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The Cato Education Market Index
Full Technical Report

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Executive Summary

The index presented in this report attempts to measure how closely existing school systems resemble free markets and rates education policy proposals on how conducive they are to the rise of competitive marketplaces. We define an education market as a system that provides the freedom for producers and consumers to voluntarily associate with one another, as well as the incentives that encourage families to be diligent consumers and educators to innovate, control costs, and expand their services. It is a system in which schools can offer instruction in any subject, using any method, for which families are willing to pay.

One of the least surprising findings of the Cato Education Market Index is that no U.S. state currently has anything resembling a free education marketplace. Perhaps more surprising, few of the prevailing "school choice" reforms, which are often described as "market-based," "market-inspired," or even "free-market" proposals, actually embody true markets. It is our hope that this index will spur debate about the necessary and sufficient conditions for a lasting and vigorously competitive education industry, and hence serve as a guide to policymakers interested in harnessing market forces for the betterment of children's educational opportunities.

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Introduction

What Are Education Markets, and Why Do They Matter?

Broadly speaking, a free education market is a system in which parents decide what, where, by whom, and for how long their children will be taught. It is a system in which educators have complete control over the curricula they offer, the teaching methods they employ, the prices they charge, and the hours they work; in which anyone who wants to open a school has the right to do so; and in which the profit motive drives the innovation and expansion of some substantial share of the education sector. It is also a system in which consumers are the primary payers and in which government schools do not enjoy a subsidy advantage over private schools—that is, if the government runs "free" schools, it must make a comparable level of financial assistance available to families who prefer independent schools.

Contrary to common assumptions, education markets are not a recent, untested idea. The first education system in the world in which schooling reached beyond a tiny ruling elite was the market that arose in classical Athens during the 5th century BC. Today, education markets thrive everywhere from impoverished slums and villages of the developing world[1] to the multi-billion-dollar after-school tutoring sector in Asia. Conversely, though fee-charging, nongovernment schooling does exist to a limited extent in many Western nations, it would be a mistake to say that those schools currently constitute a free market in education, given that virtually all are nonprofit and must compete with a high-spending (and yet tuition-free) government monopoly.

Why does it matter whether or not education is organized along free-market lines? It matters because a substantial body of international[2] and historical[3] research finds that education markets are a superior way to meet the public's educational goals, in terms of both individual needs and broader social effects. According to that research, market schools are typically more efficient, academically effective, well maintained, and responsive to the demands of families. In addition, students in independent schools in the United States have been found to exhibit levels of civic engagement and tolerance that are comparable to or better than those of their peers in public-sector schools.[4] Systems in which parents can easily pick schools of their choice, and in which most education funding comes directly from parents, also dramatically reduce the cultural conflicts that arise over government-run, government-funded schooling. The less people are pressured to patronize or pay for schools they disapprove of, the less social tension is created.[5] Finally, in the industries in which markets have been allowed to flourish, they have driven dramatic improvements in quality and efficiency, spurred relentless innovation, and pressured producers into being responsive to the preferences of consumers.

Index Goals and Design Principles

The purpose of the Cato Education Market Index (CEMI) is to rate existing school systems on the basis of how closely they approximate true free markets (we call this a market rating) and to rate education policy proposals on their conduciveness to the growth of markets (a policy rating). The index takes a large number of details about a given system or policy as its input data and uses those data to produce a numeric score from 0 to 100. This overall rating is computed by combining several subcomponent scores, which allows conclusions to be drawn about the specific strong and weak points of the school system or proposal under consideration. See Appendixes for details of methodology.

CEMI ratings are issued for whichever political unit is chiefly responsible for education legislation. In the United States, education is mainly a state-level responsibility, so CEMI rates each U.S. state individually. The same applies to countries like Canada, where each province

is responsible for structuring its own education system. Countries in which education legislation is created chiefly at the national level, such as Japan or the Netherlands, receive a single, nationwide rating.

CEMI is intended to advance several related goals:

- To encourage a discussion of the criteria necessary for effective and sustainable education markets,
- To provide a tool for rating a policy proposal's conduciveness to the rise of a competitive education industry, and
- To illustrate that markets have more in common with ecosystems than with smorgasbords—that their key attributes are interdependent and hence cannot be hobbled or omitted without undermining the system as a whole.

The index has been made available as both a Microsoft Excel spreadsheet and an interactive Web application,[6] to maximize its usefulness to different users. Researchers can make use of the spreadsheet to perform comparisons of different school systems and policies, and policymakers and analysts can easily enter the data for a single case study via the Web interface.

CEMI's design was guided by four principles: reliability, objectivity, comprehensiveness (content validity), and accuracy (predictive validity).

In order for the index to be useful, it must be reliable, that is, it must consistently produce the same rating for a given policy proposal regardless of who enters the data for that proposal. In other words, the need for subjective judgments on the part of the person entering data into the index must be kept to an absolute minimum. We have sought to maximize reliability by using multiple-choice questions whenever possible and by providing guidelines to people entering the data to ensure that the meaning of each of the possible choices is well-defined.

Objectivity in the calculations that make up the index is also important, though considerably more difficult to achieve. The education policy details that the index measures, and the weights it ascribes to them, were based as much as possible on either empirical observations of actual school systems or generally accepted axioms of economic theory. For example, there is considerable evidence that the responsiveness, efficiency, and effectiveness of schools are positively affected by the share of school funding that comes directly from parents.[7] On the basis of this work, it is reasonable to include in our metric a term corresponding to the share of total education spending that comes (or is expected to come) directly from parents. Similarly, the well-established role of prices in competitive markets suggests that the index should give lower scores to education policies that impose price controls.

Although certain components of the metric can be readily based on broadly accepted economic theory or easily quantifiable facts, others cannot. Both in the design of its calculations and in the weighting of its various components, numerous judgments were required. What, for instance, are the relative impacts on market activity of government curriculum mandates and government testing mandates? What are the relative impacts on the size and diversity of the teaching labor force of a mandatory four-year government teacher certification process and a one-year process? There is no way to answer such questions with perfect objectivity, so subjective judgments are required. The meaningfulness of CEMI's ratings and rankings is bounded by the accuracy of such judgments.[8] For that reason, CEMI is best thought of as a numerical distillation of expert opinion, rather than as a window on cardinal truths.

Another essential characteristic of the index's design is comprehensiveness. We have sought to include every policy detail that is known to have a significant, measurable impact on the operation of education markets.

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Finally, the CEMI was designed from the top down, beginning with a general conception of what constitutes a vigorous and free educational marketplace, and then progressively breaking down that general conception into greater and greater detail. That top-down design process is laid out in the section titled Measuring Education Markets.

A Note on Simplicity

Ideally, our index would embody all of the design goals described above and also be very simple to explain and calculate. In reality, the effort to maximize simplicity is in direct competition with our design goals. Faced with that tradeoff, we have chosen to emphasize the reliability, objectivity, comprehensiveness, and accuracy of our index in this inaugural version. Our reasoning is that it is impossible to rationally simplify the index until we are confident that we have a complete, meaningful version against which to compare any simplifications. Otherwise, we would have no basis for deciding which simplifications were acceptable and which excessively compromised our core design principles.

A further reason to prefer a complete version of CEMI to one that is highly simplified stems from our goal of explaining how and why education markets work. The rich detail of our index illustrates the interactions between various characteristics of education markets, making it a more useful educational tool.

That said, we believe that once CEMI has been subjected to wider scrutiny we may find ways of reducing its complexity without excessively compromising its accuracy or usefulness.

Measuring Education Markets

Markets thrive when educators have the freedom and incentives to serve families and families have the freedom and incentives to be diligent consumers. When one set of freedoms and incentives exists without the other, there can be no market. Consider, for example, a system in which children are automatically assigned to schools by the state. Regardless of how free the schools themselves happen to be, there is no market under that scenario, because families cannot choose the schools they deem best, and schools have no incentive to ascertain and satisfy families' needs. Similarly, if families are completely free to choose any school they want, but all schools are compelled to be absolutely uniform, consumer choice is rendered meaningless and no market exists.

This interrelation of the producer and consumer components of free education markets implies that our index is better calculated as a product than as a sum or average. That allows each component to have a more powerful impact on the overall index value. Consider the second of our examples above, in which we would give producer freedom a very low score (say 0.1 on a scale from 0 to 1) but consumer freedom a high score (say 0.95 on the same scale). If we simply averaged those values, we'd get a result that was better than 50 percent, but, with so little producer freedom, that seems inappropriately high. On the other hand, if we multiplied the two values, the result would be a more sensible 0.095.

