REAL BUSINESS CYCLE THEORY: WHAT DOES IT EXPLAIN?‡

Allocative Disturbances and Specific Capital in Real Business Cycle Theories

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Macroeconomists have grown disenchanted, albeit in varying degree, with business cycle theories that either posit unexplained nominal wage and price rigidities or rely on misperceptions about nominal variables as a key driving force. One response to this disenchantment has been a concentration of research effort on real business cycle theories. Aside from dissatisfaction with competitor theories, the very visible oil price shock episodes of the 1970’s lent plausibility to the view that exogenous “real” disturbances cause large fluctuations in aggregate economic activity.

This essay on real business cycle theory considers the role of allocative disturbances in aggregate economic fluctuations when human and physical capital are specialized. By “allocative disturbances,” I mean events that impinge on the economy by inducing a costly, time-consuming reallocation of specialized resources. At least since the publication of Ricardo’s Principles in 1817, economists have recognized some of the potentially important aggregate consequences of allocative disturbances. Ricardo writes:

A great manufacturing country is peculiarly exposed to temporary reverses and contingencies, produced by the removal of capital from one employment to another.... [C]onsiderable distress, and no doubt some loss, will be experienced by those who are engaged in the manufacture of such [adversely affected] commodities; and it will be felt not only at the time of the change, but through the whole interval during which they are removing their capitals, and the labour which they can command, from one employment to another. [1951, p. 263]

As important sources of allocative disturbances, Ricardo suggests the capricious nature of tastes for nonagricultural commodities, the sector-specific effects of tax changes, the uneven sectoral effects of technological innovations, and, especially, the impact of war on patterns of demand and channels of trade. To this list, recent experience suggests we add exogenous disturbances to the supply of intermediate inputs. Despite these varied sources of allocative disturbances, neither specialization of capital and labor nor nontrivial reallocation processes figure prominently in currently popular business cycle theories, real or otherwise. This state of affairs reflects a belief that the effects of allocative disturbances on aggregate economic activity are of second-order importance and, also, the difficulty of incorporating nontrivial specialization and reallocation technologies into tractable general equilibrium models of economic fluctuations.

My main purpose in this essay is to stimulate further theoretical and empirical research directed towards understanding the consequences of allocative disturbances. I argue that the aggregate consequences of allocative disturbances play a large role in economic fluctuations and that the incorporation of nontrivial specialization and reallocation technologies into real business cycle models is a promising research strategy. I discuss some recent evidence on real-world business cycles that indicates the quantitative significance of fluctuations in labor real-

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location, convey some important insights that emerge from analyses of multisector business cycle models with costly reallocation technologies, and discuss the implications of our experience with oil price shocks for real business cycle theories. I also show how some of the chief criticisms directed against real business cycle theories can be addressed by considering the implications of the costly reallocation of specialized capital and labor.

To begin, I introduce some evidence on the nature of short-run unemployment rate fluctuations.

For many persons, especially job losers, labor mobility involves measured unemployment spells. This basic observation motivates search and matching models that interpret unemployment as a nonemployment activity distinct from leisure consumption. This nonemployment activity facilitates the reallocation of specialized labor towards a more productive pattern of employment. Christopher Flinn and James Heckman (1983) provide formal econometric evidence that the state of unemployment facilitates labor mobility. Given these considerations, it is natural to investigate unemployment rate data for evidence that fluctuations in the pace of labor reallocation are an important aspect of business cycles.

