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Curing Baumol's Disease: In Search of Productivity Gains in K–12 Schooling

Paul Hill and Marguerite Roza

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The Center on Reinventing Public Education (CRPE) was founded at the University of Washington in 1993. CRPE engages in independent research and policy analysis on a range of K-12 public education reform issues, including choice & charters, finance & productivity, teachers, urban district reform, leadership, and state & federal reform. CRPE's work is based on two premises: that public schools should be measured against the goal of educating all children well, and that current institutions too often fail to achieve this goal. Our research uses evidence from the field and lessons learned from other sectors to understand complicated problems and to design innovative and practical solutions for policymakers, elected officials, parents, educators, and community leaders.

After years of steady increases in spending, current revenue projections for public education are grim at best. With inherent cost escalators that exceed even the most optimistic economic conditions, public schooling may struggle to stay afloat in the years ahead. And yet our appetite for improvements in school outcomes has never been higher.

The solution lies in the seemingly abstract notion of productivity gains. Policymakers talk about innovating to do more with less, but to date no one knows what that looks like in education. The truth is that dramatically more productive schooling models simply have not emerged in the last two decades, even amidst cost pressures that drove spending up faster than inflation or GDP.

In fact, nearly all schools look much the same today as they did fifty years ago. Even after waves of reform, including class-size reductions, new curricula, the introduction of forms of school choice, and the implementation of standards and accountability mechanisms through *No Child Left Behind* (NCLB), the basic structure of education is unchanged. Despite huge advances in computing and communications in other sectors, the core technology of education has remained virtually intact: schools are dominated by a cadre of teachers who guide a group of same-aged children through curricula delivered in nine-month segments. Schools are highly labor intensive and getting more so, due to pressures for class size reduction and increasing use of specialist teachers. Yet on average schools are producing at best only slightly better results than at earlier times; thus, given increased costs, they are literally becoming less productive.

Is this inevitable? Some claim so, due to Baumol's disease: the tendency of labor-intensive organizations to become more expensive over time but not any more productive. In the 1960s, economist William Baumol observed that productivity (defined as the quantity of product per dollar expended) in the labor-intensive services sector lags behind manufacturing. Because labor-intensive services must compete with other parts of the economy for workers, yet cannot cut staffing without reducing output, costs rise constantly. This phenomenon, of rising costs without commensurate increases in output, has been labeled Baumol's cost disease.

Baumol's prime exemplar was the string quartet, which produces the same music from the time it is first assembled until the players all retire, yet experiences higher costs as the players receive salary increases to keep up with the wages earned by others. There are compelling indicators that K–12 education suffers from the same disease. The combination of rising costs and stagnant productivity are major problems in an environment where many children are not learning the skills they need and education is now not likely to receive sustained increases in public funding.

However, more recently, other labor-intensive service sectors have beaten the disease. With innovations creating productivity improvements in the service sectors that outpace those in manufacturing, some have said the disease is "cured."[1]

Not so in education, which remains an exception among labor-intensive services.

And yet, current conditions create a critical imperative for aggressively seeking productivity gains in education. While education differs in important ways from other service sectors, this paper posits that improvement in productivity in other economic sectors may hold important lessons for understanding how the education system can become more efficient and effective. We begin by exploring the past and future outlook for education absent productivity gains. We then categorize the relevant types of strategies that have brought about productivity gains in other labor-intensive sectors and outline an approach for systematically seeking applicable productivity remedies for public education.

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1. J. Triplett and B. Bosworth, "Productivity Measurement Issues in Services Industries: 'Baumol's Disease' Has Been Cured," *FRBNY Economic Policy Review*, September 2003. Available at http://www.brookings.edu/views/articles/bosworth/200309.htm.

Past trends and current conditions generate a productivity imperative

There are two parts to productivity: costs and output. There is no question that overall costs of K–12 education have risen dramatically, and some question as to whether there has been any improvement on the outcome side.

