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Comment

Lawrence J. Christiano, *Northwestern and NBER*

This paper represents a valuable statement of a classic theory of unemployment, the "monopoly power" theory of unemployment. It builds on the work by Galí (2011), which identifies a clever reinterpretation of the standard New Keynesian model in which variations in the number of hours worked by the representative household are interpreted as variations in the number of people working. With this reinterpretation of the standard model, the authors are able to address not just the usual list of macroeconomic variables. They are also able to address labor market data such as the labor force and unemployment.[1] The paper undertakes a Bayesian time series analysis of the model, using aggregate data for the United States.

One finding is that with the specification of preferences in the standard model, income effects on labor supply are excessively strong. The authors introduce an externality into preferences to correct this implication. The change implies that when aggregate consumption is high, the individual experiences a smaller disutility of work. I discuss this model change and raise some questions about it.

It is exciting that the authors broaden the range of implications of the standard model beyond the usual set of macroeconomic variables. After reviewing these additional implications, I find four challenges for the model. First, I am skeptical that the people designated as "unemployed" in the model satisfy the offical United States definition of unemployment. Second, the model implies that the unemployed are happier than the employed. The unemployed in the model correspond best to "displaced workers" in the data—those who lose their jobs in mass layoffs and therefore presumably not as a result of their choice or because of poor job performance. Various indicators of health and

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income for displaced workers suggest that unemployment is in practice not the happy experience envisioned by the model.

Third, the model allows the authors to estimate the strength of labor union power and they find a secular rise from the late 1960s to the mid-1980s, followed by a secular decline. However, data on union density rates suggest that labor union power had been declining throughout this period. Fourth, in a cross-section of countries, the model suggests that the countries with the highest union power should be the ones with the highest levels of unemployment. Using union density as a measure of union power, I find no evidence of a relation between union power and unemployment in a panel of 13 countries.

The following section presents a brief statement of a (simplified) version of the model. That discussion forms the background for my detailed comments, which appear in the subsequent section. I conclude with some brief closing remarks.

Informal Sketch of the Model

A visual representation of the standard model appears in figure 1. The circle at the top of the figure indicates the production of a homogeneous output good by a representative, competitive final good firm. That firm's homogeneous production technology is a function of a continuum of imperfectly-substitutable intermediate goods. Each of these intermediate goods is produced using a Cobb-Douglas function of capital and labor by a monopolist. Each monopolist, while being the sole supplier of its output good, is competitive in markets for homogeneous labor and capital.

The component of the standard model that is of particular interest here is the labor market. The model of the labor market used in the paper is a modified version of the one proposed in Erceg, Henderson, and Levin (2000). The labor market is organized along the same lines as the goods market (figure 1). In particular, a homogeneous labor input is produced by a representative, competitive firm using a linear, homogeneous function of a continuum of imperfectly-substitutable labor types. Each labor type is represented by a monopoly union.

There is a continuum of identical households. Each household has all labor types within it. The relationship between the households and the unions is indicated in figure 2, which displays two arbitrarily selected households, A and B. The figure highlights two types of differentiated labor types: "painters" and "plumbers." The painters from each

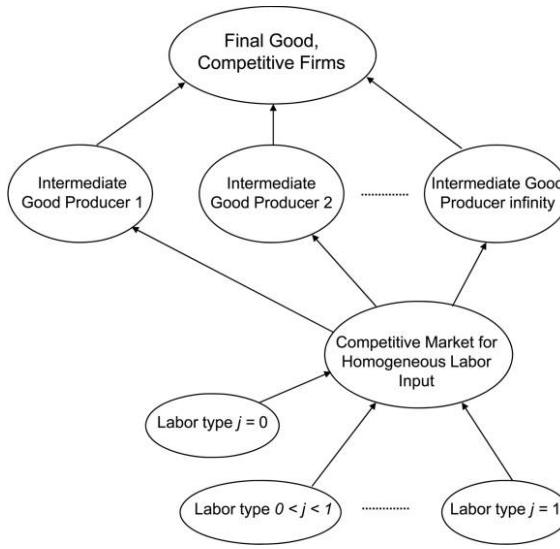

Fig. 1. Goods production and labor market in standard model

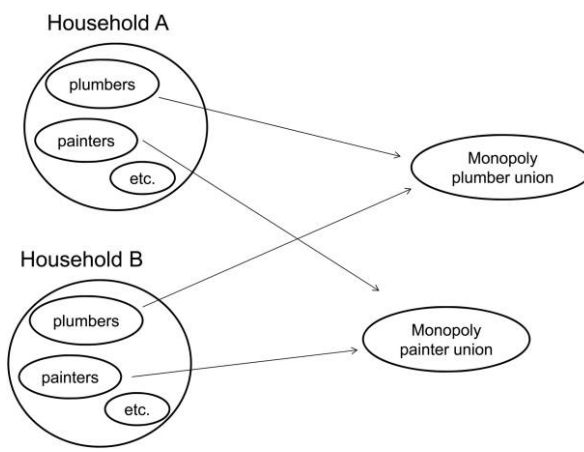

Fig. 2. Relationship between two identical households and monopoly unions

household all gather into a single union that represents all painters in the economy (similarly for the plumbers). Workers in the representative household enjoy perfect consumption insurance. Because utility is separable in consumption and leisure, perfect consumption insurance implies that each worker enjoys the same level of consumption. The