In forthcoming work, I find that fluctuations in the pace of labor reallocation across jobs are the largest component of short-run unemployment rate fluctuations. This conclusion emerges by combining three observations: (i) Short-run increases (decreases) in the unemployment rate coincide with increases (decreases) in the flow rate of persons into the unemployment pool and the flow rate of persons out of the unemployment pool. The unemployment flow rates are calculated from Current Population Survey (CPS) data on unemployment by duration. This pattern of comovement among the inflow, outflow, and unemployment rate holds for every recession in the postwar U.S. economy. (ii) The contemporaneous correlation between changes in the labor force participation rate and the flow rate of persons out of the unemployment pool is virtually zero. This observation suggests that the pattern described in (i) does not reflect cyclic movements of persons into and out of the labor force. (iii) Increases in permanent separations account for the largest fraction of short-run unemployment rate increases during recessions; in particular, they account for a larger fraction than increases in temporary separations. Permanent and temporary separations are calculated from CPS data, available since 1967, on unemployment by reason. The raw numbers indicate that increases in permanent and temporary separations contribute roughly equal amounts to unemployment rate increases during recessions. However, several pieces of evidence summarized in my forthcoming paper indicate that the raw numbers overstate the importance of temporary layoff unemployment. Many economists claim that the 1970’s witnessed unusually large changes in the composition of labor demand, so that broad conclusions about the relative importance of permanent and temporary separations drawn from post-1967 experience are open to question. Pending the accumulation of further evidence, a more conservative interpretation of the data might be appropriate—namely, that increases in both permanent and temporary separations contribute significantly to short-run increases in unemployment. In a nutshell, recessions are characterized by an unusually rapid rate of job loss by employed persons and by an unusually rapid rate of attachment of unemployed persons to new jobs.

What are the implications of this finding for real business cycle theories? First, to the extent that firm-worker matches entail relationship-specific capital, this finding constitutes direct evidence that the reallocation of labor resources across meaningfully defined sectors fluctuates greatly over the business cycle. The sectoral shifts literature contains ample evidence that the reallocation of labor resources across broad industrial sectors also fluctuates greatly over the business cycle. The phenomenon of large fluctuations in the pace of costly labor reallocation lies outside the framework of real business cycle models à la Finn Kydland and Edward Prescott (1982) or John Long and Charles Plosser (1983). In defense of their models, one might argue that whether people substitute into
leisure or into mobility during recessions is far less interesting than the observation that they substitute out of market work. Furthermore, the abstraction of lumping all non-market activities into a single category, dubbed leisure, is an extremely powerful simplifying device. The counterargument is simply that the cost of dispensing with this abstraction will be recouped many times over by a greater understanding of economic fluctuations. The payoff's come in four varieties: (i) a richer perspective on why people substitute into or out of market work; (ii) an additional class of observable disturbances that drive economic fluctuations; (iii) an understanding of how allocative disturbances and what we traditionally call aggregate disturbances interact in interesting, nonobvious ways; and (iv) the development of additional economic mechanisms that propagate real disturbances over time and across sectors. I address each point below.

Second, the finding that reallocative unemployment increases during recessions is not at variance with the better-known finding that temporary layoff unemployment, as a fraction of total unemployment, increases during recessions. Temporary layoff unemployment fluctuates greatly over the business cycle, but it constitutes a small fraction of total unemployment even during recessions. Over the years 1967 to 1985, temporary layoff unemployment averages 14.7 percent of total unemployment, reaching a low of 10.7 percent in 1973 and a high of 21.2 percent in 1975. (These figures, based on CPS data, include persons who report themselves as laid off with no definite recall date. Caveats about the overstatement of temporary layoff unemployment apply here.) Sharp cyclic movements in temporary layoff unemployment partly account for the pattern of co-movement among the inflow, outflow and unemployment rates. Sharp cyclic variation in temporary layoff unemployment is compatible with real business cycle models that abstract from specialization and reallocation. See, for example, Gary Hansen's (1985) analysis of the interaction between labor supply nonconvexities and incentives to substitute leisure intertemporally.