COSTS ON THE RISE

Zeroing in first on the input side of the productivity equation, the biggest driver in cost increases is the salary and benefits bill. Teacher salaries often increase to keep pace with those of other professions where efficiency gains are often the driving force behind salary escalation. Due to a combination of civil service-style wage scales with automatic longevity increases and periodic across-the-board raises, the cost of the average teacher often rises faster than GDP or the cost of living. In New York, for instance, even amidst state budget gaps resulting from the 2008 onset of the current economic crisis, teacher salaries increased an average of 5.6 percent from FY 09 to FY 10.[2] During the same period, the consumer price index was actually negative (falling by 1.4 percent).[3]

These upward trending salaries force increases in spending even to maintain the same level of service for students. In education, these salary increases are spread over a fixed number of students (or even fewer students when class sizes are reduced) and the result is dramatic increases in cost per unit of output (learning as realized in students). Where average teacher experience is increasing as the teaching force ages, salaries escalate beyond what is apparent in across-the-board raises, given that teachers also move along steps in the salary ladder each year.

Many localities also suffer from the rising cost of health and pension benefits, at rapidly increasing obligation to districts.[4] New York health benefit costs, for instance, rose by 5.1 percent from FY 09 to FY 10. Pension obligations have also escalated. With district contributions to teacher pensions rising faster than wages, pension obligations alone will drive up budgets faster than GDP. In fact, from 2004 to 2007, district contributions for pensions rose from under 12 percent of earnings to 14.5 percent of earnings.

