shall call each such curve a "quasi-supply curve" or "p-supply curve". Figure 1 illustrates a

family of p-supply curves. If we wanted to model the discouragement effect of unemployment, we would take $\frac{\partial S}{\partial p} > 0$ and so, as p fell, the p-supply curves would move left. If we believed that for low wages the added worker effect is dominant and for high wages the discouragement effect dominates, we would have the p-supply curves intersecting one another. Let us however, for now, go along with the assumption $\frac{\partial S}{\partial p} \leq 0$.

Our aim now is to construct the "actual (aggregate) supply curve" from the p-supply curves. This will, interestingly, depend on the nature of the demand curve, thereby illustrating our initial observation regarding the inter-dependence of demand and supply.

Let the demand curve, $D(w)$, be as shown in Figure 2. Now, given any point on any p-supply curve, we can easily work out the rate of employment that will actually come to prevail. Suppose for instance, we are at point b. Then labor supply is $\hat{w}b$ and (given the wage implicit at b) labor demand is $\hat{w}k$. Hence the rate of employment or probability finding a job is given by $\frac{\hat{w}k}{\hat{w}b}$. Note that b is a point on the p'-supply curve. Hence, if $\frac{\hat{w}k}{\hat{w}b}$ is not equal to p', labor supply can never occur at b.

By this reasoning, note that the probability of finding work at point a is 1 and at point C it is 0 (since demand for labor at C is zero). It follows that when we move from a to c along the p'-supply curve there must occur (given the continuity of the demand and p'-supply curve) some point where the probability of finding work is exactly equal to p'. If the demand curve is downward sloping and the quasi-supply curve upward sloping (and one of these strictly so), then this happens at a unique point of each p-supply curve where $p < 1$.

Let us assume that for the p' -supply curve this happens at b . That is, $\hat{w}_k / \hat{w}_b = p'$. We could then think of b as a point on the actual supply curve. It is a point that satisfies rational expectations. Suppose the wage happens to be \hat{w} . If all workers expect the rate of employment to be p' , then their supply would be such that the expectation is confirmed.

[Figure 2 here]

If on each quasi-supply curve we pick the point that satisfies rational expectation and join up such points what we get is the actual aggregate supply curve of labor. Let the thick line going through 0 and b be such a curve.

It may be worthwhile explaining why the aggregate supply curve coincides with the 1 -supply curve (that is the p -supply curve corresponding to full employment) to the left of the demand curve. This is because at any such point, for example, e , demand for labor exceeds supply and so the rate of employment is 1 .

Let us now demonstrate some of the paradoxical results that this model gives rise to. Suppose DD' in Figure 2 represents the demand for labor. If wages are fully flexible, then E represents the only point of equilibrium. The wage is w^* and demand equals supply. Now suppose government enacts a minimum wage law and sets the legal minimum wage at \hat{w} . Since $\hat{w} < w^*$, standard economics would lead us to expect that this cannot possibly have any impact (Mincer, 1976; Ashenfelter and Blum, 1976). But in this model, where there are added worker effects, this legal intervention can have significant consequences.

Observe that if wage were at \hat{w} , there are three levels of supply that would satisfy rational expectations. These are \hat{w}_e , \hat{w}_b , and \hat{w}_z . Suppose \hat{w}_b is the supply that actually occurs. Then supply exceeds demand and so wages have a tendency to fall, but the law will

not allow it to fall. So the wage persists at \hat{w} and there is open unemployment. So point b depicts an equilibrium. Point e does not depict an equilibrium because, though it satisfies rational expectations, at e there is excess demand for labor and so wage would rise. By this same logic point z depicts an equilibrium. Of course the earlier equilibrium at E is still available. In other words, the minimum wage law gives rise to multiple equilibria and, in particular, a legal minimum wage, imposed at a level below the prevailing market wage, can result in a fall in the wage. Note that among b and z, b is an unstable equilibrium. A small rise in unemployment at b will result in more unemployment and the equilibrium would finally settle at z which is a stable equilibrium.

Let us now check what happens if the minimum wage is set above w^* , for instance at \bar{w} . Standard theory would predict an unemployment level of fg. But supply occurs at point g only if the probability of finding work is one. As soon as there is unemployment, supply will begin to change. Hence, our model predicts an unemployment level of fh.