In a multisector setting with labor supply nonconvexities and barriers to short-run labor mobility, temporary layoff unemployment can arise from disturbances that have little or no effect on the aggregate (i.e., cross-sectional average) marginal product of labor. Similarly, adverse aggregate disturbances with uneven effects across sectors can produce more temporary layoff unemployment than equal magnitude disturbances with even effects across sectors. To see these points, consider a disturbance that increases the gap between labor's marginal product in different sectors and, perhaps, lowers the average marginal product. Suppose that the average marginal product remains above the value of leisure, but the marginal product falls below the value of leisure (for some workers) in the most adversely impacted sectors. If the disturbance is transitory, or some probability is attached to this possibility, persons in the most adversely impacted sectors may rationally choose to consume leisure rather than switch sectors. Large sector-switching costs imply the optimality of waiting for improvement in sectoral marginal product rather than working or moving. James Hamilton's (1986) analysis illustrates equilibrium "waiting-type" unemployment in a fully articulated multisector model. The only frictions in his model are a time cost of changing sectors and a restriction that persons supply zero or one unit of labor. The import of these remarks on temporary layoff unemployment in a multisector economy becomes apparent by recalling that sectoral experiences during recessions are sharply dissimilar. Some sectors exhibit high cyclical sensitivity, some do not. This dissimilarity, coupled with labor supply nonconvexities and a modest willingness to substitute leisure intertemporally, explains why adverse aggregate disturbances with small effects on labor's average marginal product cause big substitutions out of work and into temporary layoff unemployment (i.e., leisure).

Third, the finding that fluctuations in the pace of labor reallocation constitute a large fraction of unemployment rate fluctuations highlights the importance of the central controversy in the sectoral shifts literature: Are fluctuations in the pace of labor reallocation, and the concomitant fluctuations in the unemployment rate, driven by the arrival pattern of allocative disturbances over time? Or,
are these fluctuations driven largely by the timing of what we traditionally call aggregate disturbances? I identify the sectoral shifts hypothesis with an affirmative answer to the first question and various reallocation timing hypotheses with an affirmative answer to the second question. David Lilien (1982), Katharine Abraham and Laurence Katz (1986), my papers (1986a,b, forthcoming), and other contributors to the sectoral shifts literature seek to address these and related questions. In my view, a full resolution of the issues surrounding these questions requires confrontation between the data and fully articulated multisector models incorporating nontrivial reallocation technologies.

The sectoral shifts hypothesis has attracted attention precisely because it departs sharply from traditional notions about the driving forces behind aggregate economic fluctuations—Ricardo’s observations notwithstanding. The benefits of intersectoral labor mobility depend on the disparity in conditions across sectors—in particular, on cross-sectoral differences between current plus expected returns to labor. Allocaive disturbances that create sufficiently large sectoral disparities induce a reallocation of labor towards more productive employment. In the short run, allocative disturbances decrease the economy’s productive potential because of the time cost of labor mobility, the loss of specific capital, retraining costs, and the difficulty of reestablishing an efficient pattern of matches between firms and workers and among workers. Thus, a class of disturbances that implies little or no effect in models that abstract from specialization implies important aggregate effects in an economy with specialized capital and labor. Fischer Black (1982), myself (1986b), and Hamilton (1986) model this phenomenon.

Hamilton’s analysis shows how seemingly small allocative disturbances cause large fluctuations in aggregate output and unemployment when labor is specialized. Hamilton assumes that energy, a nonproduced good, is a complement to one of the produced goods in utility functions or a complement to labor in one of the sectoral production functions. Individuals supply labor to only one sector at a time and sector switching entails one period out of work. In this setting, an exogenous decrease in the supply of energy directly triggers a reduction in the output of goods that use energy in consumption or production. If the energy supply decrease is perceived as persistent, then output declines even further in the short run than implied by the complementarity assumption, because workers suffer unemployment while moving out of the energy-using sector. Here, the short-run output decline is bounded not by the value of energy’s share in total output, but by the output share of goods that use energy in production or consumption. This result implies that real business cycle models that consider the allocative effects of oil price shocks can explain the large output and employment declines that followed postwar oil price increases.