Taken together, total benefits costs rose from 25 percent of salaries in 1999 to 32 percent in 2006. Even in optimistic revenue scenarios, projected benefits costs threaten to take up an increasing share of the total pie, creating vulnerabilities for the rest of education spending.

Moreover, while the cost per employee is escalating, so is the number of employees. Districts now employ many more teachers per pupil in a wider range of additional specialist categories than in the past. In a system where the predominant reform model has been to add more adults, the effect is to drive up costs per unit. Thus in education, the string quartet both gets wage and benefit increases and adds enough new members to become a sextet.

NCES data reported for the last four decades indicates that the number of "other teachers" has risen from 2 per 1000 students to 37 per 1000 students, while "other instructional staff" has jumped from under 2 to over 20 per 1000. The result: the number of instructional positions has jumped from near 40 to over 100 positions per thousand students since 1960. Figure 1 illustrates the growth in K–12 education staffing over the past 40 years.

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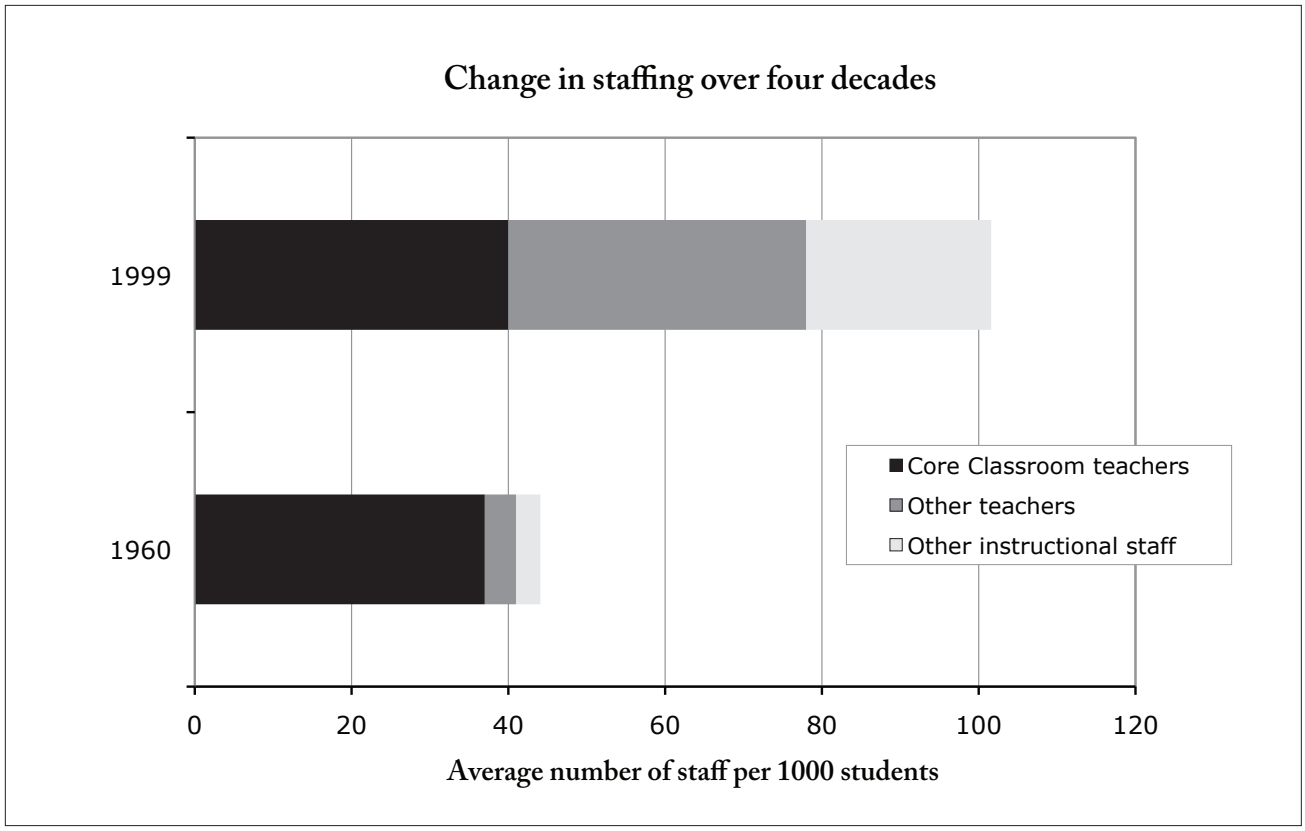
2. New York State School Boards Association, *2009 Teacher Contract Survey, Statewide*. Available at http://www.nyssba.org/clientuploads/nyssba_pdf/CommTeacherContractSurvey09.pdf.
3. Consumer *Price Index Summary*, U.S. Bureau of Labor Statistics, May 2009. Retrieved July 1, 2009, from http://www.bls.gov/cpi/.
4. See M. Roza, *Frozen Assets: Rethinking Teacher Contracts Could Free Billions for School Reform* (Education Sector, 2007) for evidence about hidden costs of teacher collective bargaining agreements. Available at www.educationsector.org/usr_doc/FrozenAssets.pdf.

