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**Article**

## Understanding aggregate fluctuations: The importance of building from microeconomic evidence

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inflation than the public does. Whether that means the public needs to listen more carefully to monetary economists, or vice versa, remains an open issue.

## Future Directions

Predicting the direction of research is about as easy as predicting the direction of the stock market. And for much the same reason: if people could tell where we were going, we would be there already. But like the inevitability of stock-market fluctuations, there is no doubt that research on monetary economics will remain active. As Japan wrestles with deflation and a potential liquidity trap, Russia copes with fiscal insolvency

and the possibility of hyperinflation, and the United States enjoys an era of approximate price stability, monetary topics are everywhere to be seen. In every case, NBER monetary researchers are sure to be there as well.

<sup>1</sup> B. S. Bernanke and I. Mibov, "The Liquidity Effect and Long-Run Neutrality," NBER Working Paper No. 6608, June 1998.

<sup>2</sup> L. M. Ball, "Disinflation and the NAIRU," NBER Working Paper No. 5520, March 1996.

<sup>3</sup> C. D. Romer and D. H. Romer, "Monetary Policy and the Well-Being of the Poor," NBER Working Paper No. 6793, November 1998.

<sup>4</sup> See B. S. Bernanke and F. S. Mishkin, "Inflation Targeting: A New Framework for Monetary Policy?," NBER Working

Paper No. 5893, July 1997. Other papers on inflation targeting include B. T. McCallum, "Inflation Targeting in Canada, New Zealand, Sweden, the United Kingdom, and in General," NBER Working Paper No. 5579, February 1998; F. S. Mishkin and A. S. Posen, "Inflation Targeting: Lessons from Four Countries," NBER Working Paper No. 6126, February 1998; G. D. Rudebusch and L. E. O. Svensson, "Policy Rules for Inflation Targeting," NBER Working Paper No. 6512, April 1998; and L. E. O. Svensson, "Inflation Targeting as a Monetary Policy Rule," NBER Working Paper No. 6790, November 1998.

<sup>5</sup> M. F. Bryan, S. G. Cecchetti, and R. L. Wiggins II, "Efficient Inflation Estimation," NBER Working Paper No. 6183, September 1997.

<sup>6</sup> R. J. Shiller, "Why Do People Dislike Inflation?," NBER Working Paper No. 5539, April 1996.

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## Research Summaries

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### Understanding Aggregate Fluctuations: The Importance of Building from Microeconomic Evidence

John C. Haltiwanger\*

In recent research using longitudinal establishment-level data, a pervasive finding is that idiosyncratic factors dominate the distribution of growth rates of output, employment, investment, and productivity across establishments. Seemingly similar plants within the same industry exhibit quite different behavior in terms of real activity at cyclical and longer-run frequencies. Even in the fastest-growing industries, a signifi-

cant fraction of establishments decline substantially; similarly, a large fraction of establishments in the slowest-growing industries grow dramatically. During severe recessions virtually all industries decline, but within each industry a substantial fraction of establishments grow. Likewise, during robust recoveries, a substantial fraction of establishments contract. Simply put, the underlying gross microeconomic changes in activity dwarf the net changes that we observe in published aggregates.

The tremendous observed within-sector heterogeneity raises a variety of questions for our understanding and measurement of key macro aggregates. Much of macroeconomic research and our measurement of

aggregates is predicated on the view that building macro aggregates from industry-level data is sufficient for understanding the behavior of the macro economy. The implicit argument is that, at least at the detailed industry level, the assumption of a representative firm or establishment is reasonable.

The finding of tremendous within-industry heterogeneity is not by itself sufficient to justify abandoning this useful assumption. There is undoubtedly considerable canceling out of the impact of idiosyncratic shocks (for example, taste, cost, and technology) that underlie the heterogeneous fortunes across individual producers. Evidence from recent establishment-level studies of em-

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ployment, investment, and productivity growth, however, suggests that this canceling out is far from complete. It is becoming increasingly apparent that changes in the key macro aggregates at cyclical and secular frequencies are best understood by tracking the evolution of the cross-sectional distribution of activity and changes at the micro level.