Our experience with oil price shocks provides the most persuasive evidence that real disturbances cause large aggregate fluctuations. Real business cycle models that abstract from specialization and reallocation seem incapable of explaining the apparent magnitude of the response to oil price shocks, especially the relatively mild shocks that occurred during the pre-OPEC period. Hamilton (1983) and many others document the magnitude of the responses, while Hamilton (1983, 1985) documents the exogenous character of the oil price shocks. My paper (1986a) and Prakash Loungani (1986) give evidence supporting interpretations that stress the allocative effects of oil price shocks. When the relative price of oil is held fixed, Loungani shows that Lilien-type dispersion measures have no residual explanatory power for unemployment rate fluctuations. His finding holds for the postwar period and the 1900–29 period. My paper showed that oil price shocks explain much of the time-series variation in the pace of labor reallocation (as proxied by a Lilien-type dispersion measure) and do so in a way predicted by the sectoral shifts hypothesis. The empirical findings by Hamilton, Loungani, and myself carry a cogent message: allocative disturbances and specific capital will be critical features of successful real business cycle theories.

Beyond offering a coherent explanation for the effects of oil price shocks, the sectoral shifts view points to important economic propagation mechanisms. A careful develop-
ment of economic mechanisms that propagate disturbances over time and across sectors marks much of the best real business cycle research; Kydland and Prescott’s development of time-to-build technologies for durable goods and Long and Plosser’s treatment of capitalistic production possibilities stand as clear examples. Propagation mechanisms stressed by the sectoral shifts view include specific human capital investment, the time costs of prospecting for a job or a better match, and other barriers to short-run labor mobility. These propagation mechanisms imply a testable prediction that serves to gauge their importance in aggregate economic fluctuations: the contemporaneous unemployment response to an allocative disturbance depends, in part, on past patterns of labor reallocation. An allocative disturbance that reinforces past patterns of labor reallocation exacerbates skill, location, and informational mismatches between workers and firms. In contrast, an allocative disturbance that reverses past patterns of labor reallocation mitigates skill, location, and informational mismatches. An unfavorable allocative disturbance, in the sense implied above, increases unemployment sharply relative to a favorable allocative. A favorable allocative disturbance may even decrease unemployment.

In my forthcoming paper I test this prediction using annual data from 1924 to 1985 by constructing indexes for the current direction of labor reallocation relative to past directions. The indexes are cross-sectoral co-variance measures:

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\sigma_{t,j}^H = \sum_{i=1}^{N} \left( \frac{x_{it}}{X_t} \right) (\Delta_1 x_{it} - \Delta_1 X_t) \\
\times (\Delta_j x_{i,t-1} - \Delta_j X_{t-1}), \quad j = 1, 2, \ldots, J,
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where \( x_{it} \) = employment in sector \( i \) at time \( t \), \( X_t \) = aggregate employment at time \( t \), \( \Delta_j x_{it} = \ln x_{it} - \ln x_{i,t-j} \), and \( N \) = the number of labor-market sectors broken down by industrial classification. \( \sigma_{t,j}^H \) indexes the time \( t \) direction of labor reallocation over a one-period horizon relative to the \( t-1 \) direction over a \( j \) period horizon. Relatively high (low) values of \( \sigma_{t,1}^H, \sigma_{t,2}^H, \ldots \) indicate that the time \( t \) direction of labor reallocation reinforces (reverses) past patterns of labor reallocation. The sectoral shifts hypothesis predicts a positive partial correlation between directional indexes and the economywide unemployment rate.

In unemployment regressions that include Lilien-type dispersion measures, unanticipated monetary disturbances, government purchases, and proxies for the financial intermediation collapse during the 1930’s as explanatory variables, I find strong support for this prediction. Coefficients on the directional indexes exhibit the predicted sign and are highly statistically significant. Furthermore, the range of unemployment rate fluctuations accounted for by the directional indexes exceeds the range accounted for by the Lilien-type dispersion measure and its lags. The econometric results survive several specification changes and are reinforced by more casual inspection of the data. The United States exhibited tremendous sectoral reallocation in the demobilization following World War II, but the directional indexes show that the pattern of labor reallocation simply reversed the pattern during the preceding war years; unemployment was very low. In contrast, 1932 was also a year of tremendous sectoral labor reallocation, but the directional indexes show that the pattern sharply reinforced the pattern during the preceding years; unemployment was very high. These empirical findings are important for three reasons: they constitute independent support for the sectoral shifts view, they highlight the significance of the propagation mechanisms stressed by the sectoral shifts view, and they suggest that allocative disturbances other than energy price shocks have caused large aggregate fluctuations.