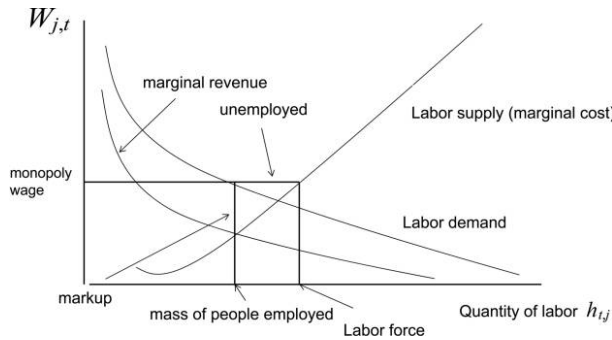

Fig. 3. Type j monopoly union

representative household finances consumption and other expenditures with profits received from the firms that it owns and with wages from employed workers. The household requires employed workers to remit their wages directly to the household. Presumably, the household's ability to require this reflects that it perfectly observes the actions of its workers and that it has leverage over the worker because of its power to withhold consumption insurance.

Differentiated labor types, j, are indexed by the points on the unit interval, $j \in [0, 1]$. The problem of the monopolist ("the jth monopolist") that represents these workers is depicted in figure 3. The downward-sloped demand curve for type j labor implies that if the jth monopolist charges a high nominal wage, $W_{j,t}$, for its type of labor, then quantity demanded is reduced as producers of homogeneous labor substitute away from the jth type of labor. The marginal revenue curve associated with labor demand is also indicated in figure 3.

Now consider the supply of j-type labor. Individual workers are atomistic, can either be employed or not, and differ according to a utility cost of working, $l \in [0, 1]$. The density of workers with any particular value of l is unity. Thus, l is distributed among workers according to a uniform distribution with support $[0, 1]$. If the per-worker level of consumption in the household is C_t, then a j-type worker with utility cost of working, l, enjoys utility

$$\log(C_t) - l^{\phi}, \phi > 0. \tag{1}$$

A worker that is not employed enjoys utility

$$\log(C_t). \tag{2}$$

Comparing (1) with (2), we see that the utility cost to a worker with work aversion, l, of being employed is l^{ϕ}. We convert this into consumption units by dividing by λ_t, the multiplier on the household budget constraint when the latter is expressed in consumption units. Thus, the cost of working in consumption units for the household with work aversion l is l^{ϕ}/λ_t. It is assumed that when a mass, h, of workers is sent to employment, the household sends them out in order, starting with the worker with the lowest value of l. When h workers are sent to employment, the value of l for the marginal worker is $l = h$. To see this, recall that the density of workers with each possible value of l is unity. Thus if all workers with $l \leq h$ are sent to employment, then the total number of employed workers is $h = \int_0^h dl$. These observations imply that h^{ϕ}/λ_t represents the cost for the marginal worker when h workers are employed. This marginal cost curve is graphed in figure 3.

The jth monopoly union's problem is the standard one, in the absence of wage-setting frictions. It chooses a level of employment, $h_{j,t}$, on the horizontal axis in figure 3 where marginal revenue equals marginal cost of labor. The union then sets the wage rate so that demand equals the chosen level of employment. The authors follow Galí (2011) in defining the total supply of the jth-type of labor as the value of $h^s_{j,t}$ that solves:

$$\frac{W_{j,t}}{P_t} = \frac{(h^s_{j,t})^{\phi}}{\lambda_t}. \tag{3}$$

this value of $h^s_{j,t}$ is indicated as the labor force in figure 3. Thus, the marginal cost curve is also the labor supply curve in figure 3. The number unemployed, $h^s_{j,t} - h_{j,t}$, is the difference between the labor force and the number of workers employed, and the unemployment rate, $(h^s_{j,t} - h_{j,t})/h^s_{j,t}$, is the ratio of the unemployed to the labor force. Unemployment is positive because the union exploits its power to raise the wage rate by restricting the number of workers that are employed. In the presence of wage-setting frictions, the monopoly union can adjust wages only periodically, subject to Calvo-style frictions. In this case, labor supply is still the solution to (3) and employment is determined by demand at the given wage rate. Unemployment is always positive, as long as shocks are not too large. In the presence of wage-setting frictions the union does not choose $W_{j,t}$ to equate marginal cost and marginal revenue period-by-period—it does so on average instead. In my comments I abstract from the presence of wage-setting frictions in the model.

Is There *Any* Unemployment in the Model?

The unemployment rate for the United States is compiled by the Current Population Survey (CPS), which is a monthly survey of households conducted by the Bureau of Census for the Bureau of Labor Statistics (BLS). If a CPS employee were dropped into the authors' model economy and proceeded to do a survey to determine the unemployment rate in the way that it is done in the United States how much, if any, unemployment would he find? Put differently, does the concept of unemployment in the model match the corresponding concept in the data? To answer this question, note that to be classified as unemployed in the United States, a nonemployed person must report that he or she (a) has actively looked for work in the prior four weeks and (b) is currently available for work.[2] The people designated as unemployed in the model clearly do not satisfy (a), because effort plays no role in acquiring employment. Still, one might suppose that introducing a trivial cost of search might fix this problem, while not changing the model's implications. We will return to this momentarily.

