Reorganization*
A comment

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1 Matching rates

In many search models, the ease of matching varies systematically with the aggregate level of matching activity. According to Hall, "Common sense suggests that congestion dominates [agglomeration effects], so it is harder to find a job when unemployment is high than when it is low." However, as he also points out, in U.S. data the flow of new hires is roughly proportional to the unemployment rate. This evidence of a "constant" job-finding rate suggests that agglomeration and congestion effects roughly balance out in practice.

These observations lead Hall to consider some microfoundations for a constant matching rate. He posits searchers who randomly visit matching stations in the hope of forming partnerships with other searchers. The match probability for an individual depends on the ratio of searchers to matching stations. The analysis focuses on how the number of matching stations influences the probability of matching.

Two explanations emerge for a roughly constant matching rate:

1. The number of matching stations tends to adjust in proportion to the number of searchers, which leaves the ratio of searchers to matching stations – and the match probability – unchanged.

2. If the number of matching stations is fixed but chosen optimally given the expected number of searchers, and if matching stations are not

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too costly, then local variations in the ratio of searchers to matching stations occur in the flat part of the aggregate matching function near its maximum.

Hall does not model how market or nonmarket institutions determine the number of matching stations, but his analysis lends plausibility to the convenient assumption of a constant matching rate. The analysis also provides an explanation for the roughly proportional nature of new hires and unemployment rates in U.S. data.

Hall remarks that the evidence in favor of a constant matching rate is far from definitive, and that the topic is ripe for investigation. I agree. Let me offer some specific reasons to question the constant-matching-rate view and its interpretation.

First, the composition of the U.S. unemployment pool varies sharply with cyclical movements in the unemployment rate. During good times, unemployment is dominated by new entrants and reentrants into the labor market. During recessions, the rise in unemployment is dominated by increases in the number of laid-off persons and an accompanying increase in the share of unemployment accounted for by prime-age workers. Systematic shifts in the composition of the unemployment pool among workers with different job-finding probabilities cloud the interpretation of the aggregate relationship between new hires and the unemployment rate.

In fact, there is a plausible story that fits the time-series evidence cited by Hall and the view that congestion effects dominate agglomeration effects with respect to cyclical swings in unemployment. The story runs as follows. During recessions, prime-age workers with high reemployment rates enter the unemployment pool in unusually large numbers. For fixed job-finding rates at the individual level, this composition shift pushes up the aggregate job-finding rate. At the same time, the increase in aggregate unemployment and matching flows involves congestion effects that reduce individual job-finding rates. If these forces roughly balance out, the aggregate flow of new hires rises in rough proportion to the rise in the unemployment rate.

Second, even clean evidence on job-finding rates may not tell us much about whether congestion or agglomeration effects dominate in the matching process. Let us suppose we estimate job-finding probabilities as a function of individual characteristics and cyclical conditions. Suppose we find countercyclical movements in job-finding probabilities, conditional on individual characteristics. Can we conclude that congestion effects dominate agglomeration effects with respect to cyclical swings in aggregate matching flows? No,

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1See chapter 6 in Davis, Haltiwanger, and Schuh (1996) for a review of this evidence.  
2Darby, Haltiwanger, and Plant (1985) develop a theory of aggregate unemployment rate dynamics based on systematic shifts in the composition of unemployment inflows over the business cycle.
because search intensity may fall off during cyclical downturns as the value of market activities declines relative to nonmarket activities. U.S. evidence on procyclical movements in labor-force participation rates and countercyclical movements in the number of discouraged workers lends credence to concerns about systematic cyclical variation in search intensity.

Thus, a convincing study of whether agglomeration or congestion effects dominate in the aggregate matching process at business-cycle frequencies would seem to require data that (i) span several business-cycle episodes, (ii) provide measures of labor-market transitions and (proxies for) search intensity, and (iii) allow controls for the composition of searching workers (and firms). These data requirements are highly demanding but not beyond the realm of possibility.

Yashiv (1999), for example, estimates a two-sided aggregate matching technology using Israeli time-series data on vacancies, unemployment, new hires, and worker search intensity. His parameter estimates imply an aggregate returns-to-scale parameter of 1.3.\(^3\) Even with constant returns to scale, the two-sided matching technology estimated by Yashiv and others implies that job-finding rates rise with labor-market tightness, as measured by the ratio of vacancies to unemployed workers. Since the ratio of vacancies to unemployment is highly procyclic, the implication is that job-finding rates also vary procyclically. Thus, the empirical literature on matching functions is at odds with the claim of a constant job-finding rate. It is also worth noting that Yashiv finds that search intensity rises with the ratio of wages to unemployment benefits.