The evidence on oil price shocks and directional indexes provides compelling support for the sectoral shifts view, but a strong form of the sectoral shifts hypothesis leaves much, perhaps most, of the short-run fluctuations in the pace of labor reallocation and the concomitant movements in unemployment unexplained. Reallocation timing hypotheses point to other reasons for fluctuations in the pace of labor reallocation. Richard Rogerson (1986), myself (1986b),
and Robert Topel and Laurence Weiss (1985) model three different reallocation timing mechanisms.

Rogerson shows how the timing of secular movements between sectors with differential trend productivity growth rates depends on the relative cyclical sensitivities of the two sectors. In his model, workers discount future returns and costs, and they face a fixed cost of sector switching that varies across workers. Naturally, low-cost workers move first, but each worker delays his costly move until the discounted lifetime returns to moving equal the discounted lifetime returns to a further delay plus the moving cost. If the shrinking sector is more (less) cyclically sensitive, then the intersectoral flow of workers accelerates (decelerates) when the cross-sectoral average marginal product is below (above) trend. In this setting, none of the variation in the pace of labor reallocation stems from the arrival pattern over time of allocative disturbances.

My paper (1986b) considers a multisector model with allocative disturbances and cross-sectoral average marginal product disturbances that arrive randomly over time. Sector switching takes a period of time, so that the opportunity cost of labor mobility varies with the value of foregone production. Convex labor force adjustment costs incurred by firms imply that the sectoral labor force distribution converges slowly in the direction of the target distribution. In this setting, average product disturbances do not change the target distribution, but they alter the timing of reallocation towards the target by affecting the opportunity cost of labor mobility. Favorable aggregate disturbances decrease the pace of labor reallocation and unemployment, while unfavorable aggregate disturbances increase the pace of labor reallocation and unemployment. Here, the reallocation timing mechanism is the intertemporal substitution of labor mobility. The strength of this intertemporal substitution effect depends on parameters describing the mobility and adjustment cost technologies and on the degree of diminishing returns to sectoral inputs. The intertemporal substitution effect operates whenever labor reallocation involves foregone production and shocks affecting average product occur.

Topel-Weiss identify a different intertemporal substitution mechanism that influences the timing of labor mobility. They consider a multisector model with sector-specific human capital investment that is costly, irreversible, and risky. The riskiness stems from the possibility that future events will alter the pattern of productive opportunities and reduce the ex post return to sector-specific investment. Recognizing this possibility, agents may choose to delay sector-specific investment and mobility, because they anticipate a resolution of uncertainty about the pattern of productive opportunities. In this setting, specific human capital investment and mobility become more or less attractive as uncertainty about future productive opportunities shrinks or grows.

The analyses by Rogerson, myself and Topel-Weiss suggest the rich potential for interesting interaction between allocative and aggregate disturbances in the determination of economic fluctuations. They show how explicit modeling of specialization and reallocation technologies yields new mechanisms by which aggregate disturbances influence the timing of labor reallocation and cause economic fluctuations.

To close, I make one final remark. This essay emphasizes how consideration of specialization and reallocation technologies can improve our understanding of the driving forces behind economic fluctuations and the mechanisms that propagate disturbances over time and across sectors. The ideas expressed in this paper have yet to be integrated into a real business cycle model as ambitious in scope as the models of Kydland-Prescott and Long-Plosser. This effort deserves a high priority on the business cycle research agenda.

REFERENCES


Davis, Steve J., (1986a) “Allocative Distur-