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Calculating our index as a product is a departure from most other metrics of educational and economic freedom.[9] Typically, such metrics are calculated as sums or averages of their component variables. In many cases, the component variables are also given equal weights. That approach has the advantage of simplicity, but it assumes that there are no interactions between the input terms and is therefore incompatible with our understanding of how education markets work.

So, to accommodate the interaction between the producer and consumer components of an education marketplace, the Cato Education Market Index is computed as the degree of

freedom and market incentives enjoyed by producers *times* the degree of freedom and market incentives enjoyed by consumers (see Equation 1).

$$\text{Cato Education Market Index} = \text{Producer Freedom and Incentives} \times \text{Consumer Freedom and Incentives} \times 100 \quad (1)$$

We calibrate our measurements so that both terms in the equation are in the range of 0 to 1, and hence their product is also in that range. We then multiply that product by 100 to produce a final index score in the range of 0 to 100 (with 0 representing the complete absence of market activity and 100 representing a maximally free and vigorous market).[10]

The next step in our top-down design process is to define, in general terms, the freedoms and incentives that we measure.

Producer Incentives

Schools must be free to enter the market and to specialize once they have set up shop. In an ideal education marketplace, there are no barriers to entry. Everyone who wants to open a school has the right to do so. Furthermore, an ideal education market would be free of regulations on the operation of schools, other than minimal health and safety standards that apply to all institutions serving the public.

But there is more to markets than freedom. Producers are most efficient, innovative, and responsive to consumers' demands when they have powerful incentives to be so. The most fundamental market incentive of all is the desire to protect and improve one's livelihood, which can only be accomplished, in the context of a competitive market, by attracting and retaining paying customers. More specifically, the profit motive encourages businesses to allocate resources to the services for which consumers are most willing to pay. Profits encourage and enable providers to innovate and to expand their services in response to rising demand.

An illustration of what happens in the absence of the profit motive can be gleaned from the mainstream private education sector in the United States, roughly 95 percent of which is operated on a not-for-profit basis. Though commendable in many respects, nonprofit private schools have been among the nation's most stagnant institutions over the past century. Even the most popular among them serve roughly the same number of students today as they did a hundred years ago. Compare that to the client curve of a GE or a Microsoft.

Though computers have been introduced to many classrooms, their addition has been at best facilitative rather than transformative. In other words, the enormous potential of modern technology to revolutionize education remains largely untapped. A typical private school classroom today would be immediately recognizable by and intimately familiar to a student from the 1850s. The last dramatic instructional innovation occurred while Thomas Jefferson was president: the introduction of the chalkboard, around 1801.

The chief cause of stagnation has been the absence of any systematic incentive powerful enough to overcome the risks and costs of innovation and expansion. For-profit schools in the United States and abroad demonstrate considerably greater desire and ability to expand, with some for-profit education chains enrolling literally millions of students in dozens of countries.[11] Hence, to ensure that we meaningfully rate the vigor of education markets, our index takes into account the share of schools operated for profit.

In order for the profit motive to work effectively, businesses must be able to set their own prices. It must be possible for them to recoup investments in expensive research and development programs by charging high initial prices for the products or services that result from those investments. Consider cell phones. Once a plaything of the rich and famous, they are now given away with a subscription to cell-phone service. Color televisions, VCRs, and DVD players fol-

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lowed essentially the same pattern. A first-generation DVD player that sold for $1,000 could not even be marketed today, given that far more sophisticated units retail for $30.

In other words, it is the ability of innovative producers to charge high initial prices for new products that allows those innovations to eventually reach the masses. Our index must therefore penalize education systems that cap the amount that schools can charge for their services. For example, a voucher system in which schools are not allowed to charge customers more than the voucher's value should receive a lower index rating than one in which there is no price ceiling.

Just as price ceilings impede the process by which free markets encourage innovation and the expansion of popular providers, artificial price floors impede efficiency. An artificial price floor is created when a service is subsidized at a rate higher than the lowest rate being charged for that service in the open market. In the case of a school voucher program, the voucher creates an artificial price floor if it is larger than the lowest tuition charged by existing private schools. In the United States, private elementary schooling is widely available for under $5,000 per year. Elementary schooling is often available for under $3,000. If a universal $8,000 voucher were introduced tomorrow, there would no longer be any incentive for schools to find ways of serving students for less than $8,000.

There is more to markets than freedom.

The extra money would not be entirely wasted, because schools would still be competing for students and hence trying to find ways to use the new money to make themselves more attractive to consumers. Nevertheless, some waste would be inevitable; if parents and taxpayers had considered any new services to be worth the extra $3,000, they would already have been paying for them without the need for government involvement. Hence, artificial price floors have a negative impact on producer efficiency.

It is worth mentioning at this point that subsidies to private schools can also have a separate, positive impact on market vigor if they increase competition between public and private schools by diminishing any existing subsidy discrimination that favors government schools. When public and private schools have the same cost to parents, public schools have to compete to attract customers because parents can switch, without financial penalty, to the private sector. At present, however, American parents must pay taxes toward the public school system whether or not they make use of its services. That puts private schools at a significant competitive disadvantage, because private school tuition represents a major additional financial burden over and above mandatory education taxation. Our index accounts for this effect, as will be discussed below.

Producer Freedom

In addition to having incentives for efficiency, innovation, expansion, and responsiveness to customer needs, schools must have the autonomy to act in accordance with those incentives. Regardless of prevailing incentives, schools whose ability to compete is hobbled by regulation cannot generate a vigorous education market.

A key way in which schools' freedom to compete is commonly impeded in the public sector is the parceling up of schools into districts. Since schools within a given district are generally forced to conform to curriculum and other policies, the unit of competition becomes the district rather than the individual school. That reduction in what we call competitive density is reflected in CEMI's rating system: the CEMI competitive density factor for public school systems is a function of the number of districts per metropolitan area. Because charter and private schools do not bear a similar burden, their competitive density scores are defaulted to the maximum value of 1.

We break the remaining aspects of producer freedom into two categories: freedom of entry into the marketplace by new schools and freedom of operation for existing schools. Freedom of entry is calculated using a host of criteria relating to financing, registration, and other requirements imposed on prospective new schools. A system in which anyone could open a school, anywhere, without giving notice to the state, would receive the maximum score for freedom of entry. A sys-

tem that erected high regulatory hurdles to the creation of new schools would receive a low score.

We measure operational freedom in terms of schools' ability to choose their own curricula, hire their own teachers, set teachers' salaries, adopt or eschew religious instruction, select their own textbooks, and so forth, and on the freedom of individuals to enter the teaching profession without having to be certified by the state.

Consumer Incentives

With few exceptions, parents have a natural inclination and incentive to ensure that their children are well prepared for adult life, and we can expect this to be more or less constant across education systems. For the purposes of our index, we wish to measure incentives that are known to vary in strength between systems. One such incentive is the extent to which parents directly shoulder the cost of their children's education.

Nobel laureate in economics Milton Friedman observed that we are most careful when we spend our own money on ourselves, less careful when we spend someone else's money on ourselves, and least careful when we spend someone else's money on a third party. He was not the first to make that observation. Two thousand years ago, the Roman corruption prosecutor Pliny the Younger decided to found a high school in his hometown and to partially subsidize the tuition cost from his own pocket. He explained:

> I would promise the whole amount were I not afraid that someday my gift might be abused for someone's selfish purposes, as I see happen in many places where teachers' salaries are paid from public funds. There is only one remedy to meet this evil: if the appointment of teachers is left entirely to the parents, and they are conscientious about making a wise choice through their obligation to contribute to the cost.[12]

The views of Friedman and Pliny the Younger are consistent with the modern empirical education literature. As explained in the Introduction, schools funded by tuition fees tend to be more responsive in the curricula they offer, more academically effective, more efficient, and better physically maintained than those funded by the state. Though alternative explanations can be ventured to account for this relationship, our index adopts the Friedman-Pliny theory that consumers pay closer attention to services they pay for themselves than to services they receive for free. Hence, we include a variable titled Incentive for Parental Responsibility in our index that is a function of the share of school costs paid directly by parents.

Consumer Freedom

In liberal democracies, parents can usually choose any private school they want, at least if they pay for it themselves. Hence, in the case of private schools, parental, or consumer, freedom can generally be assumed to be unfettered. The same is not true of government schools. Students are usually assigned to these schools on the basis of place of residence, so most families can choose a different government school only by moving to a different neighborhood. That is a dramatic imposition on the consumer's freedom of choice.

