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## Improved Neighborhoods Don't Raise Academic Achievement

It is assumed that if poor families move to better neighborhoods their children will perform better in school, but until now the data to support this proposition have been difficult to isolate and even more difficult to interpret with anything like a consensus. In **Neighborhoods and Academic Achievement: Results from the Moving to Opportunity Experiment** (NBER Working Paper No. 11909), **Lisa Sanbonmatsu, Jeffrey Kling, Greg Duncan, and Jeanne Brooks-Gunn** analyze a rich mine of information regarding such families but find no academic improvement for any of the children.

The data, collected in 2002, arise out of the U.S. Department of Housing and Urban Development's experimental Moving to Opportunity (MTO) for Fair Housing program in the late 1990s. In this program, three groups of low-income families in New York, Los Angeles, Boston, Baltimore, and Chicago were offered housing assistance via lotteries. An "experimental" group could use housing vouchers in low-poverty neighborhoods. The second group, called "Section 8," could use traditional housing vouchers with no restrictions. A control group received no vouchers but was eligible for public housing. The data from these three groupings encompassed more than 5,000 children ranging from pre-schoolers to high schoolers.

Assessments of these children, based on test-score analysis and extensive interviewing, allowed for measuring the impact of the change in residential neighborhood on academic achievement, free of family and individual attributes. The authors here also theorized that neighborhoods might influence the educational norms, social values, and community resources outside of school. Their belief was that a "better" neighborhood provides a

study of MTO results for Baltimore that suggested a positive impact on children aged 5–11, but this team's longer-run analysis (four to seven years) showed that the pupils did not sustain their gains. These results, the researchers theorize, may reflect something in particular about Baltimore schools, or may just be happenstance. Overall, the data for the five cities show no appreciable educational or social improvement.

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more positive impact on children, especially on the youngest learners, who are considered the most adaptable of children to new social environments, and on those just beginning school. The researchers accordingly tested that hypothesis, as well as the overall magnitude of impacts on educational outcomes, including both test scores and behavioral gains. Moreover, they investigated the possibility of differential effects arising from ethnicity, race, gender, and educational risk factors.

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The authors consider a number of explanations for this lack of improvement. One possibility is that members of the experimental group may have moved from poor to middle-class neighborhoods, as their plan allowed, but for a variety of reasons may have had to move again to less affluent neighborhoods. At the same time, the control group, whose families were permitted to use their housing vouchers anywhere, may not have moved to areas appreciably better than those they had been living in. In any event, neither group moved to truly affluent neighborhoods.

Another explanation for the stagnant academic improvement,

the researchers say, is that while the voucher recipients generally moved to better neighborhoods, three-fifths of them did not move to racially or ethnically integrated neighborhoods. The authors surmise that “discrimination may limit the availability of high-quality schools or other public services in minority neighborhoods,” although they admit that they had no way of confirming this.

Another factor is that, even after moving to a better neighborhood, some parents continued to send their children to school in their former neighborhoods because they felt the children would be more comfortable in familiar surroundings. And, another possible explanation for the lack of

academic improvement is that better neighborhoods do not automatically mean better schools. Indeed, the researchers note that the MTO participants rarely if ever found their children attending the top-rated schools. The new school environment almost always showed, for example, no improvement in pupil-teacher ratios or in how the students rated the school climate.

The researchers suggest further that the potential gains associated with neighborhood improvement may have been offset by the disruption of relocation and integration into a new school district. Studies do show that the move to better neighborhoods is associated with positive health outcomes for female adults and youth, fewer crimi-

nal arrests among female youth, and an overall reduction in exposure to drugs and violence. Yet despite these pluses, the authors conclude: “It appears that interventions focused exclusively on neighborhoods, rather than on factors directly related to the child, family, and school, are unable to solve the myriad problems of children growing up in poverty. From a policy perspective, residential mobility programs such as Section 8 (now called Housing Choice Vouchers) and even more dramatic MTO experimental treatment do not appear to have large impacts on the academic problems of children who live in public housing in high-poverty neighborhoods.”

— Matt Nesvisky

## Teacher-Student Matching Increases Teacher Effectiveness

If gifted students end up being taught by more qualified teachers, then estimates of the effect of teacher qualifications on student achievement are likely to be higher than if teachers and students were randomly assigned. To test that theory, authors **Charles Clotfelter**, **Helen Ladd**, and **Jacob Vigdor** use statewide classroom data from North Carolina to estimate the effect of teacher qualifications on student achievement for fifth graders in the 2000/1 school year.