Figure 1. Addition of many new staff drive up per-pupil education spending

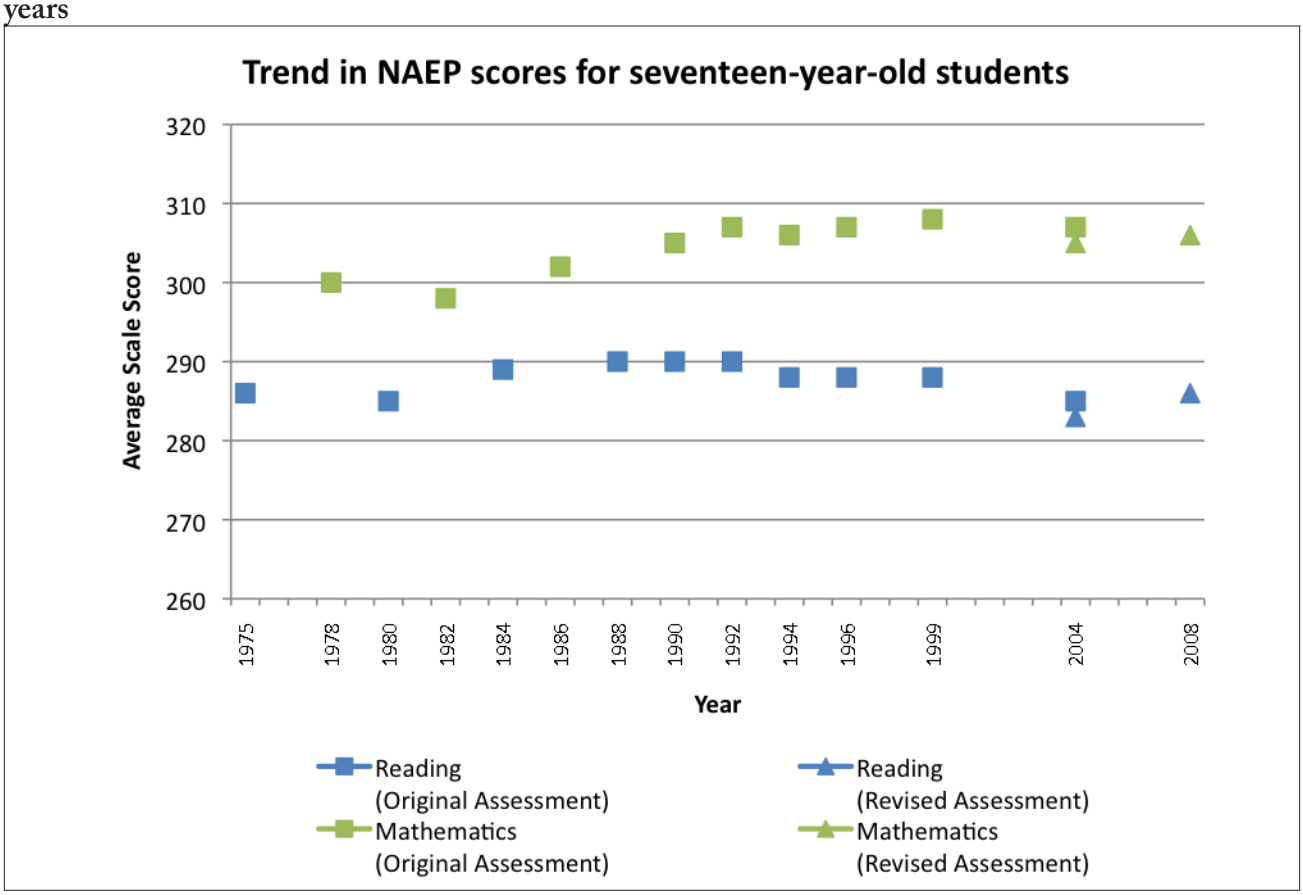


Source: Center on Reinventing Public Education.

UNDERSTANDING TRENDS IN OUTCOMES

While these indictors clearly point to increased costs for education, efforts to quantify productivity changes have been hampered by measurement challenges on the outputs side of the equation. By most accounts, key indicators of outcomes have not shown comparable gains. A thirty-year look at NAEP performance for seventeen-year-olds, for instance, suggests that test scores have changed very little. (See Figure 2.)

Figure 2. Little change in NAEP math and reading scores for seventeen-year-olds over the last thirty years



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1971–2008 Long-Term Trend Reading Assessments and 1973–2008 Long-Term Trend Mathematics Assessments. Accessed at: http://nationsreportcard.gov/ltt_2008/.

Clearly, measuring the outcomes—or the quality of the outcomes—can be a hotly debated subject, with differing views about the purpose of education. For instance, participants in a Brookings workshop on *Measuring the Output of the Education Sector* (2000) struggled with how to quantify efficiency and outputs (including quality), noting that student performance (as reported above) is only one lens on the quality of the product. Others have echoed these struggles, noting that education outputs extend well beyond student learning and may include effects of sorting, child care, lifetime earnings, societal impacts, etc.[5] Elsewhere, analysts have pointed to challenges associated with non-market inputs, including student and parent time and ability, peer influences, and neighborhood factors.[6]

5. B. Fraumeni, M. Reinsdorf, B. Robinson, and M. Williams, *Price and Real Output Measures for the Education Function of Government: Exploratory Estimates for Primary & Secondary Education*, Working Paper 14099 (Cambridge, MA: National Bureau of Economic Research, 2008). Available at http://www.nber.org/papers/w14099.pdf.
6. S. Rivkin, "The Estimation of Productivity Change in Education," Amherst College. Paper prepared for Brookings Institution Conference on Service Sector Productivity, 1999.

Whether one believes outcomes have improved or not, most would agree that schooling must accelerate productivity going forward. Increased productivity will be critical if forecasts are accurate in suggesting more constrained public funds in future years. And with a structural imbalance created as benefits costs outpace revenues, finding efficiencies may be the only way districts stay afloat. Simply put, in an environment where schools must compete with many other uses of public and private funds, control over cost growth could promote a more fiscally stable system of education.

Perhaps most importantly, those seeking reforms to improve outcomes may have no choice but to pay for those reforms with funds already in the system. If so, the viability and longer-term sustainability of such reforms require finding efficiencies from within the system. For example, reducing the total staffing required to operate a school would free up funds that could be used for many things, including increasing salaries to attract more capable teachers, or investing in productivity-enhancing technology.

