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## THE LINK BETWEEN EMPLOYMENT DENSITY AND PATENT INTENSITY

Economists, beginning with Alfred Marshall, have studied the significance of cities in the production and exploitation of information externalities that, today, we call knowledge spillovers. This paper presents robust evidence of those effects. The authors show that patent intensity — the per capita invention rate — is positively related to the density of employment in the highly urbanized portion of metropolitan areas. All else equal, a city with twice the employment density (jobs per square mile) of another city will exhibit a patent intensity (patents per capita) that is 20 percent higher. Patent intensity is maximized at an employment density of about 2,200 jobs per square mile. A city with a more competitive market structure or one that is not too large (a population less than 1 million) will also have a higher patent intensity. These findings confirm the widely held view that the nation's densest locations play an important role in creating the flow of ideas that generate innovation and growth.

*Working Paper 06-14, "Urban Density and the Rate of Invention," Gerald Carlino, Satyajit Chatterjee, and Robert Hunt, Federal Reserve Bank of Philadelphia*

## TEST SCORES, SCHOOL QUALITY, AND HOUSE PRICES

The expansion of state-mandated tests in the 1990s and the testing requirements of the No Child Left Behind Act have supplied researchers with an abundance of data on test scores that can be used as measures of school quality. This paper uses the state-

mandated test scores for 5th grade and 11th grade in Montgomery County, Pennsylvania, to examine three issues about the capitalization of school quality into house prices: (1) At what level do prospective home buyers evaluate the quality of local public education — at the district level or the level of the neighborhood school? (2) After accounting for student achievement as reflected in test scores, are other aspects of the local public school system, such as class size or expenditures, capitalized into the value of a house? (3) Are the positive results the author gets for the capitalization of school quality into house prices due simply to the correlation between high test scores and other desirable neighborhood characteristics? The results of the author's investigation suggest that to home buyers, some test-score averages are significantly better indicators of the quality of the local public school system than others. In particular, home buyers seem to evaluate the quality of public education at the district level rather than at the level of the local school. Class size at the high-school level has some independent effect on house prices, but not class size at the elementary school level. And once student achievement is accounted for, expenditures per pupil have no further effect on house prices. Finally, restricting the sample to similar neighborhoods along school district boundaries confirms earlier results for high school test scores but not for elementary school scores.

*Working Paper 06-15, "Capitalization of the Quality of Local Public Schools: What Do Home Buyers Value?," Theodore M. Crone, Federal Reserve Bank of Philadelphia*

## DIVERGENT INCOME PERFORMANCE IN TWO INDIAN STATES

In this paper the authors study the economic evolution between 1960 and 1995 of two states in India: Maharashtra and West Bengal. In 1960, West Bengal's per capita income exceeded that of Maharashtra. By 1995, it had fallen to just 69 percent of Maharashtra's per capita income. The authors employ a "wedge" methodology based on the first-order conditions of a multi-sector neoclassical growth model to ascertain the sources of the divergent economic performances. Their diagnostic analysis reveals that a large part of West Bengal's development woes can be attributed to: (a) low sectoral productivity, especially in manufacturing and services; and (b) sectoral misallocation in labor markets. These patterns, together with additional evidence on developments in the labor market, the manufacturing sector, and voting behavior, suggest a systematic worsening of the business environment in manufacturing in West Bengal during this period.

*Working Paper 06-16, "A Tale of Two States: Maharashtra and West Bengal," Amartya Lahiri, University of British Columbia, and Kei-Mu Yi, Federal Reserve Bank of Philadelphia*

## THE CYCLICALITY OF JOB LOSS AND HIRING

In this paper the authors study the cyclical behavior of job loss and hiring using CPS worker flow data, adjusted for margin error and time aggregation error. The band pass filter is used to isolate cyclical components. The authors consider both total worker flows and transition hazard rates within a unified framework. Their results provide overwhelming support for a "separation-driven" view of employment adjustment, whereby total job loss and hiring rise sharply during economic downturns, initiated by increases in the job loss hazard rate. Worker flows and transition hazard rates are highly volatile at business cycle frequencies. These patterns are especially strong among prime-age workers. For young workers, job loss and hiring adjust procyclically due to movements into and out of the labor force.

*Working Paper 06-17, "The Cyclicalities of Job Loss and Hiring," Shigeru Fujita, Federal Reserve Bank of Philadelphia, and Garey Ramey, University of California, San Diego*

## CALCULATING THE BENEFITS OF STABILIZATION POLICIES

The authors calculate the potential benefit of policies that eliminate a small likelihood of economic crises. An economic crisis is defined as an increase in unemployment of the magnitude observed during the Great Depression. For the U.S., the maximum-likelihood estimate of entering a depression is found to be about once every 83 years. The welfare gain from setting this small probability to zero can range between 1 and 7 percent of annual consumption in perpetuity. For most estimates, more than half of these large gains result from a reduction in individual consumption volatility.

*Working Paper 06-18, "On the Aggregate Welfare Cost of Great Depression Unemployment," Satyajit Chatterjee, Federal Reserve Bank of Philadelphia, and Dean Corbae, University of Texas, Austin*

## REAL-TIME DATA AND INFLATION FORECASTS

This paper carries out the task of evaluating inflation forecasts from the Livingston Survey and the Survey of Professional Forecasters, using the real-time data set for macroeconomists as a source of real-time data. The author examines the magnitude and patterns of revisions to the inflation rate based on the output price index and describes what data to use as "actuals" in evaluating forecasts. The author then runs tests on the forecasts from the surveys to see how good they are, using a variety of actuals. The author finds that much of the empirical work from 20 years ago was a misleading guide to the quality of forecasts because of unique events during the earlier sample period. Repeating that empirical work over a longer sample period shows no bias or other problems in the forecasts. The use of real-time data also matters for some key tests on some variables. If a forecaster had used the empirical results from the late 1970s and early 1980s to adjust survey forecasts of inflation, forecast errors would have increased substantially.

*Working Paper 06-19, "An Evaluation of Inflation Forecasts from Surveys Using Real-Time Data," Dean Croushore, University of Richmond, and Visiting Scholar, Federal Reserve Bank of Philadelphia*