In **Teacher-Student Matching and the Assessment of Teacher Effectiveness**, (NBER Working Paper No. 11936), they review data on the qualifications of 3,842 fifth-grade teachers from the state’s 117 school districts, including licensure test scores, undergraduate institution attended, advanced degrees, and the number of years of teaching experience. Data on the fifth grade students include gender, ethnicity, fourth-grade achievement test scores, parental education, free lunch status, and self-reported time spent on homework, television watching, and personal computer use.

The results suggest that positive matching occurs both across schools and within schools. Teachers with better qualifications — that is, more experience, degrees from more highly ranked schools, higher licensure test scores, National Board Certification,

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and advanced degrees — are more likely to work in schools with students who are more likely to be white, ineligible for subsidized lunches, to have college educated parents, and to have scored better on the prior year’s state assessment test.

To explore the effects of teacher qualifications without the bias created by such positive matching, the authors turn to a subset of schools that distribute students across classrooms in ways that balance observable student characteristics. They find that “the only teacher qualifications that consistently predict improved student performance are experience and licensure test scores.”

A single standard deviation increase in licensure score increases predicted math achievement by 1 to 2 percent. Students assigned to highly experienced teachers improve their math scores by roughly one tenth of a standard deviation and their reading scores by slightly less than

one tenth of a standard deviation.

Because teacher experience produces larger gains in math achievement for students with highly educated parents, reallocating the strongly qualified teachers to less advantaged students would probably reduce students’ mean achievement scores. The pervasiveness of positive matching (between teachers and students) likely results from four forces: teachers seeking amenable working conditions; parents desiring to maximize the quality of their children’s education; administrators seeking to maximize achievement; and administrators seeking to please vocal parents.

— Linda Gorman

## Incentives to R&D Directors Improve Corporate R&D Performance

Many American corporations downsized their centralized corporate research facilities in the late 1980s. They also changed their compensation schemes to rely more heavily on plans tied to corporate performance. But substantial segments of the scientific establishment were unhappy with these shifts — in 1992, the National Science Board went so far as to state that such changes to centralized research facilities put “the needs of today’s customers’ ahead of longer-run objectives.” In **Innovation and Incentives: Evidence From Corporate R&D** (NBER Working Paper No. 11944), co-authors **Josh Lerner** and **Julie Wulf** find that the opposite is more likely true: in firms that give their head of corporate R&D firm-wide authority over R&D decisions, “more long-term incentives are associated with more heavily cited patents,” patents of greater originality, and “more frequent awards.”

These results emerge from a confidential compensation survey of 300 publicly traded U.S. firms for the years 1987 to 1998. The firms in the sample were large, with average annual sales of 11 billion U.S. dollars, and were active in a number of industries. Treating the structure of each firm in each year as a single observation, the authors find that the companies had centralized R&D heads in 63 percent of the firm-years surveyed. In 48 percent of the

firm-years, the head of R&D reported directly to the CEO.

In inflation-adjusted 1996 dollars, the average salary-plus-bonus for corporate heads of R&D rose from an average of \$353,661 in 1988 to \$480,092 in 1998. The ratio of long-term incentive pay — pay in the form of instru-

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ments like restricted stock and options grants — to salary rose from 0.39 to 0.87 over the same time period. The short-term incentive ratio — that is, the ratio of bonus to salary — rose from 0.28 to 0.34. For corporate CEOs, in contrast, long-term incentives as a fraction of salary rose from 0.64 to 1.68. Chief Financial Officers saw long-term incentives rise from 0.49 of salary to 1.29 of salary; human resources heads saw their long-term compensation rise from 0.355 to 0.80 of salary.

After allowing for differences in firm sales, the ratio of R&D spending to sales, and the year of observation, it turns out that high-powered incentives apparently increase both research quality and research output. Long-term incentives are associated with more heavily cited patents. They are also associated with more frequent awards and more original patents. Overall, pay also matters. Increasing “total

compensation from the 25<sup>th</sup> percentile (\$344,400) to the 75<sup>th</sup> percentile (\$764,309) [was] also associated with an increase of 0.8 in mean citations for the firm.” These results hold only for firms with centralized research. Higher compensation for the head of R&D also increased patent awards in firms

with decentralized research structures, but there was no obvious relationship between long-term incentives and innovation.

Although this paper fails to find any deleterious effects of the change in compensation for heads of corporate R&D, the authors note that, “it is by no means clear that our measures can capture shifts in truly groundbreaking research.” If profound changes in corporate research patterns have occurred, their effects may not be observable for several decades.