Now consider (b). Suppose the CPS employee encountered one of the people designated as "unemployed" in figure 3, and asked if she were "available for work." What would her answer be? She knows with certainty that she will not be employed in the current period. Privately, she is delighted about this because the nonemployed enjoy higher utility than the employed (more on this in the next subsection). Not only is she happy about not having to work, but the labor union also does not want her to work. From the perspective of the union, her nonemployment is a fundamental component of the union's strategy for promoting the welfare of its membership. Since no one wants her to work, why then would she declare herself "available for work"? Still, since whatever she says has no consequence, perhaps one could simply *assume* that a person designated as unemployed in figure 3 would say she is "available to work." But now recall that (b) is not sufficient for a nonemployed person to be unemployed in practice. Such a person must also satisfy (a). Accordingly, suppose workers must pay a cost (a search cost) to join the labor force, where that cost could be arbitrarily small. However, in the presence of a search cost everyone in the model economy would agree that workers designated as unemployed in figure 3 should definitely *not* search for work. It serves no one—not the worker, not the household, or the labor union—for a worker to pay a search cost, however small, when the probability of finding a job is zero.

In sum, in the model search costs are zero and so no one satisfies the official definition of unemployment. If a tiny search cost were introduced, then the labor force would always equal the number of people employed and once again there would be no unemployment. Thus, a CPS employee dropped into the model economy would conclude that unemployment is zero. Put differently, the concept of unemployment in the model does not match the concept used in the data.

It may be that there exists a minor adjustment to the model under which the authors' concept of unemployment coincides with the one in the United States data. However, one obvious adjustment turns out to be unsuccessful. This adjustment modifies the way the household sends workers to the labor market. Recall that the authors assume the representative household sends workers to the labor market in order of increasing work aversion until labor demand is satisfied. I call this the "efficient labor supply strategy." Suppose that instead the household sends all type j workers into the labor force at the start of the period and instructs all workers who encounter a job opportunity to accept if their work aversion, l, satisfies:

$$\frac{W_j}{P} \geq \frac{l^{\phi}}{\lambda}, \tag{4}$$

where W_j is the wage rate set by the monopoly union.[3] (I drop the t subscript to simplify notation.) I call this the "inefficient" household labor supply strategy because it leaves open the possibility that some unemployed workers have lower work aversion than some employed workers. The "labor supply" curve in figure 3 continues to deserve that name, since it indicates the mapping from the wage rate, W_j, to h_j^s under the inefficient labor supply strategy (4). Suppose for the moment that the labor supply curve still also measures the marginal cost of employment, as it does in the authors' model. Optimization by the union would then lead to the same quantity of workers employed and unemployed as under the efficient labor supply strategy.[4] An important difference, however, is that the unemployed workers would satisfy condition (b) because they are required to do so by the household. Adding a small cost of being in the labor force seems unlikely to change things, and so under this interpretation the concept of unemployment in figure 3 appears to be consistent with the one used in the CPS. One could ask why the household would impose the inefficient strategy, (4), when the efficient one leads to better outcomes. However, there is a more fundamental problem with this alternative approach.

For pedagogical purposes, the previous discussion assumed that the marginal cost curve coincides with the labor supply curve. Under this assumption, the wage and employment choice of the monpoly union would coincide with what is depicted in figure 3. As it turns out, the monopoly union's behavior is not invariant to labor supply strategy adopted by the household. To see this, suppose jobs are allocated randomly among all the workers in the labor force under the inefficient labor supply strategy. Then the marginal employed worker is not the one with work aversion, $l = h_j$. As a result, marginal cost is not in fact given by (3) under the inefficient labor supply strategy. The marginal cost curve is in fact profoundly different from what it is under the efficient labor supply strategy. The marginal cost of labor has a *negative* slope. To understand this apparently counterintuitive result, consider the incentives of the union as it considers wage rates lower than the one set in figure 3. In contemplating a reduction in the wage, the union is mindful of the fact that among the employed workers there are some with high levels of work aversion, l, taken from the interval $h_j < l \leq h_j^s$. This inefficient state of affairs represents a kind of tax from the point of the union. When the union contemplates raising employment by reducing W_j, the interval, $h_j^s - h_j$, shrinks and some high work-aversion individuals among the employed are replaced with lower work-aversion individuals. In effect, by reducing the wage rate relative to its position in figure 3 the union reduces the size of a tax. Not only does the marginal cost of employment decline with an increase in h_j, but the level of that marginal cost is lower than marginal revenue. As a result, h_j is increased until it reaches its upper bound $h_j = h_j^s$, that is, the point where unemployment is zero even in the authors' sense.[5]

To formally demonstrate the observations in the previous paragraph, I compute the marginal cost of labor by first computing the aggregate utility cost of working and then differentiating with respect to h_j. Consider given values of h_j and h_j^s, the quantity of workers employed and labor supply, respectively. Of course, these values must satisfy

$$h_j \leq h_j^s. \tag{5}$$

Under the assumption that employment is assigned with equal probability to all workers in the labor force, the probability density of any particular worker of type l, $0 \leq l \leq h_j^s$, being employed is h_j / h_j^s. Given that the density of type l workers employed is h_j/h_j^s, for $0 \leq l \leq h_j^s$, the total utility cost of labor is:

$$\frac{(h_j/h_j^s)\int_0^{h_j^s} l^{\phi}dl}{\lambda} = \frac{(h_j/h_j^s)[(h_j^s)^{1+\phi}/(1+\phi)]}{\lambda} = \frac{h_j}{\lambda}\frac{(h_j^s)^{\phi}}{1+\phi}.$$