A number of different factors are potentially important in this context. The observed heterogeneity in output, employment, and investment growth rates within sectors implies a large, continuous pace of reallocation of real activity across production sites. Such reallocation inherently involves substantial frictions. One obvious and important friction is that it is time- and resource-consuming for workers (and for other inputs) to reallocate across production sites. High- and low-frequency changes in key macro aggregates are likely associated with the interaction of these frictions and the pace of reallocation. The level of unemployment, as well as the growth rate of aggregate measures of real activity (for example, real output or productivity), will reflect the efficiency of the economy in accommodating the pace of reallocation. Changes in institutions, regulation, the pace of technological change, and the sectoral mix of activity all may alter the intensity of reallocative activity and the economy's ability to accommodate the reallocation.

Relatedly, it is important to consider the nature of the adjustment costs at individual production sites in changing the scale and scope of activity. Accumulating evidence of lumpy microeconomic adjustment of inputs such as employment and capital suggests the presence of nonconvexities in micro-level adjustment costs, or, at a minimum, it implies highly nonlinear adjustment at the micro level. The combination of nonlinear micro adjustment with micro

heterogeneity has important implications for aggregate fluctuations. One key implication is time-varying elasticities of aggregates with respect to aggregate shocks. Roughly speaking, time-varying elasticities arise in this context because the impact of an aggregate shock depends on the distribution of individual producers' relative positions to their adjustment thresholds. From this perspective, characterizing aggregate fluctuations requires tracking how the distribution of shocks and adjustments has evolved.

## **Job Creation and Destruction**

Much of the recent empirical analysis documenting and analyzing the connection between micro heterogeneity and aggregate fluctuations has focused on employment dynamics. My recent work, much of it with Steven J. Davis, focuses on job creation and destruction.<sup>1</sup> Job creation is defined as the sum of employment gains at expanding and new establishments. Job destruction is defined as the sum of employment losses at contracting and closing establishments. In manufacturing (the sector with the most readily available establishment-level data for the longest period), annual job creation and destruction rates are large in absolute terms. In a typical year, roughly one in ten manufacturing jobs is created and one in ten jobs is destroyed. In nonmanufacturing (with spottier information based on tabulations from selected states for relatively short sample periods), job creation and job destruction rates are slightly higher on average.

The large pace of implied job reallocation (measured as the sum of job creation and job destruction) in both manufacturing and nonmanufacturing sectors highlights the remarkable

fluidity in the distribution of job opportunities across locations in the U.S. economy. Much of this fluidity reflects shifts within narrowly defined sectors, rather than between sectors. For example, only 13 percent of job reallocation in manufacturing reflects shifts of employment opportunities between four-digit sectors.

One important issue for the relevance of these statistics for aggregate fluctuations is the nature of time-series variation in the pace of job reallocation. In U.S. manufacturing, the pace of job reallocation varies systematically throughout the cycle at annual and quarterly frequencies. During downturns, job destruction rises sharply and job creation falls relatively mildly. Given the observed magnitude and time-series variation of job reallocation, even modest frictions are likely to yield important implications for aggregate fluctuations. In recent years, some economists have begun developing theories to explain the magnitude and cyclical behavior of job (and worker) flows and the connection to aggregate fluctuations.<sup>2</sup> Two types of theories have received the most attention. One treats fluctuations over time in the intensity of allocative shocks as an important driving force behind aggregate fluctuations. The other maintains that aggregate shocks are the primary driving forces underlying business cycles, but that the propagation of aggregate shocks involves intertemporal substitution effects changing the incentives for the timing of reallocation. Of course, there is an important debate about the direction of causality and thus the relative contribution of aggregate and allocative disturbances to aggregate fluctuations.<sup>3</sup> Regardless of the direction of causality, though, the relevant point is that understanding aggregate fluctuations requires tracking how the distribution of microeconomic changes has evolved.

## Nonlinear Micro Adjustment

Thus far I have focused on the aggregate consequences generated by the resource- and time-consuming nature of reallocation. A closely related issue is that the adjustment at the individual producer level may be nonlinear. For example, about two-thirds of annual job creation and destruction are accounted for by establishments with growth rates above 25 percent in absolute magnitude. Of this group, plant start-ups account for 12 percent of annual job creation, while plant shutdowns account for about 23 percent of annual job destruction. Thus the distribution of establishment-level employment changes exhibits both considerable heterogeneity and fat tails. The lumpy changes at the micro level in combination with the heterogeneity in turn have consequences beyond those discussed earlier.