Another interesting result arises if this model is combined with an efficiency wage model. Consider either a labor turnover model or a Leibensteinian model (Leibenstein, 1957; Mirrlees, 1975; Stiglitz, 1974, 1976; and Fehr, 1986) in which a worker's productivity happens to depend on his wage, ignoring for now the fact that a part of this wage may go to feed other members of the household. The latter is discussed in Genicot (1998). We will, later in the paper construct a model which combines a model of household decision making, as discussed above, along with a theory of endogenous wage rigidity of a fairly standard kind. Let us for now suppose that the efficiency wage is at \hat{w} , and the aggregate demand for labor is $\hat{w}k$. For wages above \hat{w} , aggregate labor demand is given by the line Dk.

Let us suppose the supply conditions are as shown in Figure 2. Thus the standard

textbook supply curve is given by OA. Our first expectation may be that, since at the efficiency wage labor demand exceeds $\hat{w}e$, wage will rise above \hat{w} , the efficiency wage, and there will be no involuntary unemployment. However, in our model, wage may persist at \hat{w} with unemployment equal to kb or, more likely kz. Of course at this wage, workers will be willing to work for a lower wage, but employees will not accept such offers.

It should also be transparent that the aggregate supply curve of labor depends on the nature of the demand curve. To see this, suppose the wage is fixed at \hat{w} (Figure 3) and the economy is at the equilibrium A. Consider a drop in the labor demand from D_1 to D_2 . To \hat{w} corresponds a labor demand ℓ smaller than k. Hence A no longer belongs to the actual aggregate supply curve since $\frac{\hat{w}\ell}{\hat{w}A} < \frac{\hat{w}k}{\hat{w}A} = p$. The point on $S(w,p)$ which will translate in an actual probability of finding work of p is now A'. It is easy to check that a fall in demand will result in the supply curve moving down (everywhere to the right of the demand curve). Starting from A, a decrease in the demand worsens people's expectations about the likelihood of finding a job. In response they will increase their labor supply causing the unemployment to rise by more than the fall of demand and the economy will settle in a new equilibrium B.

[Figure 3 here]

4. UNEMPLOYMENT BENEFITS

Turning now to another important labor policy, we shall in this section study the effect of unemployment benefits on the kind of equilibrium obtained in the labor market.

Suppose in Figure 2 the wage has a floor at \hat{w} . This can be because there is a

minimum wage law or because \hat{w} happens to be the efficiency wage. The exact explanation does not matter for our purpose here. There are then three possible equilibria--at points E, b and z. Let us check on the welfare properties of these equilibria. Clearly, given that this is a competitive market, the equilibrium at E is the most efficient. At b and z there is greater output but this is caused by workers working excessively, for fear of unemployment. The household's welfare is the highest at E, since there is full employment and the wage is higher. Between the two other equilibria, our conjecture is that b dominates z.³ Output and employment are the same at b and z, but there is more unemployment at z. As we switch to a more general formulation, where costs of effort vary across individuals, z becomes even more welfare dominated by b. The reason is that more people supply labor at z than at b. This means that, at z, workers whose effort is more costly supply labor. So a random selection of workers at z will contain more of these inefficient (in the sense of high cost) workers than a random selection at b. So the expected effort cost at z is more and so this accentuates the welfare difference between both equilibria. Since z is the stable equilibrium and b is unstable, this is a worrying consequence of the added worker effect. In the absence of the added worker effect the equilibrium would move to E. This raises the question whether we can devise policies that counteract the tendency of workers to oversupply labor.

Since the oversupply is a consequence of the workers fearing that their household will be left without adequate employed members, any policy that combats this risk should improve matters.⁴ An obvious candidate is a safety net for the unemployment. We shall here study a safety net at the level of the household, since it is the *household-level efficient decision making* which is the source of the problem (whether decisions are taken at by a unitary household or efficient bargainers). If this is properly designed the safety net may

seldom have to be used. It is its mere presence that can change household behavior favorably. So it need not cause any fiscal strain.

To see formally how this works, suppose that the government guarantees an income of G for each household. So any household whose income drops below G is given enough unemployment benefit for the household to consume G . If we use \tilde{W} to denote a household's expected welfare, then following a notation similar to that used in Section 2, and staying for simplicity with the special case, where $d \geq c$, we may write

$$\tilde{W}(n, p, w, G) = \sum_{k=0}^n \pi(k|n, p) V(\max\{kw, G\}) - npc$$

Given p , w and G the household's total supply of labor \tilde{s} is defined as follows:

$$\tilde{s}(p, w, G) = \arg \max_n \tilde{W}(n, p, w, G) \quad (4)$$

The question that we want to investigate is the effect of G on the supply of labor. Using Theorem 2 in Basu, Genicot and Stiglitz (2002), we can tell that as G increases, $\tilde{s}(p, w, G)$ decreases.