Insights on productivity might come from other labor-intensive industries

The first question at hand is how to cure Baumol's disease in education (or even whether there can be a cure). Evidence emerging from analysis of a range of service industries suggests that in the last decade, cures for the disease have emerged. The economic and business literatures are full of examples of labor-intensive industries that have fought cost growth by finding new ways to enhance the productivity of key workers. In some cases, application of technology or information systems serves to increase the productivity of professionals (for example, using scans rather than exploratory surgery for diagnosis). One might argue that even string quartets have enhanced their own productivity by distributing digital recordings to much larger audiences, via CDs and through online sales downloaded on iPods. In some cases, productivity has come with differentiating roles, so that some functions are reassigned to lower-paid individuals or to contractors with different cost structures.[7] In other cases, opening up information reduces the need for some employees and allows the consumer to play a role that increases productivity.

In fact, research now suggests that the major contributor toward U.S. economic growth in the 1990s was a productivity advance in services.[8] Triplett and Bosworth (2004) report that productivity growth in the service industries has outpaced that in other industries over the last decade.[9] However, even by their analytic methods, education has not realized the same productivity gains as other service sectors, but has instead become less productive over the period of 1987 to 2001.

7. Triplett and Bosworth, 2003.
8. H. Varian, "Information Technology May Have Cured Low Service-Sector Productivity," *New York Times*, 2004. Available at http://www.ischool.berkeley.edu/~hal/people/hal/NYTimes/2004-02-12.html.
9. See Triplett and Bosworth, *Productivity in the U.S. Services Sector: New Sources of Economic Growth* (Washington, DC: Brookings Institution Press, 2004).

Some worry that productivity gains imply reduced service quality as humans are replaced by machines. And yet, industries that have cured Baumol's disease (or at least controlled its effects) have not eliminated human touch, but rather have focused its use. Research on public and private sector service organizations, including that done by Triplett and Bosworth, suggest that increased productivity over the last decade can be attributed instead to various advances, including:

Information technology. Estimates suggest that roughly a quarter of service industry labor productivity growth can be attributed to investments in information technology. Information technology helps industries track outputs, monitor operations, communicate with customers, and react to shifts in demands for services and contexts. Service industries such as communications, wholesale trade, retail trade, and finance have dramatically redesigned their delivery systems around IT advancements. Unlike other sectors, education has not realized the same advances from information technology. While districts have made some improvements in student data collection and management, the data has not yet fueled more advanced information processing that can come with IT advances.

Deregulation. Studies of retail, communications, and other industries (both in the U.S. and abroad) indicate that deregulation has been associated with increases in productivity.[10] Externally imposed restrictions on labor use, information exchange, and service delivery models all work to limit productivity. In the transportation sector (including trucking, rail, and interstate busing), deregulation has worked to remove barriers to entry, making it possible for many new firms to enter the transportation industry.[11] While there do exist some attempts at deregulation in education (via charter schools or school-based autonomy policies), many would argue these attempts have not been fully implemented and thus we should not expect corresponding productivity gains.

Redefinition of the product. Private sector firms have divested businesses that took them too far away from their core competencies. In many cases such divesting has increased the productivity of both the parent firm and the ones spun off, eliminating inefficiencies caused by corporate bureaucracy and internal cross-subsidies, and allowing each firm to focus on design, production, and marketing of a relatively simple product line. Public sector organizations, always plagued with mission creep and the temptation to satisfy diverse groups, have tried in some cases to simplify their activities and allow them to be held accountable for specific outcome measures. This movement from extensive to intensive accountability is more evident in Europe than in the U.S.[12] Efforts to hold schools accountable only for student outcomes represent related efforts in the U.S., although most schools have not yet ended or outsourced their non-core functions.

Increased efficiency in the supply chain. Industrial firms have increased productivity by explicitly identifying all the people, organizations, information, and processes by which their product is made and marketed, and asking whether each element of the process could be made more efficient. The result, in many cases, has been re-engineering of key processes and elimination of others. Similar processes have been linked to increased efficiencies in the services sector, where purchasing intermediate inputs and streamlining steps in service create efficiencies. Some firms have abandoned traditional ways of performing some tasks (for example, in-house production of key components) and assigned them to independent contractors. Others have reassigned key tasks to different layers of production, (such as welfare departments' delegation of casework duties to Catholic Charities) and sometimes require the consumer to perform some of the tasks (like

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10. D. Tirtiroglu, K. Daniels, and E. Tirtiroglu, "Deregulation, Intensity of Competition, Industry Evolution, and the Productivity Growth of U.S. Commercial Banks," *Journal of Money, Credit, and Banking* 37, 2 (2005): 339-60.
11. Governor R. S. Kroszner, Federal Reserve Board, "What Drives Productivity Growth? Implications for the Economy and Prospects for the Future." Remarks made at The Forecasters Club of New York, September 27, 2006. Available at http://www.federalreserve.gov/newsevents/speech/kroszner20060927a.htm.
12. E. Kamarck, "The End of Government as We Know It," in *Market-Based Governance*, eds. J. Donohue and J. Nye (Washington, DC: Brookings Press, 2002).

navigating an automated phone system in order to connect with the appropriate specialist, instead of having a receptionist do it for them).