Building on the literature about the aggregation of (S,s) models, a useful means of organizing micro data to characterize the interaction of nonlinear micro adjustment and heterogeneity is the adjustment hazard framework. My work with Ricardo J. Caballero and Eduardo M. Engel has used this approach to characterize the micro and macro employment dynamics.<sup>4</sup> Using a measure of the gap between desired and actual employment at the micro level, the adjustment hazard measures the relationship between the size of this gap and the fraction of it that is closed by the establishment. The standard convex adjustment cost model implies a constant (flat) hazard, but our findings using micro data reveal a highly nonlinear hazard, with businesses with large absolute gaps closing a disproportionately high fraction of the gap. The combination of a nonlinear micro hazard and considerable micro heterogeneity in the cross-

sectional distribution of the gaps has important implications for aggregate adjustment. Time-varying aggregate elasticities of aggregate employment emerge as the impact of an aggregate shock depends on the underlying cross-sectional distribution at the time of the shock and the endogenous dynamics of the cross-sectional distribution interacting with the nonlinear micro adjustment. Our findings indicate that the marginal responsiveness for employment varies as much as 70 percent over time. Furthermore, the impact of the time-varying marginal response is especially large during recessions; for example, the decline in the 1974–5 recession was 59 percent larger than it would have been in the absence of nonlinear adjustment.

## Investment Dynamics

Nonlinearities in the adjustment dynamics of capital, driven by irreversibilities and related nonconvexities in the adjustment costs of capital, have analogous implications for aggregate investment dynamics. Several recent studies of establishment-level investment dynamics support the view that micro investment dynamics exhibit lumpy adjustment. Plant-level investment is dominated by large-scale investment episodes. Denoting these large-scale investment episodes as spikes, Russell Cooper, Laura Power, and I show that the probability of an investment spike is increasing in the time since the previous spike, lending additional support to the view of a microeconomic environment with nonconvexities in the adjustment technology.<sup>5</sup> Using the adjustment hazard approach in this context, my work with Caballero and Engel shows a highly nonlinear relationship between investment and fundamentals.<sup>6</sup> For plants with positive excess capital, the adjustment hazard is quite flat

and close to zero, which is consistent with irreversibilities in investment. In contrast, plants with large shortages of capital adjust proportionally more than do plants with small shortages of capital.

As with employment dynamics, the nonlinear adjustment hazard yields time-varying elasticities of aggregate investment with respect to aggregate shocks. For investment, the marginal responsiveness is highly procyclical and varies by as much as 70 percent. The time-varying elasticities suggest a possible explanation for the often-puzzling response of aggregate investment to cost of capital and other shocks. The basic idea is that the empirical aggregate investment literature has difficulty in quantifying the relationship between aggregate investment and the cost of capital because of the failure to incorporate the time-varying responsiveness generated by the interaction of nonlinear micro adjustment and heterogeneity.

## Productivity Dynamics

Several of the findings discussed earlier raise a variety of conceptual and measurement questions regarding our understanding of aggregate productivity growth. Several key, related findings are of interest. First, there is large-scale, ongoing reallocation of outputs and inputs across individual producers. Second, the pace of this reallocation varies over time (both secularly and cyclically) and across sectors. Third, much of this reallocation reflects within-sector rather than between-sector reallocation. In addition, recent evidence shows large differentials in the levels and rates of productivity growth across establishments within the same sector. The rapid pace of output and input reallocation along with differences in productivity levels and growth rates are necessary for the pace of reallocation to play an impor-

tant role in aggregate (that is, industry) productivity growth. My recent work with Lucia Foster and C. J. Krizan suggests that reallocation plays a significant role in the changes in productivity growth at the industry level.<sup>7</sup> While measurement-error problems cloud the results somewhat, two aspects of the results clearly point in this direction. First, our results show a large contribution from the replacement of less productive exiting plants with more productive entering plants when productivity changes are measured over five- or ten-year horizons. Second, the contribution of net entry is disproportionate—that is, the contribution of net entry to productivity growth exceeds that which would be predicted by simply examining the share of activity accounted for by entering and exiting plants. These results are particularly striking for selected service-sector industries that we investigate. There is tremendous reallocation of activity across service

establishments, with much of this reallocation generated by entry and exit. The productivity growth in the selected service industries we examine is dominated by entry and exit effects. For example, the primary source of productivity growth between 1987 and 1992 for the automobile repair shop industry is accounted for by the exit of very low productivity plants.