This implies that unemployment benefit can dampen the added worker effect. It may be checked that an implication of this theorem is that as G increases, the aggregate supply curve moves (weakly) upwards. Hence, for each wage, w , the largest supply of labor satisfying rational expectations must fall. Hence, for a given minimum wage, a rise in G can cause unemployment to fall (with total employment remaining unchanged). Further it is easy to see that if G is kept at a small level, the quasi supply, when p is 1, remains unaffected by the G . That is, $\tilde{s}(1, w, G) = s(1, w)$. In other words there is no shirking of labor. So, interestingly, what this demonstrates is that unemployment benefits may be

justified without having to invoke equity reasons, but purely on grounds of efficiency.

5. RACE, GENDER AND UNEMPLOYMENT

5.1 Affirmative Action and Unemployment

A well-known fact for most economies is that unemployment rates vary across different categories of labor more than can be dismissed as natural stochastic variations. Thus, we often hear how Black unemployment exceeds White unemployment by a wide margin, or how unemployment for some caste groups in India is markedly larger than for others.⁵

At first blush, it may appear that our model with its penchant for multiple equilibria may have an explanation for this. Indeed, it does offer an explanation but for reasons more roundabout than one may behave initially.

To see this, suppose first that employers are race-blind and caste-blind, that is, they select their workers randomly from among the unemployed without showing preference for any race or caste. Evidently, then the expected unemployment rates of Hispanics, Blacks and Whites, and any sub-category for that matter, must be the same. This fact remains unchanged even if it were the case that more low caste workers supplied labor. In brief, this fact is independent of the supply responses of the different groups. If on the other hand, employers set themselves, or are given, quotas for different castes, races or other sub-categories, or have diversity norms for the workforce, the unemployment rate can vary across different sub-groups. What is interesting is that this can happen even if employers follow diversity norms that are 'fair'.

To understand this, assume that a fraction β of an economy's (working-age) population happens to be of a disadvantaged caste. Let us suppose that the wage has a floor at \hat{w} below which it will not go. This can be because of a minimum wage law or because of efficiency wage arguments. Let us also suppose that \hat{w} is below the aggregate market-clearing wage w^* . So the situation is akin to the one shown in Figure 2. Now assume that each caste group takes their household labor decisions based not on the aggregate employment rate p , but the caste-specific employment rates, p_d and p_h (where d and h denote the two caste groups). Now it is entirely possible to have different unemployment rates for the two groups despite the fact of the employer following the norm of employing workers so that a fraction β of the workers are from the backward caste. The argument is easy to grasp. Suppose that disadvantaged caste workers conjecture that p_d is low, while high caste conjectures p_h is high. Then this can create a relatively larger supply of the disadvantaged caste labor by bringing more of their family members into the labor force while high caste women and children stay at home and in school, thereby fulfilling the initial conjectures.

Note finally that we assumed that the employers use a fair norm not because they actually do so, nor because that is necessary for our argument, but because that is the assumption under which our result is least expected. If employers use a biased norm, variations in caste-specific unemployment rates are only to be expected.

It is interesting to note that the logic of sex-specific unemployment rates will have to be very different since most households consist of males and females, and so female labor supply will depend not just on p_f (the employment rate of female) but also on p_m (the male employment rate). And typically a larger male unemployment will cause a positive female

labor supply response resulting in a larger female unemployment rate as well. Our model suggests that at a macro level male-female unemployment rates will tend to move together, though unemployment rates can vary markedly across races.

This leads us to an interesting micro question. How do unemployment rates within households and across gender vary? That is the subject matter of the next sub-section.

5.2 Discouragement Effect And Some Empirical Paradoxes

A number of empirical studies of labor supply in the US have found the added worker effect to be feeble.⁶ Other studies have pointed out that this effect may not be feeble but its net effect is weak because it is offset by a comparable discouragement effect pushing in the opposite direction.⁷ As we know from Basu, Genicot and Stiglitz [2001], the presence of search costs might explain a certain discouragement effect in the sense of a less active search. However, we are inclined to believe that in empirical studies the discouragement effect *appears* to be larger than it really is. We shall show this by assuming that there are no search costs and therefore, there is no discouragement effect. Hence, from here on we assume $d \geq c$ and $\theta = 0$. We will then show how with a small realistic modification of our model we can explain why it may be the case that the discouragement effect is overestimated.