The authors measure innovation with patent data drawn from the NBER Patent Citations Database, publication data drawn from Thomson/ISI’s Web of Science, and compensation data from Hewitt Associates. The data on financial performance come from Compustat and CRSP.

— Linda Gorman

## No Decline in Long-Term Employment

For some years it has been that reported that employees in the United States experienced widespread, substantial declines in job security or stability over the past several decades. Various newspaper articles have suggested that big structural changes in

labor markets mean that job security is a “myth,” that lifetime employment with a single employer is far less likely than it was, say, thirty years ago. Workers themselves worry that their prospects for keeping a job for a long period have shrunk, that they may need

several jobs during their careers. “There is, however, a striking lack of solid empirical evidence to support these claims,” writes economist **Ann Huff Stevens**.

In **The More Things Change, the More They Stay the Same: Trends**

**in Long-Term Employment in the United States, 1969–2002** (NBER Working Paper No. 11878), Stevens sees stability in the prevalence of long-term employment for men in the United States, contrary to popular views. “Long-term relationships with a single employer are an important feature of the U.S. labor market in 2002, much as they were in 1969,” she writes. So, the likelihood is that most workers will have some job during their working lives that lasts for more than 20 years.

Stevens uses data from surveys of men aged 58–62 who were quizzed at the end of their working careers. She finds that in 1969 the average tenure for men in the job they held for the longest period during their careers was 21.9 years. In 2002, the comparable figure was 21.4 years, not much different. Just more than half of men ending their careers in 1969 had been with a single employer for at least 20 years; the same was true in 2002. Around a quarter of those men retiring, anytime in the 1969–2002 period, had stayed with a single employer for 30 or more years.

The focus on complete tenure provides a natural and direct measure of the frequency of “lifetime” or long-term employment, Stevens writes. Moreover, her data — drawn

from the Retirement History Survey, started in 1969, the National Longitudinal Study of Older Men, started in 1966, and the Health and Retirement Study, started in 1992 — cover a longer time span than those used in previous research on job stability. She also finds that tenure in the longest job held by these older men actually rose to an average of 24 years for those groups

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retiring in the late 1970s. Then, over the next decade, job tenure declined to levels comparable to those prevailing in 1969.

Looking at the data in more detail, Stevens finds that educated men tend to have longer tenure than less-educated men, that is, men with less than a high school education. The average tenure in the job held longest for those with less than 12 years of completed education was about 21 years in 1969, and 18.6 years in 2002. Tenure for men with 12 or more years of education stood at 22.4 years in 1969 and 22.05 in 2002. Further, non-whites have an average tenure below the comparable measures for white men.

Stevens’ findings for the most recent years reflect the career outcomes for the generation of men approaching retirement age in 2002. Whether this level of stability will apply to subsequent generations of men depends on the continued evolution of job retention rates. Job retention rates declined in the 1990s, but it is not yet clear whether these declines will persist. Only with rela-

tively long-lasting reductions in job retention rates will individuals experience corresponding reductions in completed tenure on their longest jobs.

In her paper, Stevens looks at whether job stability during the 1969-2002 period was affected by increased early retirement of men, a rise in average education levels, and the differing numbers of those taking years off from civilian work to serve in the military. But, she concludes that these factors do not bias her major finding, that job stability has remained relatively steady in that period.

— David R. Francis

## Intangible Capital and Economic Growth

The revolution in information technology (IT) is apparent in the profusion of new products available in the market place, including PCs, PDAs, ATMs, wi-fi devices, and cell phones. These innovations are part of a broader technological revolution, based on the discovery of the semiconductor, often called the “IT revolution.” However, while its effects are apparent in the market place, its appearance in the

macroeconomic statistics on growth has been slow to materialize. Several economists have remarked that technological advances have not been reflected in productivity data. Alan Greenspan observed in the mid-1990s that the negative trends in productivity observed in many service industries seemed inconsistent with the fact that they ranked among the top computer-using industries.

The IT revolution only began

to appear in the productivity data in the mid-1990s and has been linked to investment in IT capital. However, there is reason to doubt that official data accurately capture all factors that affect U.S. economic growth. Both firm-level and national income accounting practice historically has treated expenditure on intangible inputs as an intermediate expense and not as an investment that is part of GDP. This state

of affairs has begun to change with the capitalization of software in the U.S. National Income and Product Accounts (NIPAs). The capitalization of software alone has had an appreciable affect on the measured growth of output per worker in the non-farm business sector, and the growing literature on intangibles suggests that this is just the tip of the iceberg.