Third, the time-series behavior of unemployment rates and labor-market flows in most European countries differs greatly from the U.S. experience in recent decades. Large increases in long-term unemployment rates and declining job-finding rates have accompanied rises in the level of European unemployment (e.g., Machin and Manning, 1999). These developments may well reflect factors outside the scope of most matching models, but they nonetheless point to the difficulty of using time-series evidence to draw inferences about the properties of the matching technology.

2 Tradeoffs between production and reorganization

A central theme in Hall's paper is that the economy faces a tradeoff between production and reorganization. Like much other work on this tradeoff, he treats labor reallocation in general – and the matching process in particular – as the chief aspect of reorganization of interest to macroeconomists. I

\(^3\)While he cannot control directly for composition effects, Yashiv notes that labor-force survey data point to little cyclical variation in the composition of the Israeli unemployment pool.
wholeheartedly share Hall's enthusiasm for studying the reallocation process as a path to understanding macroeconomic phenomena, but the matching process embedded in simple search models offers a fairly narrow conception of reorganization. Other notions of reorganization and organization capital also offer useful insights into the nature of the tradeoffs between current and future production.

For example, much of Hall's work on labor markets emphasizes the experimentation required to form a good match. In practice, workers and firms typically learn about match value over time. As a consequence, the formation of a stable, high-value match often involves transit through many short-term employment relationships. Incorporating this idea into dynamic search and matching models improves their ability to explain the persistence of aggregate employment and output responses to shocks (Hall, 1995 and Pries, 1998).

A similar process of experimentation and selection holds with respect to production units, as distinct from employment relationships. Davis, Haltiwanger, and Schuh (1996, Table 4.5) report that annual gross job destruction rates decline from 16.5% of employment at one-year-old manufacturing plants to 9.5% at plants that are 15 or more years old. Davis and Haltiwanger (1999, Section 4.2) show that there remains a strong relationship between plant age and employment volatility after controlling for a long list of plant and industry characteristics.

As modeled by Jovanovic (1982), new businesses learn over time about initial conditions relevant to success and business survival. This type of theory has become a work horse in empirical studies of how establishment and firm dynamics relate to employer size and age. It provides an appealing interpretation of the strong and pervasive negative relationship between employer age and the magnitude of gross job flows. And, like the matching theory emphasized by Hall in "Reorganization," theories of experimentation and selection also imply a tradeoff between current production and reorganization activity that improves future production possibilities.

Specific investments in ongoing matches and organizations also imply tradeoffs between production and reorganization. These specific investments come in many forms, and they operate at many levels. At the level of individuals, on-the-job training and learning by doing often have a match-specific character that enhances the durability and value of particular employment.

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5 Caves (1998) and Davis and Haltiwanger (1999) review some of this evidence and provide references to the literature.
relationships. Learning by doing can also operate at the level of production units and firms. Lucas (1993), for example, presents evidence of dramatic reductions in the labor required to build ocean-going transport and escort vessels during World War II. Shipyard productivity for a particular vessel rises with the cumulative production of that same vessel at that same shipyard. This evidence is highly suggestive of learning by doing and the accumulation of organization capital at the level of the shipyard. As a quite different example, Cusumano and Selby (1995) provide an in-depth case study of how the organizational structure and decision-making processes at Microsoft Corporation evolved over time to better develop and market new computer software, to more effectively harness the efforts of thousands of complementary hardware and software suppliers, and to influence the evolution of industry standards. Each of these examples suggests that reallocation involves the destruction or abandonment of old organization and match capital while simultaneously laying the foundations for the creation of new capital.

At the economy-wide level, much organization capital is embodied in the deployment of specific forms of physical capital and complementary inputs. In general, this deployment is history-dependent and costly to change. Exogenous shocks—such as a change in the relative price of energy—alter the desired deployment of specialized capital and labor. But adapting the existing deployment of factor inputs to the desired deployment is a costly process that involves a sacrifice of current production in order to improve future production possibilities. Atkeson and Kehoe (1994) neatly analyze this tradeoff in a model that delivers interesting implications for the aggregate response to energy price shocks. Ramey and Shapiro (1996) provide empirical evidence on the costs of redeploying specialized forms of physical capital.