Investments by key beneficiaries. Supply chain analysis reveals that some participants (such as firms that supply particular components) can benefit from the investments made in methods and equipment, in ways that go beyond the immediate arrangement (for example, by selling related products to others). In those cases, the suppliers make the investments and capture the benefits of increased productivity. Professional service organizations, such as hospitals and law firms, also understand that individuals can capture the benefits of new skills; employers adjust pay in light of increased productivity but they often do not subsidize the training. The education supply chain includes many participants who can capture at least some of the benefits of their investments, including students and parents, or industries that rely on graduates. Such investments—say by industries wanting specific skills in their workforce—are not the norm in education.

Production process innovations. Substitution of capital for labor is the paradigmatic way to improve productivity. Industrial firms have attempted this through use of computer-based design, modeling, and robotic production. Industrial firms and human services organizations have also differentiated staff roles in order to optimize the use of staff members' skills. Depending on the industry, these actions can lead to greater specialization, more targeted application of labor, or to the use of only one kind of employee who is heavily supported by technology. Most schools have resisted making production process changes, relegating technology to supplementary uses such as tutoring. Instead, they continue to idealize the teacher as a general practitioner who knows enough to provide everything children need to learn. Similarly, the system rarely differentiates the labor (teachers) to understand the different level of supports needed.

Carefully designed workforce policies. Many organizations, public and private, consciously manage their workforces in light of the broader labor market. They try to retain individuals who have rare or specialized skills, and anticipate much more rapid turnover among employees with commodity skills. The resulting pay scale allows for salary differentiation and ensures that the firm has enough highly paid people to do its work, but no more. In the public sector, the U.S. Foreign Service limits the number of people at the high points on its pay scale via a rigorous "selection up or out" policy. Promotions from lower to higher grades are strictly limited in number so that only a fraction of candidates can be promoted. Moreover, individuals who are passed over for promotion more than twice must leave the Foreign Service. This keeps a lid on salary costs and also guarantees that there are always some slots for excellent junior people to move into. Public schools, with seniority-based pay and lifetime tenure, have avoided such workforce policies.

Organizational change. Some studies attribute productivity growth in certain service sectors to organizational changes. Organizational changes often happen as a result of (or at least in conjunction with) some of the other key advances listed above. For instance, organizational changes in the retail trades (toward super stores or warehouse clubs) have been combined with advances in supply chain. Here again, progress toward organizational change in education has been muted, as the system is rooted in multiple governmental levels with stubbornly vested interests.

The examples above show how labor-intensive and service-oriented sectors, including some that require extremely high-skilled and dedicated people, have fought the pressures that make them less productive over time. While some experts now question whether recent productivity growth in the service sectors can continue, it may be the case that some of these remedies have yet to be applied to education.[13]

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13. B. Blackstone, "Is Productivity Growth Back in the Grips of Baumol's Disease?" *Wall Street Journal*, August 13, 2007, A2.

CAN SUCH STRATEGIES BE APPLIED TO EDUCATION?

With some exceptions noted above, public education has not taken advantage of the remedies that have helped productivity in other service industries. One explanation may be that education faces unique challenges that make application of these remedies more difficult. It is clear that society creates ever more demands on the education system, including for instance the need to educate increasingly disadvantaged children, expand the curriculum (to provide education in civics, health, or other topics), tackle societal ills (such as racial and gender inequity), and provide therapeutic services for students with disabilities. Similarly, the system itself may contain other explanations for its inability to adopt those remedies that have worked in other labor-intensive industries. For example, some argue that because publicly provided education lacks competitive market pricing, the system has not connected outputs to inputs in a way that creates a force for productivity.[14] And some suggest that productivity has been stymied by the fact that teaching salaries have been forced to increase as labor markets opened up non-teaching jobs to women.