Even under many "open-enrollment" or "public school choice" programs, parental choice of public schools remains limited. Some school districts, for example, allow parents to name their top three public school choices; then the districts allocate students to schools on the basis of racial integration levels, space availability, and parental preference. That is clearly a greater degree of choice than exists under systems that force parents to move to a new district to change schools, but it falls far short of unfettered choice *even within the public sector itself*. Our index takes account of these varying levels of consumer freedom of choice within the conventional public sector and assumes complete freedom of parental choice among private and charter public schools.

The last dramatic instructional innovation occurred while Thomas Jefferson was president: the introduction of the chalkboard, around 1801.

Vouchers create an artificial price floor if they are larger than the lowest tuition charged by existing private schools.

Of course, the fact that parents have to pay for private schools directly, whereas government schools charge no tuition, also has an effect on consumers' choices—it pushes many people to choose government schools when, up-front costs being equal, they might prefer private schools. But, strictly speaking, this does not constitute a substantial reduction in their *freedom*. In the absence of government schools, parents would still have to pay for private schools. The "free" status of public schooling makes it artificially appealing from an economic standpoint but does not strictly and substantially curtail the freedom of parents to *choose* private schools.

Note that our index does take into account the ramifications for market effectiveness of encouraging families to frequent the (usually much more heavily regulated) public sector rather than the private sector—it is just that we do not include this effect *under the rubric of parental freedom*.

A counterargument can be made that parental freedom *is* impinged because parents must pay for the government schools in taxes, and then again for private school tuition—even if they make no use of the government schools themselves. In practice, however, this imposition on parental freedom is smaller than might be assumed. Because the cost of government schooling is spread over the entire taxpaying population, not imposed exclusively on parents with school-aged children, the share of education taxes paid by parents is generally far less than the cost of the government school services they consume. For a family with two children in school, the average cost of the government system would be about $20,000 a year, whereas the dollar value of that family's tax burden that would go toward government schooling would typically be much lower. This is especially true since parents with school-aged children are generally younger than the average taxpayer and have correspondingly lower incomes and property values (and thus tax liabilities) than the average taxpayer.

Even so, we could still reasonably factor in the compulsion to pay government school taxes as a restriction on parents' freedom. We have chosen not to do so, however, on the grounds that this effect is captured, to a great extent, by another term in our index: the Incentive for Parental Responsibility, described above. Because that term measures the share of school funding that comes directly from parents, it rises and falls in inverse proportion to the share of tax funding of education (the larger the share of spending coming directly from parents, the less remains to be paid through taxes). Our Incentive for Parental Responsibility term thus reflects, to a substantial degree, the freedom-limiting effects of education taxes on parents.

Overview of Index Inputs

Assimilating the previous discussion, we can now specify that

Producer Freedom and Incentives = Competitive Density x Incentives for Innovation and Expansion x Incentive for Efficiency x Entry and Operational Freedom

Consumer Freedom and Incentives = Incentive for Parental Responsibility x Parental Freedom of Choice

Substituting these values into Equation 1, we arrive at Equation 2:

Index = Competitive Density x Incentives for Innovation and Expansion x Incentive for Efficiency x Entry and Operational Freedom x Incentive for Parental Responsibility x Parental Freedom of Choice x 100 (2)

Though we are now getting closer to the nitty-gritty data input terms from which index scores are calculated, we still have a bit further to go. Most of the terms in Equation 2 are not

directly measurable values; they must be computed from a series of more basic inputs. This section provides an overview of those inputs. A fully detailed enumeration of the raw data used in the index can be found in Appendix A, and the index's computational details, including relative weightings of the various components, are presented in full in Appendix B . An Excel spreadsheet encompassing both the data and the calculations can be found on the Cato Institute website (http://cato.org/cemi/cemi_2006.xls).

A final consideration is the relative weight to be given to each of the terms in Equation 2. That subject is also examined in detail in Appendix B .

As mentioned above, *Competitive Density* is set to 1 (i.e., maximum density) in the case of private and charter schools, because they are not forcibly grouped together into relatively homogeneous districts. In the case of traditional public schools, *Competitive Density* is proportional to the average number of districts per metropolitan area.

Incentives for Innovation and Expansion is the product of two terms: a function of the share of schools operated for profit and a measure of how strict a price cap, if any, is imposed on schools.

The *Incentive for Efficiency* term is a function of the size and scope of any school subsidies as a fraction of the average tuition charged by private schools. The point of this term is to measure the extent to which school subsidies create an artificial price floor for school spending, and hence eliminate any economic incentive for schools to find ways of serving students for less than that artificial floor amount.

Entry and Operational Freedom is a term that resembles a standard index of economic or educational freedom: it is a weighted sum that measures the freedom of new schools to enter the market and the degree of autonomy that schools enjoy once they have been allowed to open for business. The freedom-of-entry inputs measure the degree to which proposed new schools are unencumbered by requirements to

- Register with the state,
- Prove consumer interest (e.g., submit a list of preenrolled students),
- Join a government-approved private school organization,
- Limit themselves to certain locations, and
- Post a bond with the state.

The operational freedom inputs measure the degree to which schools enjoy autonomy with regard to their

- Admissions policies,
- Curricula,
- Testing,
- Textbooks,
- Budgets,
- Staffing,
- Teacher certification,
- Religious affiliation, and
- Other unenumerated freedoms.

Each of those inputs is allowed to take on one of several discrete numeric values between 0 and 1, corresponding to the level of freedom schools enjoy in that area. As an example, the possible values for schools' autonomy with regard to their curricula are presented in Table 1.

The final entry in the list of operational freedom inputs, "other unenumerated freedoms," is meant to capture the fact that our list cannot be exhaustive. Even under a system in which

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Table 1
Input Quantizations for Schools' Freedom over their Curricula

Level of Curriculum Freedom Enjoyed	Value
The entire curriculum is laid down by the state	0
Highly detailed state standards are imposed in all subjects	0.25
Standards are *either* highly detailed *or* cover most or all subjects	0.5
A few general standards are imposed in a limited number of subjects	0.75
The state imposes no curriculum mandates whatsoever	1

schools have 0 freedom in all of the areas we measure, it is still possible that educators will find ways of differentiating their services. So, even when the measured operational freedom terms all have the value 0, the overall operational freedom value should not necessarily be 0. We account for this by including in our sum the constant "other unenumerated freedoms." In theory, if our list of specific operational freedoms were truly exhaustive, we could dispense with this constant.

Incentive for Parental Responsibility is a function of the share of educational costs covered directly by parents.

Parental Freedom of Choice is set to 1 in the case of private or charter schools. In the case of traditional government school systems, it has a very low value if the only way to choose a school is to move to a different district, and it has a progressively higher value as public school choice options become stronger.

Accounting for Different Market Conditions across Sectors

Different types of schools are treated very differently by lawmakers. Curriculum and testing regimes, for instance, are generally determined by schools in the private sector but stipulated by government in the public sector. The extent to which costs are covered directly by parental fees also varies dramatically between sectors. These differences in the characteristics of, and regulations applied to, the different education sectors require us to collect data for each type of school separately. Consequently, our index recognizes four different types of schools: Conventional Government Schools (CGS), Alternative Government Schools such as charter schools (AGS), Voucher-accepting Private schools (VP), and Nonvoucher Private schools (NVP). In states that offer education tax credits for personal tuition costs or for donations to private scholarship organizations, the details of those programs are recorded in the section for Nonvoucher Private schools.

Schools funded by tuition fees tend to be more responsive in the curricula they offer, more academically effective, more efficient, and better physically maintained than those funded by the state.

Having those separate data input categories solves the problem of different regulations being applied to different types of schools but creates a new problem of its own: how do we combine these four component scores to produce an overall rating? The solution we have adopted when rating existing education systems is to calculate our index scores individually for each of the four categories and then combine those scores in a sum that is weighted by their school type's respective shares of total enrollment. So, a state in which 88 percent of students were enrolled in the Conventional Government School sector, and the remainder attended Nonvoucher Private schools, would have an overall index score of (0.88 × CGS rating) + (0.12 × NVP rating), where the CGS and NVP ratings depend, respectively, on the regulatory frameworks applicable to Conventional Government Schools and to Nonvoucher Private schools.

What about Other School Types?

Our four-part categorization of educational options is obviously incomplete. Most notably

absent from this list are homeschooling and after-school tutoring services. Both are omitted from this initial version of our index chiefly due to the scarcity of relevant data, though both could (and, ideally, should) be added at a later date. Of the two, the one most likely to skew the index's results, at least in the case of international comparisons, is the omission of tutoring services. That is because of the enormous role played by such services in many Asian nations. While Japan's public schools are among the most nationally centralized in the free world, that nation enjoys a vast, multi-billion-dollar-a-year, unregulated for-profit tutoring sector. Most Japanese students study at *juku*—as the tutoring schools are known—for some period of time during their elementary and/or secondary years, often for many hours a week. The metric's current inability to pick up on this large free market in after-school education decreases its accuracy for the purpose of international comparisons.