The modification in question consists in allowing for the possibility that there are household-level factors that can influence a person's job prospect. This possibility is hinted at in a study by Layard, Barton and Zabalza (1980) and discussed more explicitly by Lundberg (1985). It seems quite reasonable to suppose that there are many influences that occur at the level of the households. The empirical evidence of "assortative mating"

provides support for this assumption. In the U.S., in a typical household, both husband and wife are Black or both are White. Now if employers discriminate against Blacks, then either both will stand better chances on the market, or both will stand worse chances respectively. Likewise, if some locations provide better job opportunities, then again each member of one household may have better job prospects than each member of another household. The same is true if ones social network matters and if every husband and wife belong, or do not belong, to networks together.

To model this, let us assume that there are two types of households, 1 and 2. There are h_1 and h_2 households of each of these types and $h_1 + h_2 = h$. These two kinds of households are identical in every other way except that type 1 households are more likely to find jobs when there is unemployment. Let us model this by assuming that, when a type 1 individual (i.e. a person belonging to a household of type 1) applies for a job, he is $1 + \gamma$ times as likely to get a job as a type 2 individual, where $\gamma > 0$. It then follows that if K_1 and K_2 persons of types 1 and 2 supply their labor and there are J jobs going, then the probability of each type 2 person finding a job is given by (for simplicity, we assume that

$$K_1 + K_2 \geq J)$$

$$p_2(J, K_1, K_2) \equiv \frac{J}{(1 + \gamma)K_1 + K_2} \quad (15)$$

and each of type 1 person being employed is given by

$$p_1(J, K_1, K_2) \equiv \frac{(1 + \gamma)J}{(1 + \gamma)K_1 + K_2} \quad (16)$$

The lottery process which gives us these probabilities may be thought of as follows. When the employment exchange gets K_1 and K_2 job applications from types 1 and 2,

respectively, and has J jobs to allocate ($K_1 + K_2 \geq J$), earlier (that is in Sections 3 and 4), the

employment exchange may have been thought of as allocating $\frac{K_1 J}{K_1 + K_2}$ jobs to type 1

applicants and $\frac{K_2 J}{K_1 + K_2}$ to type 2. Now it sets aside $\frac{(1 + \gamma) K_1 J}{(1 + \gamma) K_1 + K_2}$ jobs for type 1

applicants and $\frac{K_2 J}{(1 + \gamma) K_1 + K_2}$ for type 2, picking within each category by some unbiased

lottery mechanism.

From here we can proceed along two alternative routes. First, we could assume that households are unaware of their differing probabilities of being employed and so both types use the aggregate employment rate as expected probability of finding jobs. Second, we could assume that households are more discerning and compute their own probability of being employed as p_1 and p_2 depending on whether they are of type 1 or type 2. Both routes lead to the same conclusion but we illustrate the argument by making the second assumption. Then, given w , p_1 and p_2 , we can use (3), as before, and determine the supply of labor of a type i household to be given by

$$s_i = s(w, p_i)$$

where the function $s(\cdot, \cdot)$ is the same as before. Then, given w , p_1 and p_2 , the total supply of type i workers will be

$$S_i(w, p_i) = h_i s(w, p_i)$$

As before, p_1^e and p_2^e are *rational expectations* of finding a job on the part of type 1 and type 2 households if and only if

$$p_i(D(w), S_1(w, p_1^e), S_2(w, p_2^e)) = p_i^e, \quad i = 1, 2.$$

Equilibrium, with or without minimum wage legislation, is defined as in Section 3.

Now, consider an equilibrium where there is unemployment. It will be found that in households where men are unemployed, the women will be more likely to be unemployed and in households where men are employed, the women will be more likely to be employed. This occurs despite the fact that the added worker effect is there for each household and there is no discouragement effect. Without denying that in reality there could be certain discouragement effects that result from search costs, empirical evidence supporting it, based on the fact an unemployed person's spouse tends to be unemployed, might overstate this effect.

In addition, as stressed earlier, it seems important to measure the added worker effect as the households and their secondary workers' labor supply response to the worsening job prospects of the primary worker, instead of the actual loss of employment of the primary worker used in much of the empirical literature.