Here, I have divided by λ to convert into consumption units. Under the employment rule, (4), h_j^s satisfies (3). Substituting the utility cost of employment in consumption units turns out to be proportional to total labor revenue:

$$\frac{W_j h_j}{P}\frac{1}{1+\phi}.$$

As usual, marginal revenue, denoted by MR_j, is:

$$MR_j \equiv \frac{d(W_j h_j/P)}{dh_j} = \frac{W_j}{P}\left[1-\frac{1}{\varepsilon}\right],$$

where ε denotes the elasticity of demand for h_j with respect to W_j. I follow the authors in assuming that ε is constant and $\varepsilon > 1$. Specifically, the demand for labor is:

$$\frac{W_j}{P} = \frac{W}{P}\left(\frac{h}{h_j}\right)^{1/\varepsilon},$$

where h and W denote the aggregate level of employment and aggregate wage rate, repectively, both of which are beyond the control of the jth monopolist. Thus, marginal revenue expressed as a function of h_j is

$$MR_j = \frac{W}{P}\left(\frac{h}{h_j}\right)^{1/\varepsilon}\left[1-\frac{1}{\varepsilon}\right].$$

This is the usual downward-sloping function of h_j and lies below the demand for labor by a fixed factor of proportionality, the markup.

From the preceding results, we see that the jth monopolist's marginal cost of labor, denoted by MC_j, is

$$MC_j = \frac{MR_j}{1+\phi}.$$

That is, marginal cost is decreasing and is always lower than marginal revenue. As a result, the jth monopolist sets h_j to its highest possible value. Note from the demand curve that h_j is increased by reducing W_j. This in turn implies, via (3), that h_j^s falls. The highest possible value of h_j is encountered when $h_j = h_j^s$. That is, under the rule (4), the jth monopolist sets the wage to the point where the demand curve intersects the

upward sloping labor supply curve in figure 3. There is no unemployment at all in this case. Ironically, though the inefficient labor supply strategy leads to an inefficient outcome from the point of view of the monopolist, from a general equilibrium point of view it leads to the socially efficient outcome in which there is no unemployment. As noted before, the reason for this is that under the inefficient labor supply rule the monopoly union is in effect taxed when there is unemployment (some high work-aversion workers are employed) and in the model this gives the monopoly union the incentive to set wages in a way that avoids unemployment completely.

I state the preceding results in the form of a proposition:

Proposition. *Suppose the labor force is the set of workers with work aversion, l, that satisfy (4). Suppose employment is allocated randomly among those workers. Then, absent wage-setting frictions, optimality by monopolists implies that unemployment is zero in the sense that $h_j^s = h_j$, for all $j \in [0, 1]$.*

Utility of the Unemployed

In the model there is perfect consumption insurance among the members of the household. Because of separability in utility, this implies that consumption is equalized across all workers, whether they are employed or not. Employment is allocated to workers according to their realized value of l. Workers who find that they do not have to work are unemployed or out of the labor force, and they have cause to rejoice as a result. Unemployed workers enjoy higher utility than the employed because they receive the same level of consumption, but without having to work.

There is much evidence that in practice unemployment is not the happy experience it is for workers in the model. For example, Chetty and Looney (2006) and Gruber (1997) find that US households suffer roughly a 10% drop in consumption when they lose their job. According to Couch and Placzek (2010), workers displaced through mass layoffs suffer substantial and extended reductions in earnings. Moreover, Oreopoulos, Page, and Stevens (2008) present evidence that the children of displaced workers also suffer reduced earnings. Additional evidence that unemployed workers suffer a reduction in utility include the results of direct interviews, as well as findings that unemployed workers experience poor health outcomes. Clark and Oswald (1994), Oswald (1997), and Schimmack, Schupp, and Wagner (2008) describe evidence

that suggests unemployment has a negative impact on a worker's self-assessment of well-being. Sullivan and von Wachter (2009) report that the mortality rates of high-seniority workers jump 50 to 100% more than would have been expected otherwise in the year after displacement. Cox and Koo (2006) report a significant positive correlation between male suicide and unemployment in Japan and the United States. For additional evidence that unemployment is associated with poor health outcomes, see Fergusson, Horwood, and Lynskey (1997) and Karsten and Moser (2009). Finally, there is a substantial literature which argues that insurance against labor market outcomes is imperfect (for an early example, see Cochrane 1991).

Labor Supply

In the New Keynesian approach to business cycles, labor supply has generally retreated from center stage.[6] This contrasts sharply with the real business cycle approach, in which labor supply was a major preoccupation.[7] In this paper, labor supply is once again central because labor supply corresponds to the labor force, and the latter is a key input to the construction of the unemployment rate. It is therefore not surprising that some of the labor market challenges that were the focus of the real business cycle literature are back. To see this, recall that according to the discussion of equation (3), labor supply has the following form:

$$\frac{(h^s)^{\phi}}{u'(C)}. \tag{6}$$

For simplicity, in (5) I ignore the distinction between different labor types and I replace λ with $u'(C)$, the marginal utility—to the representative household—of household consumption.[8] Here, $u(C) = \log(C)$ and the prime indicates differentiation. The "labor supply curve" is a graph with h on the horizontal axis and the real wage on the vertical, for given C.