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Measuring Education Policies

Why Do We Need a Separate "Policy" Rating?

To maximize the usefulness of our index as a policy tool, it must be able to rate not only existing school systems as they are currently constituted (the market rating described in the preceding section) but education policy frameworks as well (policy ratings). As explained in the previous section, market ratings weigh the differing levels of enrollment in each of the four school types assessed by our index. This ties market ratings to the current reality on the ground and prevents them from capturing the likely future effects of newly passed legislation. If New York State were to adopt a universally accessible school choice program tomorrow, for example, the impact on public versus private sector enrollment might not be felt for months, and might not reach its full effect for years. Hence, a market rating for New York computed today would be very similar to the rating computed tomorrow, even though that state's policy framework would have changed dramatically.

It is important, therefore, to be able to assess the "market-friendliness" of education policies in the abstract, without taking current enrollment breakdowns into account. Doing so allows us to evaluate not only the policy frameworks already on the books but new education reform proposals as well. We call these evaluations policy ratings.

Computing policy ratings requires certain modifications to our list of input data and our calculations, which we explore in the next section. Note that inputs and calculations that are common to both policy and market ratings are not discussed again here.

Computing Policy Ratings

When calculating the *Competitive Density* term for a policy rating we will not generally have exact figures for the average number of schools per district or districts per metropolitan area, because these are not typically spelled out in complete detail in enabling legislation. In most cases, however, it should be possible to estimate these figures from the proposed policy and the state or nation in which it is intended to be implemented, and that is the approach we have chosen.

The *Incentives for Innovation and Expansion* term for a market rating requires us to know the share of schools that is operated for profit—again, something that will not be available for a proposal that has not yet been implemented. To fill that gap, we measure the presence or absence of an outright prohibition against for-profit schools and, if there is no outright prohibition, the extent to which the policy would penalize schools for being operated on a for-profit basis. We consider the current U.S. federal income tax exemption for nonprofit private schools a major disincentive to for-profit operation.

In computing the *Incentive for Parental Responsibility* term, we weigh the share of school funding that is likely to come from tuition, based on the details of the policy in question. So, for example, a school voucher proposal that explicitly forbids voucher-receiving schools to charge tuition fees above the voucher amount would receive the lowest value for this term. A voucher proposal that required parents with sufficient means to directly cover some of the cost of their children's education would receive a higher value. This is different from the calculation of *Incentive for Parental Responsibility* under a market rating, which is based on the actual share of children's educational costs that is paid directly by parents in the form of tuition fees.

By far the most substantial difference between market and policy ratings, however, is the absence, in the latter case, of enrollment data for the different types of schools. Without that information, we must come up with an alternative mechanism for assigning weights to the component scores for each of the four school types. Our chosen solution is to weight them on the basis of the extent to which they are favored or discriminated against in both financial and regulatory terms. In other words, we look at the relative levels of subsidies available to each school type, and the relative levels of autonomy they are allowed, and weight the school types accordingly. Our reasoning is that consumers are encouraged to frequent the types of schools that cost the least and have the most autonomy with which to respond to those consumers' demands.

Our index recognizes four different types of schools.

Let's consider an example. Imagine a policy that allows for only two types of schools: conventional government schools and voucher-receiving private schools. Under this policy, private schools receive a voucher worth two-thirds of the per pupil spending in government schools, but they are essentially unregulated, whereas government schools must follow a strict and uniform curriculum. Such a policy creates a relatively strong incentive for consumers to at least consider enrolling their children in the private sector. Now imagine a policy that offers an identically sized voucher but imposes the same restrictions on private voucher schools that it does on government schools. Under such a scenario, the incentive for families to seek private-sector schooling is much weaker. The combination of these two factors—relative subsidies and relative autonomy levels—is thus how we determine weights for each school type when computing a policy rating. A fully detailed explanation of this weighting system is provided in Appendix C .

An important design goal for CEMI was to achieve consistency between its market ratings and its policy ratings. We have attempted to ensure that, when the education policy details governing a particular state or nation are fed into the index, it will produce a policy rating similar to the current market rating for that same state or nation—provided that the policy framework for that state or nation has not recently changed in a substantive way. Put mathematically, we wish to maximize the correlation between the market and policy ratings produced by the index. We explore this correlation in Appendix C and find that, after excluding states with relatively recent and strong charter school laws (whose policy and market ratings *should* differ), the correlation between our market and policy scores is quite high.

Index Ratings

Interpreting the Results

Before discussing the ratings produced by our index, a caveat regarding their interpretation is in order: It does not make sense to speak of a CEMI rating of 25 as "one-quarter of a free market" or to say that a rating of 50 represents exactly twice as much of a market as a rating of 25. This is partly due to the subjective judgments required in the construction of the index, discussed in the Introduction, and partly because CEMI ratings and market outcomes are not necessarily related in a linear way. It seems likely, for instance, that vigorous and sus-

tainable markets cannot arise until a critical mass of constituent freedoms and incentives is achieved; and so even if our index is effective in measuring the presence of those freedoms and incentives, its relationship to particular market outcomes could well be nonlinear.

The United States

Tables 2 and 3 list the overall market and policy ratings (respectively) for the 50 U.S. states. Several conclusions are immediately apparent from the results:

- No state currently has anything resembling a free market in education.
- No state's education policies are likely to create a free market in education if left unchanged.
- In most cases, the current market ratings are quite similar to the policy ratings, but there are notable exceptions.

The top states by education market freedom arrive at their scores in varying ways. Wisconsin, one of the two top-scoring states, combines an unusually free (but still far from marketlike) conventional public school sector, one of the freest private sectors in the nation, a nonnegligible charter school program, and a small voucher program. Connecticut, which tied Wisconsin's score of 26 out of 100, has an even freer conventional public school sector but a much smaller charter sector and no voucher program. Idaho is a more distant third, having one of the freest conventional public school systems in the nation but a minuscule private education sector.

Of these states, only Wisconsin places in the top 3 on the policy rating. What the top 10 states on the policy rating scale have in common is that all have charter programs that do not cap the total number of charter schools that can be created. That leaves open the possibility that charter schooling will continue to spread and that, over time, a substantial share of the families in those states may gain access to charter schools. As a result, the top 9 of those states have policy ratings that are as high as or higher than the market rating of Wisconsin.[13]

Interestingly, Connecticut's market and policy ratings are nearly identical. That is because Connecticut has such a tight cap on its charter school program that it has little room for growth, and so the long-term market education prospects for the state are not very different from the current reality.

The states with the most market-friendly education *policies* in the nation are Texas and Wisconsin. Even they, however, rate only 30 out of 100. That should not be a surprise. While their charter schools are substantially freer than their own or other states' conventional public schools, the component scores for those charter sectors are still only in the mid-30s on our metric's scale, because of their limited freedom and market incentives.

Arizona comes in a close third on the policy scale, and an inspection of its results helps to illustrate precisely which policy features bring down its score. The state's conventional public schools earn 11 out of 100, due to their combination of very limited freedom and incentives for families and very limited freedom and incentives for educators. The state does have interdistrict choice, but that choice is highly constrained, and, as is the case for U.S. public schools generally, parents have no direct financial responsibility for their children's education (only attenuated indirect responsibility, through taxation). Arizona's public school principals have virtually no autonomy with regard to their curricula, admissions policies, teacher qualifications, and budgets. Finally, public schools are not, and cannot be, operated for profit.

Arizona's charter schools fare substantially better than its conventional public schools, but their score is also limited because of constraints on their freedom and incentives and the absence, once again, of any direct financial responsibility for parents. Arizona charter schools have no control over their admissions polices, are compelled to administer state tests (which stifle the diversity of their curricula), have no control over their revenue and prices, cannot offer devotional religious

To maximize the usefulness of our index as a policy tool, it must be able to rate not only existing school systems as they are currently constituted but education policy frameworks as well.