Many recent empirical studies confirm the importance of reorganization that takes the form of factor reallocation among production units. For example, Davis and Haltiwanger (1999, Section 7.3) report that only 48 percent of the total factor productivity increase in the U.S. manufacturing sector from 1977 to 1987 is accounted for by within-plant productivity gains and a fixed distribution of factor inputs. The remaining 52 percent reflects the reallocation of capital and labor towards plants with higher levels of total factor productivity and greater productivity gains. This accounting decomposition underscores the significance of factor reallocation among production units in the development and maintenance of an economy’s level of organization. This type of reorganization is intimately tied to factor reallocation, but it is not captured very well by the matching mechanism that inhabits the type of

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6Davis and Haltiwanger (1999) provide an extended discussion of the idea that energy price shocks upset an economy’s established patterns of production, thereby devaluing existing organization capital and triggering a costly reallocation process. They also provide references to related work.
model that Hall emphasizes.

Theories that emphasize match-specific and organization-specific forms of capital suggest a number of additional themes. I mention three. First, matches and organizations tend to become more productive over time with the accumulation of specific knowledge on how to better carry out the production activity. This effect is obviously distinct from the experimentation and selection effects highlighted by the "matching" theories of Jovanovic (1979, 1982), Hall (1995), and Pries (1998), among others. Second, it takes time for productivity to recover following a shock or disruption to the established pattern of production – possibly a very long time, as emphasized by Atkeson and Kehoe (1997). Third, matches and organizations may be more prone to destruction early on, not because of selection effects, but because the match participants and organization have had little time to accumulate the specific capital that enhances durability in the face of adverse shocks.

This brief discussion scarcely scratches the surface of theoretical and empirical research related to reallocation and reorganization. Much, if not all, of this research points to interesting tradeoffs between current production and an improved organization of society's productive inputs.7

3 Temporal concentration in job destruction

Section 5 of Hall’s paper develops an interesting theory of temporal concentration in job destruction dynamics. According to the theory, a “burst of job destruction is followed by a period of lower than normal likelihood of further job destruction.” High job destruction today effectively borrows from future job destruction that would have taken place in any event. Hall (1999) finds evidence of temporal concentration in the job destruction time series for the U.S. manufacturing sector.

The mechanism that underlies the temporal concentration phenomenon in Hall’s model seems likely to arise in many models. The key model features that deliver temporal concentration are endogenously determined job destruction and a nondegenerate distribution of match values. Given these features, an adverse shock that triggers a burst of job destruction also depletes the stock of filled jobs with low surplus values. Following the shock, it then takes some time for the normal process of match degradation to replenish the stock of low-value matches. Meanwhile, since few matches are near the breakup threshold, job destruction tends to be lower than normal.

This is a sensible idea, and I expect it to find empirical support in many settings. However, it is worth pointing out that several of the reorganization theories mentioned above imply the opposite of concentration. As a

7See Aghion and Howitt (1998) for an extensive treatment of reallocation and reorganization as it pertains to economic growth.
first example, consider the consequences of a shock that causes a burst of job destruction among mature plants in a selection model along the lines of Jovanovic (1982). If aggregate employment recovers through the entry of new plants, job destruction will be high for many periods as the newly intensified selection process works itself out. Second, theories that emphasize experimentation and selection in match formation also give rise to this sort of effect. Recall that, according to the Hall-Pries view, an initial burst of job destruction triggers recurring job separations and hence a persistent unemployment response to an adverse shock. In many circumstances, the surplus value of a job position rises with the quality of the existing job-worker match. As a result, when the match terminates, the job may also be destroyed. So, an initial burst of job destruction sows the seeds of more job destruction down the road. Third, theories that emphasize specific investments in ongoing matches (or organizations) suggest that new matches (organizations) may be relatively fragile and, hence, more susceptible to destruction upon the arrival of bad news or an adverse shock. Thus, all three of these alternative reorganization theories highlight “anti-concentration” effects in the temporal behavior of job destruction. These anti-concentration effects probably operate at somewhat longer horizons than the concentration effect emphasized by Hall’s model.

These remarks are not meant to criticize Hall’s model or his emphasis on temporal concentration in job destruction dynamics. Rather, they are meant to be suggestive of the rich implications for economic dynamics that flow naturally from models of reorganization and reallocation.
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