Consider the situation depicted in part A of figure 4, where W denotes the wage rate, which we assume is fixed for the purpose of discussion. Suppose there is an expansionary monetary policy shock and that this results in an increase in aggregate consumption, consistent with the implications of some structural vector autoregression (SVAR) analyses.[9] Then, concavity of preferences implies $u'(C)$ falls and the resulting positive wealth effect shifts labor supply to the left (see part A of figure 4). The only labor market variable included in the standard anal-

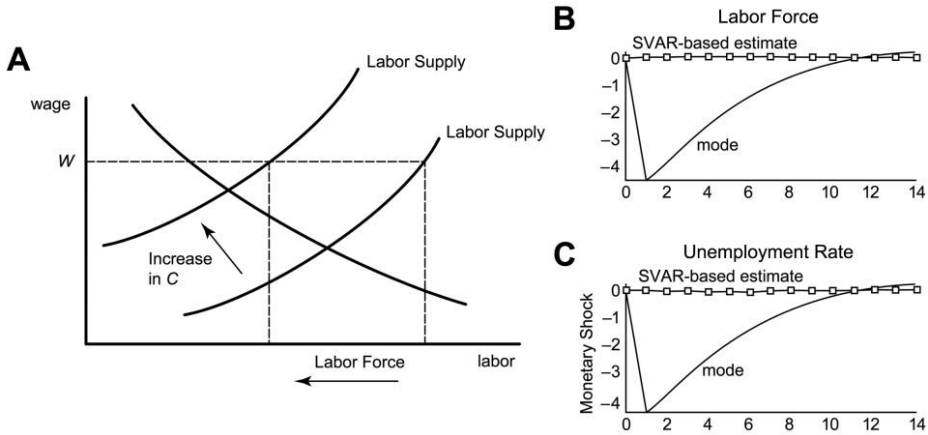

Fig. 4. Labor market with "Standard Preferences"

ysis of the New Keynesian model is employment and as long as labor is demand determined and W is relatively inflexible, the wealth effect on labor supply has no observable consequence. However, this effect has implications that cannot be ignored when the labor force and unemployment are also included in the analysis.

Note from part A of figure 4 that the labor force falls as the rise in C shifts labor supply to the left. The shift right in labor demand induced by a fall in the price markup (not pictured in figure 4, part A) and shift left in labor supply combine to produce a fall in the unemployment rate. Christiano, Trabandt, and Walentin (2010) simulate a dynamic model that captures the framework discussed here. Figure 4, part B, displays the response of the labor force to an expansionary monetary policy shock in their economic model and in the SVAR analysis that they report. According to their SVAR, the labor force rises a small amount, while—consistent with part A of figure 4—the model implies a substantial drop in the labor force. According to the SVAR result in part C of figure 4, the unemployment rate declines after an expansionary monetary policy shock. However, the dynamic economic model implies a drop in the unemployment rate that is an order of magnitude too large. Evidently, the large income effects on labor supply generate strongly counterfactual implications for unemployment and the labor force.

The fix proposed in the paper to address the aforementioned counterfactual implication modifies the utility cost of working by multiplying

it by $u'(\bar{C})$, where $\bar{C}$ denotes the economy-wide level of consumption. With this modification, labor supply in (5) is replaced by:

$$\frac{u'(\bar{C})h^{\phi}}{u(C)}. \tag{6}$$

In equilibrium, $C = \bar{C}$, so that labor supply simply reduces to h^{ϕ} and the income effect is completely gone. With this modification, the troublesome left-shift in the labor supply equation with a rise in C is eliminated. Still, the fix raises several questions.

How is one to interpret the presence of $u'(\bar{C})$ in (6)? Why would the utility cost of working be smaller for individual workers when the aggregate level of consumption is high? The answer is not obvious to me.

The expression for the cost of working in (6) resembles the cost of working implied by the preferences proposed in Greenwood, Hercowitz, and Huffman (1988; henceforth, GHH). With GHH preferences, however, $\bar{C}$ in (6) is actually the household's own consumption. The GHH specification of utility is not adopted in this paper, presumably because it makes consumption and employment nonseparable in utility, making some of the equilibrium computations messy.[10] If the authors have in mind that (6) is a reduced-form approximation to GHH preferences, this raises other questions. For example, GHH preferences imply that labor supply is only a function of the real wage. But, if this is so, then how does one explain that per capita employment has not risen anywhere near as much as the real wage has risen over long periods of time? The wage rate also varies by orders of magnitude in the cross section of the population at a point in time. Is the magnitude of variation in labor supply in the cross section consistent with GHH preferences? A full assessment of the labor market structure in this model requires addressing these questions.

The Wage Markup

The model specifies that the elasticity of demand for labor is constant across the different labor types at a point in time. However, in each period that elasticity is the realization of a stochastic process. This elasticity shock is also referred to as a wage markup shock. This is because there is a one-to-one relation between the elasticity and what the markup of the wage over the marginal cost of labor is in the absence of wage-setting frictions. The monopoly power of unions is high when