Table 2
Current Market Ratings for the United States

State	Overall Market Rating	Conventional Public		Charter Public		Nonvoucher Private		Voucher Private	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight
Wisconsin	26	16	0.84	30	0.03	87	0.12	72	0.01
Connecticut	26	19	0.89	37	0.00	85	0.11	N/A	0.00
Idaho	22	19	0.93	35	0.03	81	0.04	N/A	0.00
South Dakota	21	17	0.92	N/A	0.00	61	0.08	N/A	0.00
Florida	20	12	0.87	20	0.03	87	0.10	75	0.01
Delaware	19	3	0.79	39	0.04	85	0.18	N/A	0.00
New Jersey	19	9	0.85	39	0.01	80	0.14	N/A	0.00
Texas	19	15	0.93	34	0.02	81	0.05	N/A	0.00
Pennsylvania	18	6	0.82	36	0.02	81	0.15	N/A	0.00
Missouri	18	10	0.87	36	0.01	75	0.12	N/A	0.00
New York	18	7	0.85	37	0.01	82	0.15	N/A	0.00
Alaska	17	14	0.92	14	0.03	79	0.05	N/A	0.00
Kansas	17	11	0.92	29	0.00	87	0.08	N/A	0.00
Louisiana	17	8	0.84	33	0.01	65	0.16	N/A	0.00
Hawaii	17	11	0.80	14	0.02	44	0.17	N/A	0.00
Michigan	17	9	0.87	33	0.04	87	0.09	N/A	0.00
New Hampshire	17	9	0.89	42	0.00	82	0.11	N/A	0.00
Rhode Island	16	9	0.85	16	0.01	64	0.14	N/A	0.00
Nebraska	16	8	0.87	N/A	0.00	68	0.13	N/A	0.00
Ohio	16	7	0.85	34	0.03	81	0.12	71	0.00
Massachusetts	16	7	0.86	29	0.02	80	0.12	N/A	0.00
Georgia	16	10	0.91	36	0.01	85	0.07	N/A	0.00
Arizona	16	11	0.88	35	0.08	84	0.04	N/A	0.00
Minnesota	16	9	0.88	36	0.02	72	0.10	N/A	0.00
California	16	9	0.88	38	0.03	76	0.09	N/A	0.00
Maine	15	10	0.92	N/A	0.00	79	0.02	72	0.06
Arkansas	14	10	0.93	30	0.01	78	0.06	N/A	0.00
New Mexico	14	8	0.91	18	0.02	87	0.07	N/A	0.00
Washington	14	9	0.92	N/A	0.00	76	0.08	N/A	0.00
Indiana	14	6	0.90	35	0.00	80	0.10	N/A	0.00
Maryland	13	2	0.85	31	0.00	78	0.15	N/A	0.00
Illinois	13	3	0.87	18	0.01	86	0.12	N/A	0.00
Iowa	13	10	0.91	25	0.00	47	0.09	N/A	0.00
Vermont	12	5	0.89	N/A	0.00	81	0.04	69	0.07
Tennessee	11	5	0.91	24	0.00	78	0.09	N/A	0.00
South Carolina	11	4	0.91	26	0.01	85	0.08	N/A	0.00
Montana	11	7	0.94	N/A	0.00	73	0.06	N/A	0.00
Oregon	10	4	0.92	27	0.01	84	0.08	N/A	0.00
North Dakota	10	6	0.94	N/A	0.00	76	0.06	N/A	0.00
Colorado	10	3	0.89	36	0.04	85	0.07	N/A	0.00
Mississippi	10	2	0.90	12	0.00	85	0.10	N/A	0.00
Virginia	9	2	0.91	25	0.00	83	0.09	N/A	0.00

State	Overall Market Rating	Conventional Public		Charter Public		Nonvoucher Private		Voucher Private	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight
Oklahoma	9	5	0.95	28	0.00	87	0.05	N/A	0.00
Kentucky	9	2	0.90	N/A	0.00	76	0.10	N/A	0.00
West Virginia	9	6	0.95	N/A	0.00	66	0.05	N/A	0.00
North Carolina	8	2	0.91	39	0.02	78	0.07	N/A	0.00
Nevada	8	4	0.94	27	0.01	76	0.04	N/A	0.00
Wyoming	7	6	0.97	26	0.00	69	0.02	N/A	0.00
Alabama	6	2	0.91	N/A	0.00	52	0.09	N/A	0.00
Utah	5	2	0.95	35	0.01	77	0.03	N/A	0.00

Table 3
Policy Ratings for the United States

State	Overall Policy Rating	Conventional Public		Charter Public		Nonvoucher Private		Voucher Private	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight
Texas	30	15	0.47	36	0.45	81	0.09	N/A	0.00
Wisconsin	30	16	0.45	32	0.46	87	0.07	72	0.02
Arizona	29	11	0.47	37	0.44	84	0.09	N/A	0.00
Minnesota	29	9	0.41	38	0.51	72	0.08	N/A	0.00
California	29	9	0.47	40	0.45	76	0.09	N/A	0.00
New Jersey	27	9	0.55	41	0.36	80	0.09	N/A	0.00
New York	27	7	0.50	39	0.41	82	0.09	N/A	0.00
Idaho	27	19	0.77	37	0.14	81	0.09	N/A	0.00
Indiana	26	6	0.47	37	0.44	80	0.08	N/A	0.00
New Hampshire	25	9	0.63	45	0.29	82	0.09	N/A	0.00
Connecticut	25	19	0.89	39	0.02	85	0.09	N/A	0.00
Utah	24	2	0.48	37	0.43	77	0.08	N/A	0.00
Pennsylvania	23	6	0.59	38	0.33	81	0.09	N/A	0.00
Arkansas	23	10	0.58	32	0.34	77	0.09	N/A	0.00
Oklahoma	23	5	0.48	30	0.44	87	0.09	N/A	0.00
Ohio	22	7	0.58	36	0.33	81	0.05	71	0.04
Maryland	22	2	0.48	33	0.43	78	0.09	N/A	0.00
South Dakota	21	17	0.91	N/A	0.00	61	0.09	N/A	0.00
Alaska	20	14	0.64	15	0.28	79	0.09	N/A	0.00
Oregon	19	4	0.59	28	0.33	84	0.09	N/A	0.00
Virginia	19	2	0.52	26	0.40	83	0.09	N/A	0.00
Florida	19	12	0.86	21	0.05	87	0.07	75	0.02
South Carolina	18	4	0.63	28	0.29	85	0.09	N/A	0.00
Kansas	18	11	0.90	31	0.02	87	0.09	N/A	0.00
Missouri	18	10	0.83	39	0.09	75	0.09	N/A	0.00
Georgia	17	10	0.90	39	0.02	85	0.09	N/A	0.00

Continued

Table 3 ***continued***

State	Overall Policy Rating	Conventional Public		Charter Public		Nonvoucher Private		Voucher Private	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight
Michigan	16	9	0.88	36	0.04	87	0.09	N/A	0.00
Wyoming	16	6	0.67	26	0.24	69	0.09	N/A	0.00
New Mexico	16	8	0.84	19	0.07	87	0.09	N/A	0.00
Maine	16	10	0.91	N/A	0.00	79	0.03	72	0.06
Washington	14	9	0.91	N/A	0.00	76	0.09	N/A	0.00
Hawaii	14	11	0.90	14	0.02	44	0.09	N/A	0.00
Massachusetts	14	7	0.88	31	0.04	80	0.09	N/A	0.00
Rhode Island	14	9	0.88	17	0.03	64	0.09	N/A	0.00
Louisiana	14	8	0.89	35	0.02	65	0.09	N/A	0.00
Delaware	14	3	0.83	42	0.08	85	0.09	N/A	0.00
Nebraska	14	8	0.91	N/A	0.00	68	0.09	N/A	0.00
Colorado	13	3	0.84	38	0.08	85	0.09	N/A	0.00
Iowa	13	10	0.91	25	0.00	47	0.09	N/A	0.00
Montana	12	7	0.91	N/A	0.00	73	0.09	N/A	0.00
North Dakota	12	6	0.91	N/A	0.00	76	0.09	N/A	0.00
Tennessee	11	5	0.91	24	0.00	78	0.09	N/A	0.00
Nevada	11	4	0.89	29	0.02	76	0.09	N/A	0.00
Vermont	11	5	0.91	N/A	0.00	81	0.03	69	0.07
West Virginia	11	6	0.91	N/A	0.00	66	0.09	N/A	0.00
Illinois	11	3	0.89	19	0.02	86	0.09	N/A	0.00
North Carolina	10	2	0.88	41	0.03	78	0.09	N/A	0.00
Mississippi	9	2	0.91	12	0.00	85	0.09	N/A	0.00
Kentucky	8	2	0.91	N/A	0.00	76	0.09	N/A	0.00
Alabama	6	2	0.91	N/A	0.00	52	0.09	N/A	0.00

instruction, and may not be directly operated as for-profit businesses (they can, however, be contracted out by the nonprofit charter board, at its discretion, to a for-profit management company). Nor is there any binding appeals process for rejected charter applications, and there are nonnegligible barriers to the entry of new charter schools. All of those limitations conspire to make Arizona's charter school system, while among the freest in the nation, quite remote from a truly free educational market.