6. A NOTE ON INFLATION

There is an interesting insight that our model sheds on the relation between unemployment and inflation. Suppose an economy has a legal minimum wage at \hat{w} as shown in Figure 2 and suppose that the labor market equilibrates exactly at that wage with labor supply equal to $\hat{w}z$ and unemployment kz . It is usually the case that minimum wages are specified in nominal rather than real terms, and so let us assume that this is the case. Now, suppose that there is gentle inflation in the economy. This means that the minimum wage, in real terms, will slowly erode downwards. It seems reasonable to suppose that the equilibrium supply will move along the segment zr on the actual supply curve.⁸ Note now

that, as we go from z to r , we move from $S(w, p''')$ to $S(w, p'')$. From Theorem 1, we know that $p''' < p''$. Hence $1 - p''' > 1 - p''$. So as inflation occurs, unemployment will tend to fall. In other words, a minimum wage legislation, in the absence of automatic indexation, provides an explanation for a Phillips curve type relation, though inflation in our model results not just in lower unemployment but a falling *rate* of unemployment.

7. CONCLUSION

Whenever decision-making occurs at the level of the household (whether we conceive the household as a single decision-making unit or an arena of bargain), it is natural that what is expected to happen to one person in the labor market will affect the behavior of other members of his or her household. Hence, the aggregate labor supply curve cannot strictly be derived without knowledge of what the demand curve looks like.

This paper argues that in the presence of unemployment risk, there might be important added worker and discouragement effects. Households could send additional participants to the labor market in order to insure against the worst outcome of no labor income and there can also be situations where workers become despondent in the face of increased unemployment and cease to search for work. The empirical literature in labor economics has shown awareness of this inter-dependence and there is a body of writing that has looked into the 'supply response' to demand shifts. However, most existing empirical studies have tended to underestimate the added worker effect by focusing on actual employment status and neglecting expectations, and showed that they may have overestimated the discouragement effect of unemployment by ignoring household-level characteristics. It is also worth noting that increasing the labor supply is only one way to

reduce the fluctuations in income due to unemployment, borrowing and dissaving constituting other options. Hence, while most empirical studies look at data for the United States or the United Kingdom, the added worker effect is likely to be stronger for developing countries and poor areas, where families are larger and credit or dissaving opportunities are more limited.

The added workers increase labor supply, possibly creating a downward sloping supply curve and giving rise to surprising phenomena. One of the most interesting insights concerns the response of the labor market to wage rigidity, whether it be from minimum wage legislation or some kind of efficiency wage. In particular this paper showed that a minimum wage law can result in an overall drop in wages.

The paper also analyzed the effect of a household-level income guarantee scheme which insures worker households against the worst ravages of an economic slump. It was argued that such unemployment benefits can be justified not just in terms of equity but also efficiency.

The model developed here can be extended in several ways. For one, there are other policy interventions (for instance, differently designed guarantee schemes or unemployment benefits) that need to be examined. This can be useful in designing social welfare interventions.

Secondly, in constructing our model, we kept coming up against matters that, essentially, involve dynamics or at least a modicum of inter-temporal decision-making. People may, for instance, want to revise their labor supply decision *after* they learn what happens to the household. Of course, one then has to allow a third round of adjustment, and a fourth round and so on. Moreover, a household could try to smoothen its consumption not

only by offering and withdrawing its secondary workers but by having its primary workers over work when work is available and save for the rainy season. We have, in this paper, made strong assumptions and deliberately stayed away from these dynamic issues; but these will be worth researching into in the future.

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Endnotes

¹ In addition, an added worker effect would also arise if household members are substitutes in home production. An increase in the primary worker's non-market time would reduce the relative value of the secondary workers' non-market time, thereby inducing them to join the labor force. Note that this effect would be a response to the *actual* loss of employment of the primary worker. However, we will abstract from this matter here.

² The probability of receiving k offers if supply is n and probability of getting a job is p is

$$\text{simply } \pi(k|n, p) = \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k}$$

³ For reasons similar to the argument in Rothschild and Stiglitz (1970).

⁴ It should be stressed that this is currently a conjecture since we have not yet proved formally that b dominates z .

⁵ In Third World countries, child unemployment rates often differ markedly from adult unemployment rates. This can however have causes very different from the ones discussed here (see Basu, 2000).

⁶ See e.g. Mincer, 1966; Maloney, 1991.

⁷ Cain, 1966; Lundberg, 1985; Tano, 1993.

⁸ In other words, though the labor supply correspondence is multi-valued around \hat{w} , we are assuming that, as \hat{w} changes a little, supply varies continuously as long as that is possible.