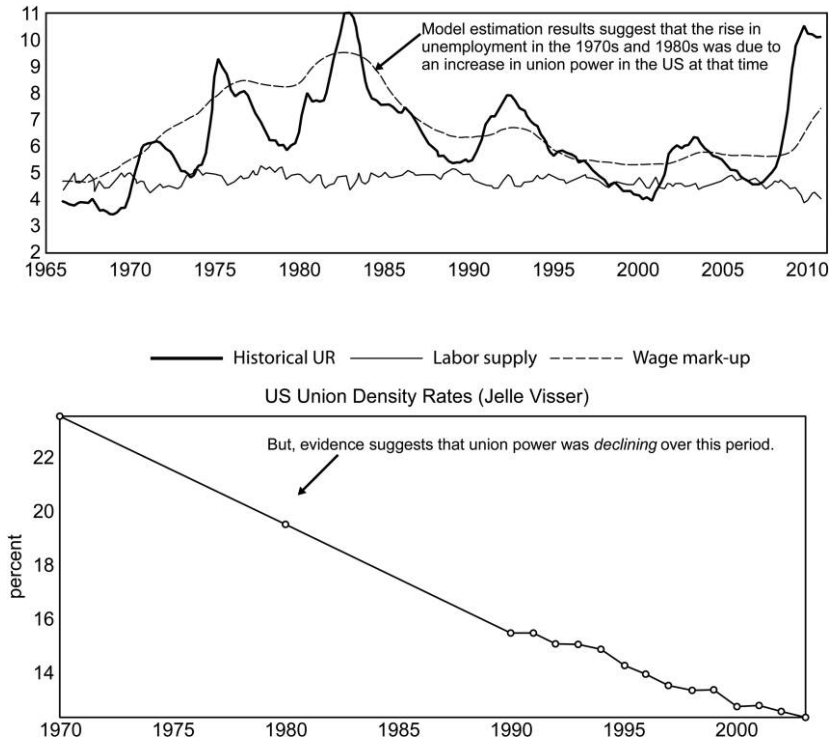

Fig. 5. Union density rates and wage markup over time

the demand elasticity is low—that is, the wage markup is high—and monopoly power of unions is low otherwise. Thus, the model predicts a positive correlation between the wage markup and the unemployment rate. The top panel in figure 5 displays the time series data on the unemployment rate, as well as the historical decomposition of the unemployment rate in terms of the estimated wage markup and labor supply shocks. Labor supply shocks are relatively unimportant for unemployment, while wage markup shocks are important determinants of the low frequency component of unemployment. The portion of unemployment explained by the markup shocks forms an inverted V shape. That is, the model analysis suggests that union monopoly power increased from the late 1960s to around 1984 and declined thereafter.

Measures of the strength of labor unions were not used in the estimation of the model. Such a measure therefore can be used to conduct an "out-of-sample" test of the model. To this end, I obtained data on union density—the fraction of eligible workers who are union mem-

bers—from Visser (2006). As discussed in Howell et al. (2007) and Visser (2006), union density is an imperfect measure of the strength of labor unions. With this caveat, I use Visser's data to assess the implication of the model analysis for the secular evolution of union power. The bottom panel of figure 5 displays Visser (2006)'s data on union density for the United States, indicated by the solid dots. The data indicate that union density declined since 1970, and shows no evidence of the inverted V predicted by the model. It is important to note that although annual data are available after 1990, the only earlier observations are for 1970 and 1980. Thus, the conclusion that union membership had been declining already since 1970 rests heavily on the accuracy of one observation, the observation for 1970. I conclude that this preliminary evidence appears to go against the model, though a more definitive conclusion requires examining additional evidence on the secular evolution of labor union strength in the United States.

Cross-Country Evidence on the Relation between Union Power and Unemployment

I obtained data on the unemployment rate for 13 countries from the Bureau of Labor Statistics (BLS) and the International Labor Office (ILO).[11] The union density rates for the same 13 countries were taken from table 3 in Visser (2006) (the data pertaining to the United States are displayed in the bottom panel of figure 5). I investigate the model's implication that higher union power (imperfectly measured by union density) produces higher unemployment rates. This implication is referred to as the "Monopoly Power Hypothesis" in figure 6. Although the data are constructed with the aim of preserving international comparability, I nevertheless examine the data in a way that minimizes problems arising from lack of comparability in terms of levels. I do this by focusing on the trends in the levels. Specifically, I test the model implication that in countries where union power is increasing relative to what it is in the United States, unemployment relative to that in the United States should be rising. If this pattern is detected across countries, then the Monopoly Power Hypothesis would fail to be rejected. In this case, the hypothesis is not necessarily supported, of course, because causality could go the other way, from high unemployment stimulating increased unionization as a response. But, in fact I fail to find a systematic positive association in the cross-country data between union power and unemployment, and so this represents a challenge for the model.

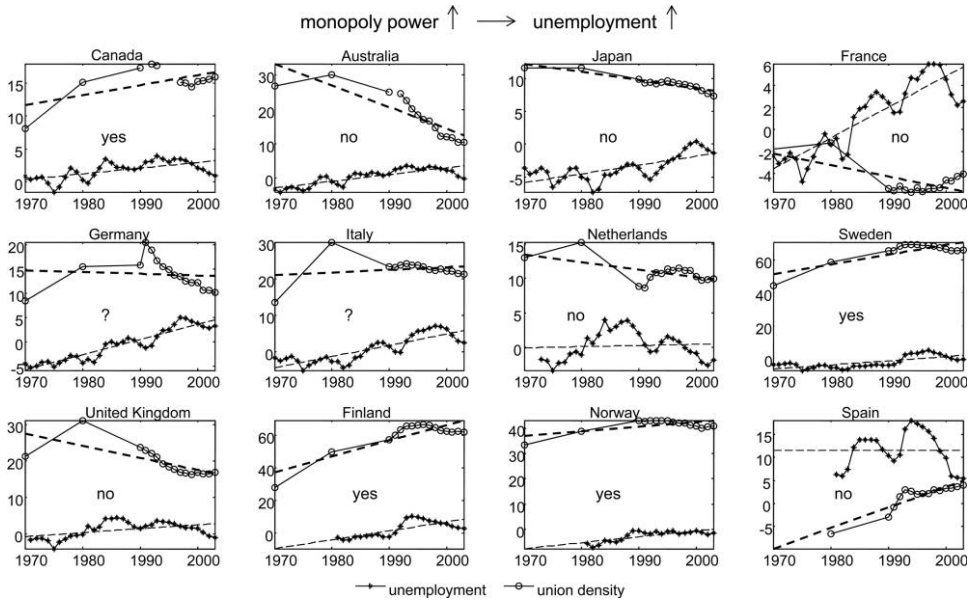

Fig. 6. Data consistent with Monopoly Power Hypothesis

My finding of the absence of a systematic association is consistent with findings reported in the Organization for Economic Cooperation and Development (OECD 2006) and Howell et al. (2007).