Despite these qualifiers, it is true that K–12 education, both public and private, has also stood aside from the general trend toward more productive use of human skills. Politically active teacher unions have fought for class size reduction, emphasizing numbers hired, uniform pay scales, and job security, rather than apply funds to trials of productivity-enhancing technologies. Parent groups and some education researchers have also equated smaller classes with quality instruction, although research finds mixed results. The predominant employment model has been one of full-time, career teachers, with resistance to alternative pathways or performance- based compensation. The idea of contracting out non-core services has expanded but not without resistance, and most school districts continue to provide food, maintenance, and supplies through central in-house operations.

The current model of "schools" is highly resistant to change. For all the furor over reform, most schools look fundamentally the way they have for decades: buildings consisting of classrooms housing students of the same age; the vast majority of employed adults being career teachers or administrators locked into narrowly defined roles by collectively bargained employment contracts; a school day that rarely matches the real needs of parents and students; limited and superficial use of technology that does not reflect students' own home experiences with it; and seat time requirements that do not differentiate a child who has mastered a topic from one who has not. Compared to other sectors where innovation appears ongoing, and where technology has been used to fundamentally transform products and the way they are produced, K–12 schooling seems antiquated.

Some might have expected that opening up public education to independent providers through voucher programs and charter schools would promote experimentation with ways of making schools more productive. To date it is not clear whether this has happened. Charter and voucher schools frequently offer options otherwise unavailable in the localities where they operate,[15] and hire and compensate teachers differently.[16] It is not clear, however, whether many are making tradeoffs between technology and teacher work, or how they will deal with pressures for longevity-based pay increases as their staffs age. Charter schools might end up imitating the workforce policies of parochial schools, which keep small cadres of relatively well-paid experienced teachers, but also employ large numbers of low-paid junior teachers who are expected to leave for other careers in a few years. Alternatively, charter schools might come to resemble independent private schools, which employ many career teachers and struggle constantly with escalating salary costs.

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14. Triplett and Bosworth, 2004.
15. B. Gross and K. M. Pochop, "How Charter Schools Organize for Instruction," in *Hopes, Fears, & Reality: A Balanced Look at American Charter Schools in 2008*, ed. R. Lake, National Charter School Research Project (Seattle, WA: Center on Reinventing Public Education, 2008). Available at http://www.crpe.org/cs/crpe/view/csr_pubs/257.
16. C. Hoxby, "Would School Choice Change The Teaching Profession?" *Journal of Human Resources* 37, 4 (Fall 2002): 846-891.

What lessons lie in non-school-based learning?

While it seems important to consider lessons learned in other labor-intensive sectors about escaping the Baumol trap, one might wonder if there is something about the nature of learning that is so fundamentally different from the business of other sectors that the lessons from those sectors won't apply in education. While the public K–12 education system works a lot like a monopoly provider, we do know that organized learning occurs in many forms outside the existing system. For this reason, it makes sense that we look at how individuals, parents, governmental agencies, and corporations fund and structure different kinds of learning to see if these arrangements provide any insights into how the K–12 system could be designed more efficiently.

Most of us think of private and charter schools as the only alternative to the organized learning that occurs in traditional public schools. Yet growing numbers of families are exercising options like home schooling and distance learning. Also relevant, the education systems developing in other countries serve as an example of how different education can be. Each of these alternatives presents substantially divergent models for learning that could inform a study of how education could become more efficient. Similarly, other innovations might surface from close examination of the ways learning happens outside of schools. For instance, some students learn piano, take swimming lessons, participate in driver's education, employ tutoring programs (for example, Sylvan), or tackle what look like school topics (such as foreign language programs, science camps, or Kumon math programs). In each of these learning models, while the delivery system is dramatically different than that of the typical school, the students are gaining knowledge and skills. Sometimes the model is self paced and relies on student practice outside of instruction (in the case of piano lessons and Kumon math), while in other cases, all learning may take place on site (for example, swimming lessons).

Adults, too, participate in organized learning in higher education, but also in their places of employment, sometimes in ways more organized than others. The military structures learning for its recruits in settings nothing like typical K–12 schools. Many companies develop interactive online training modules that rely on user responses to verify mastery of material. And while the materials taught vary from one sector to another, there are some similarities in mission. Since all these different learning systems have evolved in different directions over time, it may be the case that some of them are not suffering the same productivity constraints as have been surfaced in K–12 schooling.