It does not make sense to speak of a CEMI rating of 25 as "one-quarter of a free market" or to say that a rating of 50 represents exactly twice as much of a market as a rating of 25.

Sweden and the Netherlands

For an international perspective, we turn now to Sweden and the Netherlands, both of which have nationwide voucherlike programs under which government education funding follows children to whichever public or eligible private school their parents select. The Dutch program was introduced in 1917, and the Swedish program has been in existence since 1992. Both nations impose a substantial regulatory burden on voucher-accepting private schools—more substantial than the controls imposed on any of the existing U.S. voucher programs. In both nations, voucher schools must follow the state curriculum and are forbidden to charge tuition fees larger than the voucher amount. For-profit status is permitted for voucher schools in Sweden, but not in the Netherlands. Dutch restrictions on staffing and budgeting decisions also

tend to be more severe. One of the few respects in which the Swedish program is more restrictive than the Dutch is the extensive constraints it imposes on schools' admissions policies—constraints very much like those imposed on U.S. voucher programs. The Dutch program gives schools more autonomy in this regard.

The overall result of these differences is that, on paper at least, the Swedish program is more marketlike than the Dutch, and so receives a substantially higher policy rating (40, versus 31 for the Netherlands), as seen in Table 4. Interestingly, the reverse is true for the current market rating, shown in Table 5, in which the Netherlands outscores Sweden 31 to 25. The reason for this reversal is that the Dutch voucher program is now nearly a century old, and the private-sector share of enrollment has thus had ample time to grow, fulfilling the potential of its enabling legislation. That explains why the policy and market scores for the Netherlands are identical.

About 76 percent of Dutch children are enrolled in the private sector today, compared to only 8 percent in Sweden. The much smaller Swedish private-sector share is due to the fact that its program is comparatively recent. Sweden went from having only about 1 percent of its students enrolled in private schools before 1992 to having 8 percent enrolled today. Should this growth trend continue, as it has in other countries with uncapped voucher programs, Sweden is likely to ultimately reach an even higher share of private-sector education consumption than has the Netherlands. That is due to the fact that Swedish voucher schools currently operate under somewhat freer regulatory conditions than do Dutch voucher schools, and so should have an easier time customizing their services to the needs of families and hence a better chance of luring families out of the more heavily constrained public sector. This difference in the long-term prospects for the Swedish voucher program is captured by CEMI's policy rating, which explains Sweden's substantially higher score.

It should be noted that the Dutch program has become increasingly regulated over time, and should the Swedish program suffer the same fate, its policy rating will fall closer in line with that of the Netherlands.

No state's education policies are likely to create a free market in education if left unchanged.

Table 4
Policy Ratings for Sweden and the Netherlands

State	Overall Policy Rating	Conventional Public		Charter Public		Nonvoucher Private		Voucher Private	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight
Sweden	40	24	0.10	N/A	0.00	N/A	0.00	42	0.90
The Netherlands	31	25	0.23	N/A	0.00	N/A	0.00	33	0.77

Table 5
Current Market Ratings for Sweden and the Netherlands

State	Overall Market Rating	Conventional Public		Charter Public		Nonvoucher Private		Voucher Private	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight
The Netherlands	31	25	0.24	N/A	0.00	N/A	0.00	33	0.76
Sweden	25	24	0.92	N/A	0.00	N/A	0.00	46	0.08

Market-Inspired Policy Proposals

Even one of the most market-friendly education policies in the industrialized world, that of Sweden, receives a failing grade from our index. Because of factors such as strict price controls and central planning of the curriculum, Swedish schools do not, and cannot, constitute a true free market. That prompts an obvious question: what policies *would* bring about free and vigorously competitive education markets?

We address that question in Table 6, looking at 13 different policy options ranging from the total separation of school and state to the current education policy situation in California (which, as the most populous state, was chosen as a benchmark for the status quo). California data are also used in some of the school choice program scenarios to show how the various policy options would affect the ratings of an existing state education system.

The first scenario treated in Table 6 represents the complete withdrawal of government from the field of education. By definition, this yields a perfect market score of 100. Notably, this separation of school and state includes the elimination of the federal government income tax exemption for schools organized as nonprofit corporations. The reason for taking that exemption into account is that it dramatically favors nonprofit over for-profit schools (because nonprofits are allowed to retain substantially more of their revenues than are for-profits). When the exemption for nonprofit schools is introduced, the rating for an otherwise free educational market drops from 100 to 89.

The states with the most market-friendly education policies in the nation are Texas and Wisconsin. Even they, however, rate only 30 out of 100.

The next highest-scoring policy scenario is a sizable tax credit program that offers credits both for the personal use of parents with school-aged children and for donations to private scholarship-granting programs that subsidize education for low-income students. This scenario also assumes that private schools operate in an environment that is essentially free of government regulation, including the absence of the income tax exemption for nonprofit schools. When that exemption is introduced, the rating drops from 96 to 84.

The third most marketlike policy scenario is a universal school voucher program that provides all children with a voucher for the lesser of $4,000 or the tuition charged by their chosen private school. Like the previous two scenarios, it assumes that there are no government-owned, government-operated schools, and that there is no tax exemption for nonprofit schools. Were the tax exemption included, the score would drop from 86 to 77.

The chief reason that the idealized voucher scenario scores well below the idealized tax credit program is that it more severely limits the share of educational costs paid directly by parents in the form of tuition. Because personal use tax credits allow parents to pay for their children's schooling with their own money, they maximize the share of the population in which the consumer is also the payer and minimize third-party payment. Increasing the voucher size from $4,000 to $9,800 drops the metric's rating from 86 to 77—a drop that is also attributable to the lower share of school costs paid directly by parents.

The highest-ranking scenario that represents a plausible policy is the current California education system supplemented with a two-part $4,500 tax credit program. Under that scenario, the average personal use tax credit would total $4,500, as would the average scholarship awarded by scholarship-granting organizations. Unlike the four highest-scoring scenarios, this one takes account of the federal income tax deduction for nonprofit schools. If that deduction were removed, this scenario's score would rise from 74 to 82. It does, however, assume that nongovernment schools would be allowed complete freedom in regard to their curricula (as in the three highest-scoring scenarios), which would be a departure from the existing policy in California (where private schools must adopt curricula comparable to the public school curriculum). If we add that curriculum restriction to this California plus tax credits scenario, its score drops from 74 to 69.

The next three scenarios represent idealized and unregulated public school choice, a similar idealized vouchers plus charter schools combination, and an idealized charter school program with no vouchers. All receive comparable scores of 64 or 65 and assume the existence of

Table 6
Policy Ratings for U.S. Market-Inspired Proposals

Scenario	Overall Policy Rating	Conventional Public		Charter Public		Nonvoucher Private		Voucher Private	
		Score	Weight	Score	Weight	Score	Weight	Score	Weight
Free market, no gov't schools or intervention	100	N/A	0.00	N/A	0.00	100	1.00	N/A	0.00
Idealized $4,000 dual tax credit, no gov't schools	96	N/A	0.00	N/A	0.00	96	1.00	N/A	0.00
Idealized $4,000 voucher, no gov't schools	86	N/A	0.00	N/A	0.00	100	0.04	85	0.96
Idealized $9,800 voucher, no gov't schools	77	N/A	0.00	N/A	0.00	100	0.04	76	0.96
California + decent $4,500 dual tax credit program	74	14	0.09	42	0.02	81	0.89	N/A	0.00
Idealized maximally free conventional gov't schools	65	63	0.92	N/A	0.00	87	0.08	N/A	0.00
Idealized maximally free charter schools	65	N/A	0.00	63	0.92	87	0.08	N/A	0.00
Idealized vouchers and charters, $9,800 / pupil	64	N/A	0.00	63	0.30	100	0.02	63	0.67
California + $7,000 decent voucher program	53	9	0.01	40	0.01	76	0.04	53	0.93
California + $2,500 decent dual tax credit program	52	9	0.23	40	0.22	74	0.56	N/A	0.00
California + $9,800 decent voucher program	51	9	0.00	40	0.00	76	0.04	50	0.96
California + $4,000 decent voucher program	45	9	0.21	40	0.20	76	0.04	58	0.55
California	29	9	0.47	40	0.45	76	0.09	N/A	0.00

the federal income tax exemption for private schools and hence that, in every case, the education industry would be dominated by nonprofit providers.