<sup>1</sup> For an overview of this work, see S. J. Davis and J. C. Haltiwanger, "Gross Job Flows," in *Handbook of Labor Economics*, O. Ashenfelter and D. Card, eds., Amsterdam: North Holland, forthcoming; and S. J. Davis, J. C. Haltiwanger, and S. Schuh, *Job Creation and Destruction*, Cambridge: MIT Press, 1996.

<sup>2</sup> See, for example, R. J. Caballero and M. Hammour, "On the Timing and Efficiency of Creative Destruction," NBER Working Paper No. 4768, June 1994; published in *Quarterly Journal of Economics*, 111 (August 1996), pp. 805–52; and D. Mortensen and C. Pissarides, "New Developments in Models of Search in the Labor Market," in *Handbook of Labor Economics*, O. Ashenfelter and D. Card,

eds. Amsterdam: North Holland, forthcoming.

<sup>3</sup> See, for example, S. J. Davis and J. C. Haltiwanger, "Driving Forces and Employment Fluctuations: New Evidence and Alternative Explanations," NBER Working Paper No. 5775, September 1996.

<sup>4</sup> R. J. Caballero, E. M. Engel, and J. C. Haltiwanger, "Aggregate Employment Dynamics: Building from Microeconomic Evidence," NBER Working Paper No. 5042, February 1995; published in *American Economic Review*, 87 (March 1997), pp. 115–37.

<sup>5</sup> R. Cooper, J. C. Haltiwanger, and L. Power, "Machine Replacement and the Business Cycle: Lumps and Bumps," NBER Working Paper No. 5260, September 1995; forthcoming in *American Economic Review*.

<sup>6</sup> R. J. Caballero, E. M. Engel, and J. C. Haltiwanger, "Plant-Level Adjustment and Aggregate Investment Dynamics," *Brookings Papers on Economic Activity*, 2 (1995), pp. 1–39.

<sup>7</sup> L. Foster, J. C. Haltiwanger, and C. J. Krizan, "Aggregate Productivity Growth: Lessons from Microeconomic Evidence," NBER Working Paper No. 6803, November 1998.

## East Asian Mysteries: Past and Present

Dani Rodrik\*

East Asia has long served as a Rorschach test for economists. The region's spectacular growth from the 1960s until the crash of 1997 spawned diverse interpretations that had as much to do with the preoccupations of the analyst as with the realities on the ground.

Observers with a favorable take on industrial policy saw in East Asia a

confirmation of their theories on the importance of state intervention. Advocates of free markets saw instead the triumph of small government and unfettered private initiative. Trade economists viewed it as a miracle based on outward orientation, labor economists stressed the early emphasis on education, and macroeconomists pointed to the region's fiscal conservatism. Growth theorists debated the respective contributions of human capital, physical capital, and technology adoption.<sup>1</sup>

Interpretations of the recent crisis have had a similar quality. Critics of state-led industrialization have blamed East Asian governments for encouraging excessive investments with low marginal returns. Those

who worry about moral hazard have focused on "crony capitalism." Economists skeptical of the rationality of international capital markets have viewed the crisis as yet another episode in the boom-and-bust saga of financial markets.

One reason that East Asia has something to offer to all persuasions is the region's diversity. The attitude toward economic policy ranges from the almost laissez-faire (Hong Kong) to the highly interventionist (South Korea, until recently). In terms of the rule of law, the region spans almost the entire feasible range, from Indonesia at one end to Singapore at the other. Japan and Korea are homogeneous societies, while the populations of Indonesia and Malaysia are

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