An R&D effort to search for a cure

For K–12 education, however, seeking productivity enhancements has not been the system's strong suit. Much of the reform efforts over the last few decades have sought to improve outcomes, without worrying about the cost of inputs. While most new initiatives have added on new expenditures, few have removed or replaced existing budget items. But true productivity enhancements—the kind that have worked to improve outcomes while reducing costs—rarely happen without some deliberate intention to find them.

So how do we find the cure? In other words, what might an R&D process look like to uncover productivity enhancements? First, as Figure 3 lists, the process would start by more closely examining the application of strategies used by other sectors for their applicability to fighting cost growth in education. The goal of such an investigation would be to surface potentially adaptable strategies that might theoretically reduce some portion of K–12 costs. The idea would be to use a methodical process (as illustrated in Table 1) to explore each possible strategy utilized by other service sectors and consider its relevance to education.

The second step goes then to other learning systems, to explore what alternative visions of schooling are feasible. Talk of "schools of the future" is too much in the realm of imagination, and bold visions are often hard for policymakers, educators, and parents to understand and support. In order to begin to consider dramatically different

production processes, such an investigation would examine various forms of organized learning routinely taking place outside public K–12 systems, and include:

- Home schooling
- Distance learning systems
- Foreign language learning
- Franchise tutoring programs
- Summer content camps
- Parent-paid instructional programs (music, swimming lessons, etc.)
- Armed services training
- Industry training/development
- Apprentice programs
- Education systems abroad

Figure 3. Five steps toward finding a productivity-enhancing cure for Baumol's disease in education:

1. **Systematically consider strategies employed by other labor-intensive industries for their relevance to education.(See Table 1.)**
2. **Zero in on learning systems outside schools to surface alternative production processes that may yield greater productivity.**
3. **Understand the key cost drivers in the current schooling model, *and examine the impact on each of proposed alternatives.***
4. **Prototype test new models.**
5. **Create a policy agenda for identifying and reproducing the most promising ways to increase productivity.**

For each, an analysis would uncover primary beneficiaries and arrangements for teacher-student contact, the use of technology, self-pacing, self-study, delayed starts, and other strategies that play out in these learning systems.

In the third step, promising options from the investigations of innovations both in other labor-intensive industries and other learning systems should be tested with fiscal models to further assess their viability for improving productivity in education. Such analysis would identify key production processes, cost elements, and financial arrangements. The relevance of each of these learning systems would provide a backdrop for identifying promising production models for use in beating cost disease in K-12 education.

Once promising innovations are identified, the fourth step would move forward with on-the-ground development of test models. Such models would need to be funded outside regular education finance formulas (with public, venture, or philanthropic funds).

And lastly, for those promising models found to hold potential, the remaining step toward larger-scale system implementation would involve identifying barriers and creating a policy agenda to reproduce such efforts at scale. Education is well known for its capacity to resist exactly these kinds of strategies, regardless of their potential benefits for productivity. Critical, then, is the identification of real or perceived economic, political, legal, and policy barriers that would need to be addressed in order to apply promising strategies to education.

Table 1. What promise do various strategies hold for productivity gains in education?

Nature of productivity gains	Examples of strategies to be considered				
	Strategy #1: Use of information technology	**Strategy #2:** Deregulation	**Strategy #3:** Change in organization and production processes	**Strategy #4:** Supply chain efficiencies	**Strategy #5:** Workforce policies
Decreased labor costs					
Increased output					
Increased output quality					
Eliminate intermediate steps in production					
Others?					

The alternative to finding a cure is a slow erosion of the current system

Yes, the search for a cure costs money at a time when resources are certainly scarce. With the financial outlook bleak, such R&D expenditures may seem frivolous. And yet, proceeding without a cure brings cost escalation without commensurate improvements in outcomes—or perpetually declining productivity. More than a year into the fiscal crisis we know what we can expect if costs continue to rise and revenues remain constrained: hiring freezes, teacher layoffs, school day furloughs, and wage and benefit reductions. Together these actions work to erode the existing system with absolutely no upside for students. If depressed revenues are instead used as a rallying cry for innovation, the current fiscal crisis could ultimately strengthen public education by opening the door to improved processes that have the potential to do more with less. By investing now in an R&D strategy to find a cure for Baumol's disease, the promise is to unearth strategies that could ultimately refocus schools around a productivity imperative.