The next highest-scoring real-world scenario is California plus a $7,000 voucher, followed by California plus a $2,500 dual tax credit program and California plus a $9,800 voucher. These are followed by California plus a $4,000 voucher program. The $9,800 voucher receives a lower rating than the $7,000 voucher due to its more severe reduction in the share of school costs paid directly by parents. The $4,000 voucher's score is lower still because it is too small relative to the higher spending in California's heavily regulated conventional public schools. The lowest-scoring scenario is the existing California policy, which rates a score of 29.

CEMI Ratings and Educational Outcomes

We have already noted that the relationship between CEMI ratings and the scope and vigor of market activity is not necessarily linear. Nevertheless, it is inevitable with an index of this

Because of factors such as strict price controls and central planning of the curriculum, Swedish schools do not, and cannot, constitute a true free market.

On all five of our regression tests, the CEMI market rating was positively and statistically significantly associated with educational outcomes.

kind that linear regression will be used to search for relationships between its ratings and whatever educational outcome measures happen to be readily available.

Given that reality, we have run a series of regressions using a variety of different educational outcome measures, and a reasonable suite of controls for other factors commonly associated with those outcomes. Our outcome measures include on-time high school graduation rates, the average of fourth grade NAEP reading and mathematics scores, the average of eighth grade NAEP reading and mathematics scores, the average of fourth and eighth grade NAEP reading and mathematics scores, and a composite index of fourth and eighth grade reading and math scores with graduation rates.

The NAEP was chosen because it is the only test administered to representative samples of students from every state. Reading and mathematics were selected as the subjects of interest because they represent two of the three "Rs" and because other NAEP subject test results (such as science) are not reported for all states. The fourth and eighth grades were chosen because they are the only ones for which state-level NAEP data are available.

Each of our regressions controlled for five common socioeconomic and demographic variables:

- The share of householders receiving state or local assistance,
- The share of children living with foreign-born householders,
- The share of children not living in married-couple families,
- An index of parents' level of education, and
- The share of white children.

Other control variables such as the share of Hispanic families, the share of students for whom the language spoken at home was not English, and the share of disabled students were also included in various models but were not found to be statistically significant or to add predictive power to the model.

On all five of our regression tests, the CEMI market rating was positively and statistically significantly associated with educational outcomes, though its effect was not large by conventional measures. For the outcome measure that combined fourth and eighth grade test scores with graduation rates, the CEMI term was highly significant and of moderate effect size, and it uniquely explained more of the variance of the outcome measure than did any of the control variables. In other words, CEMI uniquely explained more of the variation in this overall educational outcome measure than did race, wealth, presence of nuclear families, or parental education. It is worth noting, however, that none of the variables in that model uniquely explained more than 5 percent of the total variance in that outcome measure, implying that much of the predictive effect of the variables in this model is due to interrelations among them.

These results are described in detail in Appendix D.

Index Robustness to Alternative Component Weights

Given the unavoidable subjectivity involved in the calibration of CEMI's weighting values, it is useful to test how its ratings respond to variations in the weights we have chosen. If our index ratings varied wildly in response to tiny changes in our calibrations, then CEMI's usefulness would be limited. If, on the other hand, its ratings are fairly stable so long as the weights remain within some reasonable range of the values we have chosen, then its potential usefulness is greater.

The quality of being stable in the face of changes in weighting values is called "robustness," and it can be tested by randomizing the index's constants within some specified range and

recomputing the ratings and rankings to see how widely they vary in response to those randomizations. The results of a pair of robustness tests are presented in Appendix E. In brief, CEMI ratings and rankings are quite stable when its weights are randomly varied in a 10 percent range[14] and are fairly stable, on the whole, when varied in a 20 percent range.[15]

The most volatile CEMI scores are its market rankings, and their greater variability is due to the fact that U.S. states have such similar education systems, and hence such similar CEMI ratings. With all the ratings so close together, even small changes in those rating values can lead to a significant shift in the rank ordering of the states. Hence, it is wise not to refer to the rankings in isolation and to always keep them in the context of the actual rating values produced by CEMI.

Conclusion

CEMI is intended to model the way education markets work. To the extent that it accurately measures the necessary components of free education markets, it suggests a number of conclusions about America's school systems and the policies proposed to reform them.

First, and least surprising, CEMI ratings indicate that no state in the country currently enjoys anything remotely resembling a competitive education industry—including the states that have implemented small-scale voucher or tax credit programs or larger (but still weak, from a market standpoint) charter school programs. The U.S. education industry is dominated by state school monopolies that, because of their government-funding advantage, have reduced the private sector to a tiny niche.

More intriguing, CEMI suggests that even the national voucherlike programs of Sweden and the Netherlands are also very far from free markets. Their low ratings on our index are largely due to the regulations imposed on participating schools, though the relative youth of the Swedish program also plays a role.

When we apply CEMI to a variety of different school choice policy proposals, we find very large differences in their market potential, due to differences in funding levels and mechanisms, degrees of regulation, and program size. These policy ratings, more than anything else, are likely to precipitate disagreements over CEMI's design and calibration. But we believe such disagreements will advance the debate over optimum school choice policy design. By putting the policy questions into explicit mathematical terms, CEMI will allow a much clearer discussion of the necessary and sufficient features of meaningful reform. Analysts who disagree with particular index ratings will have the ability to point to the specific characteristics of the CEMI model responsible for those ratings and suggest alternative weights or calculations, focusing the debate in a way that has not previously been possible.

In the end, if this index leads merely to a greater emphasis on the details of school choice policies, and their roles in creating and sustaining a competitive education industry, we believe that our efforts will have been worthwhile.

CEMI ratings and rankings are quite stable when its weights are randomly varied in a 10 percent range and are fairly stable, on the whole, when varied in a 20 percent range.

Appendix A: Index Input Data

This Appendix gives the inputs to our metric. We use the term "jurisdiction" to apply to the level of political organization that is chiefly responsible for education law. So, in the United States, "jurisdiction" refers to a state, while in Canada it refers to a province. In nations like the Netherlands, where education policy is chiefly determined by the national government, "jurisdiction" refers to the nation as a whole. In other words, our metric is designed to provide ratings for U.S. states, Canadian provinces, and entire nations such as the Netherlands and Sweden. A single metric rating cannot be obtained for all of the United States or Canada because education systems and policies vary substantially from one state and province to another. It is possible, however, to obtain an overall national rating for those countries by simply averaging the ratings for the constituent states or provinces (weighted, optionally, by enrollment).

The term "district" refers to the local government agency in charge of operating conventional government schools. In the United States, this is of course a school district, but in many other nations it is referred to as a Local Education Authority, or LEA.

The organization of our input data listing is illustrated in Table A-1. The variable name of each input item appears in the upper left-hand corner of each box and is followed, immediately below, by a description of that data item. Some input items, such as per pupil spending figures, require a numeric response. Other input items, particularly those used to gauge the level of regulatory intervention, are multiple choice, with the choices appearing just to the right of the input item descriptions. Each choice in a multiple-choice list corresponds to a particular numeric value (given in the rightmost column).

As a helpful mnemonic, all of the variables specific to a particular school type are prefixed with the acronym of that type: Conventional Government Schools by CGS, Alternative Government Schools by AGS, Nonvoucher Private schools by NVP, and Voucher/Subsidy-Accepting Private schools by VP.

Table A-1
Legend for Data Input Table

Input variable name	Optional note on applicability	
Input variable description	possible choice 1 possible choice 2, etc.	value 1 value 2
Description of the possible choices		

Initial Data Inputs

CEMI Rating Type Settings

Policy_or_Market_Evaluation		
Do you want to weigh only the policy framework, or include data about ongoing market activity?	Policy_Only Include_Market_Activity	

Shared Data

School_Aged_Population_of_Jurisdiction

School-aged population of the jurisdiction in question (approximate if necessary)

If this is a "policy only" evaluation, please enter the school-aged population of the jurisdiction to which the policy would be applied.

This is a required input field because it provides a necessary context within which various policy details and market realities can be assessed.

Data Inputs for Specific School Types

Input Data for Conventional Government Schools

CGS_Freedom_of_Entry

Freedom of entry	No_Market_Entry	0.1

Note: There is no possibility of entrepreneurs opening conventional government schools, so this value is not editable. This value is not set to 0 because there is some possibility for consumer demand to affect the creation of public schools, albeit only indirectly through the political process (hence the low value).

CGS_Type_of_Parental_Choice

Can parents choose their children's schools within the conventional government school system?	Only_by_Choice_of_Residence	0
	Yes_within_Their_District	0.5
	Yes_Jurisdiction_Wide	1

CGS_Degree of_Choice

How free are parents' choices under the prevailing choice program (whether within-district or jurisdiction-wide)?