In **Intangible Capital and Economic Growth** (NBER Working Paper No. 11948), authors **Carol Corrado, Charles Hulten, and Daniel Sichel** find that the rapid expansion and application of technological knowledge in its many forms (including R and D, brand equity, and human competency) is a key feature of recent U.S. economic growth. Accounting practice traditionally excludes investment in intangible knowledge capital, thus excluding, according to the authors' estimates, approximately \$1 trillion from the conventionally measured output of the non-farm business sector by the late 1990s, and understating the business capital stock by \$3.6 trillion. The \$1 trillion in omitted intangible investment is roughly equal to the amount of investment spending on tangible capital goods, which is included in measured output, and intangible investment amounts to around 10 percent of that output.

The current practice also overstates labor's share of income by a significant amount and masks a downward trend in that share.

The authors suggest that the inclusion of intangibles, both as an input and as an output, can have a large impact on our understanding

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of economic growth. They find that the inclusion of intangible investment in the real output of the non-farm business sector increases the estimated growth rate of output per hour by 10 to 20 percent over the period 1995–2003 relative to the base-line case which completely ignores intangibles. Thus, the inclusion of intangibles matters for labor productivity growth rates, although it has little effect on the *acceleration* of overall productivity in the mid-1990s.

On the input side, intangibles were about as important as tangible capital as a growth source after 1995. When the two are combined, capital deepening supplants Multi-Factor Productivity (MFP) as the principal source of growth. Moreover, the majority of the contribution of intangibles comes from non-traditional categories.

It is also worth noting that the fraction of output growth per hour attributable to the old "bricks and mortar" forms of capital investment is very small, accounting for less than 8 percent of total growth in the period 1995–2003. The authors suggest that it is inappropriate to auto-

matically attribute the other 92 percent of total growth to "knowledge capital" or to "the knowledge economy." However, it is equally inappropriate to ignore the association between innovation, human capital, and knowledge acquisition, on the one hand, and investments in intangibles, IT capital, and labor quality change on the other.

That intangibles, and more generally, knowledge capital should be such an important driver of modern economic growth is hardly surprising, given the evidence from every day life and an understanding of basic economic theory. What is surprising is that intangibles have been ignored for so long, and that they continue to be ignored in financial accounting practice at the firm level.

— Les Picker

## The Value of Stock Options to Non-Executive Employees

In **The Value of Stock Options to Non-Executive Employees** (NBER Working Paper No. 11950), authors **Kevin Hallock and Craig Olson** empirically estimate the dollar value placed on employee stock options (ESOs) for a particular set of employees in a firm. Their analysis is based on the observation that employees will choose to hold an

option for another period (a day, week, or month) if the utility of the income they would receive (stock price minus exercise price) by exercising the option immediately is less than the value of holding it and reserving the right to exercise it at a later date. Conversely, if employees exercise an option in the current period, then we know that the value

of *not* exercising the option is less than what they gain by exercising it now and receiving an amount equal to the stock price minus the exercise price.

The authors find that the expected value to employees from continuing to hold their options after the vesting date is significantly related to a variety of individual

and market characteristics. Options are held longer when the overall stock market is doing well relative to the firm's stock price or when an employee has a higher salary. The authors also find that exercise decisions are heavily influenced by unobserved employee characteristics such as risk aversion.

The authors note that the Black-Scholes model predicts that diversified investors will never exercise options prior to expiration but may sell if they seek liquidation. On the other hand, employees cannot sell their options to others and often exercise prior to expiration of the option. Hallock and Olson's estimates of the value employees place on options are not consistent with the widely held view that employees value options at less than their Black-Scholes Valuation (BSV); rather, the authors find that most employees value their options at a level that is higher than the Black-

Scholes method implies.

These findings suggest that the value of the options to employees is greater than the cost of the options to the firm, because "early" exercise decisions by employees imply option costs that are less than the firm's

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BSV. Thus, if the firm under study were to curtail the use of options for middle managers because of the new FASB rule, for example, it might create employee dissatisfaction that, perhaps, could be offset only by paying employees more than what the firm spends on options. In this firm, these options appear to be a source of "competitive advantage." This firm, and other firms that offer ESOs, may do so precisely because their employees are overly optimistic

about the firm's future.

One limitation of this study is that it focuses solely on the first exercise date for options from a grant. In about half of those decisions, less than 100 percent of the options in the grant are exercised. This implies

that options from a grant are not valued equally. The authors note that we could learn more about the value of options to employees if we studied the partial/complete exercise decision of employees, and the timing of the second exercise decision, when less than 100 percent of the options were exercised on the first exercise date.

— Les Picker

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