Figure 6 contains 12 panels, each of which contains two curves and their associated trend lines (obtained by least squares). One curve displays the unemployment rate for the indicated country, minus the United States unemployment rate. The other curve displays the analogous variable corresponding to union density. If the two trend lines have the same slope, then I conclude that the evidence for that country is consistent with the Monopoly Power Hypothesis and a "yes" is indicated. Otherwise, I indicate a "no." In the case of Germany and Italy, the slope for the trend of the union density differential seems too uncertain, and so I report a "?" , though the reader is free to factor in the evidence from those two countries as he or she sees fit. The figure displays six panels containing a "no" and four panels containing a "yes." I view this as an indication that the cross-country evidence is mixed. In particular, the data do not support the view that high unionization leads to high unemployment.

Conclusion

I have provided a critical assessment of the labor market model analyzed in this paper. I have identified dimensions on which the model can be challenged. However, a model is an abstraction. A well-crafted model leaves out features of reality that are not essential for the purposes to which the model is put. So, an assessment of the model shortcomings described here depends on whether they distort the answers to the policy questions it is used to address. An alternative approach to integrating unemployment into the New Keynesian model is provided in Christiano, Trabandt, and Walentin (2010). It avoids the problems raised here. In that model, the unemployed satisfy the official United States definition of unemployment, the unemployed have lower utility than the employed, income effects do not create counterfactual implications for the labor force and unemployment, and there is no prediction for the relationship between monopoly power and the unemployment rate.

Endnotes

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1. By the standard model, I have in mind the type of structure in, for example, Christiano, Eichenbaum, and Evans (2005), or Smets and Wouters (2007).
2. See the Bureau of Labor Statistics website, http://www.bls.gov/cps/cps_htgm.htm#unemployed, for a discussion of the survey questions used to determine a household's employment status.
3. I continue to assume that the household observes the worker's l and observes all the worker's actions in the labor market. In addition, the household requires that the worker remit his or her earnings straight to the household. Finally, it is assumed that the household has the means to enforce its demands on the worker, perhaps by the threat of withholding consumption insurance.
4. Although the quantity of employed and unemployed workers would be the same, their identities would not be the same. This will play an important role in the following analysis.
5. Employment, $h_{j,t}$, cannot be increased beyond $h^s_{j,t}$ because the union is required in the model to supply all labor demanded at the specified wage. But, the household will not supply more than $h^s_{j,t}$.
6. That labor supply plays at best a minor role in the dynamics of New Keynesian models in part reflects the emphasis on wage-setting frictions and the assumption that labor is demand determined. The relatively minor role of labor supply also reflecs the presence of price-setting frictions and the assumption that goods production is demand determined. This has the effect of amplifying shifts in labor demand through endogenous movements in markups. Examples that highlight the relative unimportance of labor supply in the New Keynesian model appear in Christiano (2011) and Christiano, Eichenbaum, and Rebelo (2011). The latter paper shows that in interior equilibria (e.g., where the zero lower bound on the nominal rate of interest is nonbinding) of the New

Keynesian model the government consumption multiplier is smaller the more persistent is a given increase in government spending. This persistence property reflects that the negative wealth effect of taxes on private consumption dominates the positive wealth effect on labor supply. This property of the New Keynesian model contrasts sharply with the corresponding property of the standard real business cycle model. In that model, the size of the government spending multiplier is larger, the *more* persistent is the increase in the government spending shock. This reflects the relative importance of wealth effects on labor supply in the real business cycle model (see Christiano and Eichenbaum 1992).

7. That literature was preoccupied with a "labor supply elasticity" puzzle and with an "income effect on labor supply" puzzle. The first puzzle is that according to the aggregate data, employment fluctuates substantially while wages move very little, and in the micro-data employed people do not change their labor supply much in response to changes in the real wage (Hansen 1985 and Rogerson 1988). For a survey, see Christiano, Trabandt, and Walentin (2011). The "income effect" puzzle is that long time series data suggest that income effects roughly cancel the substitution effect arising from the secular rise in the real wage. Yet, the apparently elastic response of employment to small movements in wages over the business cycle suggest that income effects on labor supply are small (for a discussion and proposed resolution, see Benhabib, Rogerson, and Wright 1991).

8. For notational simplicity, I also ignore the fact that the authors assume habit persistence in preferences.

9. See, for example, Christiano, Trabandt, and Walentin (2011).

10. The complications arise from the presence of perfect consumption insurance. The work of Guerron (2008) suggest that, although messy, the calculations are manageable.

11. With the exception of Finland, Norway, and Spain, the unemployment data were taken from the website of the BLS, http://www.bls.gov/fls/flscomparelf/unemployment.htm#table1_2. The BLS data were taken from Table 1-2, "International Comparisons of Annual Labor Force Statistics, Adjusted to U.S. Concepts, 10 Countries, 1970–2010." The unemployment data for Finland, Norway, and Spain were obtained from the ILO document, "Comparable annual employment and unemployment estimates, adjusted averages," available at http://laborsta.ilo.org.

References

Benhabib, Jess, Richard Rogerson, and Randall Wright. 1991. "Homework in Macroeconomics: Household Production and Aggregate Fluctuations." *Journal of Political Economy* 99 (6): 1166–87.

Chetty, Raj, and Adam Looney. 2006. "Income Risk and the Benefits of Social Insurance: Evidence from Indonesia and the United States." NBER Working Paper no. 11708. Cambridge, MA: National Bureau of Economic Research, October.

Christiano, Lawrence J. 2011. Comment on Eggertsson. *NBER Macroeconomics Annual 2010*, vol. 25, edited by Daron Acemoglu and Michael Woodford, 113–24. Chicago: University of Chicago Press.

Christiano, Lawrence J., and Martin Eichenbaum. 1992. "Current Real Business Cycle Theories and Aggregate Labor Market Fluctuations." *American Economic Review* 82 (3): 430–50.

Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans. 2005. "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy." *Journal of Political Economy* 113 (1): 1–45.

Christiano, Lawrence J., Martin Eichenbaum, and Sergio Rebelo. 2011. "When Is the Government Spending Multiplier Large?" *The Journal of Political Economy* 119 (1): 78–121.

Christiano, Lawrence J., Mathias Trabandt, and Karl Walentin. 2010. "Involuntary Unemployment and the Business Cycle." NBER Working Paper no. 16074. Cambridge, MA: National Bureau of Economic Research, June.

———. 2011. "DSGE Models for Monetary Policy Analysis." In *Handbook of Monetary Economics*, vol. 3A, edited by Benjamin M. Friedman and Michael Woodford, 285–367. The Netherlands: North-Holland.

Clark, A. E., and A. J. Oswald. 1994. "Unhappiness and Unemployment." *Economic Journal* 104 (424): 648–59.

Cochrane, John H. 1991. "A Simple Test of Consumption Insurance." *The Journal of Political Economy* 99 (5): 957–97.

Couch, Kenneth A., and Dana W. Placzek. 2010. "Earnings Losses of Displaced Workers Revisited." *American Economic Review* 100 (1): 572–89.

Cox, W. M., and J. Koo. 2006. "Miracle to Malaise: What's Next for Japan." Federal Reserve Bank of Dallas Economic letter, January.

Erceg, C. J., D. W. Henderson, and A. T. Levin. 2000. "Optimal Monetary Policy with Staggered Wage and Price Contracts." *Journal of Monetary Economics* 46:281–313.

Fergusson, D. M., L. J. Horwood, and M. T. Lynskey. 1997. "The Effects of Unemployment on Psychiatric Illness during Young Adulthood." *Psychological Medicine* 27 (2): 371–81.

Galí, Jordi. 2011. "The Return of the Wage Phillips Curve." *Journal of the European Economic Association* 9 (3): 436–61.

Greenwood, J., Z. Hercowitz, and G. Huffman. 1988. "Investment, Capacity Utilization, and the Real Business Cycle." *American Economic Review* 78 (3): 402–17.

Guerron, Pablo. 2008. "Refinements on Macroeconomic Modeling: The Role of Non-Separability and Heterogeneous Labor Supply." *Journal of Economic Dynamics and Control* 32: 3613–30.

Gruber, Jonathan. 1997. "The Consumption Smoothing Benefits of Unemployment Insurance." *The American Economic Review* 87 (1): 192–205.

Hansen, Gary D. 1985. "Indivisible Labor and the Business Cycle." *Journal of Monetary Economics* 16:309–27.

Howell, David R., Dean Baker, Andrew Glyn, and John Schmitt. 2007. "Are Protective Labor Market Institutions at the Root of Unemployment? A Critical Review of the Evidence." *Capitalism and Society* 2 (1): 1–71.

Karsten, I. Paul, and Klaus Moser. 2009. "Unemployment Impairs Mental Health: Meta-Analyses." *Journal of Vocational Behavior* 74 (3): 264–82.

Organization of Economic Cooperation and Development (OECD). 2006. "Reassessing the Role of Policies and Institutions for Labour Market Performance: A Quantitative Analysis." In *OECD Economic Outlook, Boosting Jobs and Incomes*, chapter 7. Paris: OECD.

Oreopoulos, Philip, Marianne Page, and Ann Huff Stevens. 2008. "The Intergenerational Effects of Worker Displacement." *Journal of Labor Economics* 26 (3): 455–83.

Oswald, Andrew J. 1997. "Happiness and Economic Performance." *Economic Journal* 107 (445): 1815–31.

Rogerson, Richard. 1988. "Indivisible Labor, Lotteries and Equilibrium." *Journal of Monetary Economics* 21:3–16.

Schimmack, Ulrich, Jurgen Schupp, and Gert G. Wagner. 2008. "The Influence of Environment and Personality on the Affective and Cognitive Component of Subjective Well-Being." *Social Indicators Research* 89:41–60.

Smets, Frank, and Raf Wouters. 2007. "Shocks and Frictions in US Business Cycles." *American Economic Review* 97 (3): 586–606.
Sullivan, D., and T. Von Wachter. 2009. "Job Displacement and Mortality: An Analysis Using Administrative Data." *Quarterly Journal of Economics* 124 (3): 1265–1306.
Visser, Jelle. 2006. "Union Membership Statistics in 24 Countries." *Monthly Labor Review*, January, 38–49.