Exceedingly_Constrained_Choice	0
Heavily_Constrained_Choice	0.3
Modestly_Constrained_Choice	0.7
Unfettered_Choice	1

Please use the following guidelines in completing this field:

Exceedingly_Constrained_Choice:
Two or more of the constraints listed in the "Heavily_Constrained_Choice" category (see below)

Heavily_Constrained_Choice:
Districts may opt out, or choices constrained by racial or other quotas, or significant caps on interdistrict transfers

Modestly_Constrained_Choice:
Liberal caps on interdistrict transfers, some specialized schools may opt out

Unfettered_Choice:
All schools and districts must participate, no caps on interdistrict mobility

CGS_per_Pupil_Spending

Average per pupil expenditure
When rating policies that do not make this figure explicit, please approximate the expected initial per pupil spending figure. This figure should include all expenditures, not simply operating expenditures.

CGS_Direct_Parent_Funding

Parents' share of funding as stipulated in (or likely to follow from) the relevant legislation
Share of core service costs paid for directly by parents (do not include fees for extracurricular activities).

CGS_Freedom_over_Admissions

Schools' freedom over admissions policy

Extensive_Constraints	0
Some_Limited_Constraints	0.5
Complete_Admissions_Freedom	1

Extensive_Constraints:
- students are automatically assigned to schools by the jurisdiction, or
- schools must accept every applicant until they are oversubscribed, at which point they must use a random lottery (typical voucher program requirement)

Some_Limited_Constraints:
- no discrimination by gender, race, religion

Complete_Admissions_Freedom:
- self-explanatory

CGS_Teacher_Requirements_Jurisdiction

How heavy are the state-imposed requirements for entering the teaching labor force?

Multi_Year_Govt_Mandated_Training	0
Up_to_1_Year_Govt_Mandated_Training	0.33
Any_College_Degree_Plus_Background_Checks	0.8
Anyone_Can_Teach	1

This question is concerned with the mandatory educational requirements for teacher certification. Multi-year government-mandated training covers the typical U.S. case, in which prospective public school teachers must obtain a degree in education from an accredited teacher-training program at a college or university. Even most jurisdictions that have alternative certification programs fall into this category because the alternative certification routes are typically temporary and require candidates to eventually complete a full degree in education. The up-to-1-year category is for jurisdictions with stronger alternative certification routes. The final two categories apply mainly to private schools (for which this question is also asked, below).

CGS_Staffing_Freedom_Jurisdiction

To what extent do jurisdiction-wide regulations and/or bargaining agreements limit the freedom of principals to hire and fire employees?

Principal_Has_Virtually_No_Say	0
Constrained_by_Collective_Bargaining	0.33
Hires_Fires_within_Policy_Guidelines	0.66
Hires_Fires_at_Will	1

Principal_Has_Virtually_No_Say: e.g., teachers are appointed by the state
Constrained_by_Collective_Bargaining: e.g., seniority-based bumping rules apply
Hires_Fires_within_Policy_Guidelines: e.g., moderate due-process requirements must be followed
Hires_Fires_at_Will: e.g., Principal essentially has a free hand

CGS_Curriculum_Freedom_Jurisdiction

Describe any jurisdiction-wide curriculum mandates

Zero_Curriculum_Freedom	0
Extensive_AND_Detailed_Framework	0.25
Extensive_OR_Detailed_Framework	0.5
Limited_General_Framework	0.75
Complete_Curriculum_Freedom	1

In the case of the United States, this refers to mandatory curriculum guidelines or complete curricula imposed at the state level. In the case of nationally centralized education systems (or proposals), such as those of Japan or Taiwan, this refers to national curriculum mandates.

CGS_Curriculum_Freedom_District

Describe any district-level curriculum mandates

Zero_Curriculum_Freedom	0
Extensive_AND_Detailed_Framework	0.25
Extensive_OR_Detailed_Framework	0.5
Limited_General_Framework	0.75
Complete_Curriculum_Freedom	1

School districts (a.k.a., Local Education Authorities) often have their own curriculum mandates that build on any mandates that exist jurisdiction-wide. In the case of the United States, this refers to the school district's official curriculum.

If there are no local education authorities within the jurisdiction or proposal being rated, choose the No_Curriculum_Mandates option.

CGS_Textbook_Freedom_Jurisdiction

Describe any jurisdiction-wide textbook selection mandates

All_Textbooks_Mandatory	0
Some_from_List_and_Some_Mandatory	0.25
Choose_All_from_Approved_List	0.5
Choose_Some_from_Approved_List	0.75
Complete_Textbook_Freedom	1

This variable measures the extent of state-level textbook mandates. There are two common types of textbook mandates: requirements that textbooks be chosen from an approved list and requirements that specific textbooks be adopted. We allow for each approach and for combinations of the two.

CGS_Testing_Freedom_Jurisdiction

Describe any jurisdiction-wide testing mandates	Extensive_or_High_Stakes_Govt_Tests	0
	Some_Government_Imposed_Tests	0.33
	Some_but_Schools_Choose_Tests	0.66
	Complete_Testing_Freedom	1

CGS_Budget_Freedom_Jurisdiction

Describe any jurisdiction-wide budget mandates	Budget_Is_Totally_Centralized	0
	Heavy_Allocation_Constraints	0.33
	Some_Allocation_Constraints	0.66
	Complete_Budget_Freedom	1

Budget_Is_Totally_Centralized: e.g., several major budget items set at jurisdiction level for all schools
Heavy_Allocation_Constraints: e.g., one or two big budget items (e.g., teachers' salaries) set at jurisdiction level
Some_Allocation_Constraints: e.g., 65 percent of spending must be in classroom
Complete_Budget_Freedom: jurisdiction imposes no budget allocation mandates

CGS_Budget_Freedom_District

Describe any local/district budget constraints	Budget_Is_Totally_Centralized	0
	Heavy_Allocation_Constraints	0.33
	Some_Allocation_Constraints	0.66
	Complete_Budget_Freedom	1

Budget_Is_Totally_Centralized: e.g., several major budget items set at district level for all schools
Heavy_Allocation_Constraints: e.g., one or two big budget items (e.g., teachers' salaries) set at district level
Some_Allocation_Constraints: e.g., 65 percent of spending must be in classroom
Complete_Budget_Freedom: district imposes no budget allocation mandates

CGS_Religions_Permitted

Number of religions permitted to operate schools and/or provide devotional instruction

One_Religion_or_None	0
Select_Few_Religions	0.4
All_Major_Religions	0.7
All_Religions	1

This question exists mainly to differentiate U.S. public school systems from systems in other nations that allow (or insist on) religious state-run schools, and also to differentiate between U.S. public schools and U.S. private schools.

CGS_Districts_per_Metro_Area

Average (or expected average) number of districts per metropolitan area

CGS_Avg_Schools_per_District

Average (or expected average) number of schools per district

CGS_For_Profit_Policy

Are for-profit schools permitted?
Answer is always
No in the public sector

No	0

CGS_Parent_Funding_Reality *Applies only to "Market Ratings"*

Actual share of total spending derived directly from parental fees

CGS_For_Profit_Reality *Applies only to "Market Ratings"*

Percentage of for-profit schools 0

Always 0 because profit making is prohibited in the public sector

CGS_Actual_Enrollment *Applies only to "Market Ratings"*

Jurisdiction-wide conventional government school enrollment

Input Data for Alternative Government Schools (e.g., charter schools)

AGS_School_Cap

Cap on number of alternative government schools
Leave blank if there is no cap. Enter 0 if there is no provision for alternative schools

AGS_Non_District_Authorizers_Allowed

Can authorities other than local school districts authorize new alternative schools?	Yes	1
	No	0

AGS_Num_Authorizers

Number of authorities that can authorize the creation of new alternative schools
In the case of U.S. charter schools, do not count each school district as a separate authorizer unless it can authorize the creation of new charter schools anywhere in the state.

AGS_Binding_Appeals

Is there a binding appeals process for rejected authorization requests?	Yes	1
	No	0

AGS_Govt_Founders_Only

Must alternative schools be founded by government school personnel?	Yes	1
	No	0

AGS_Creation_Paths

Allowed creation paths for alternative government schools	Conversions_Only	0.5
	New_Schools_Only	0.5
	Conversions_or_New_Schools	1

A "conversion" is a conventional government school that is converted into an alternative school.

AGS_Burden_of_Proof

Burden of proof of consumer demand

More_Than_50_Preenrolled	0
Up_to_50_Preenrolled	0.25
More_Than_50_Expressing_Interest	0.5
Up_to_50_Expressing_Interest	0.75
No_Proof_of_Demand_Required	1

This refers to laws requiring that anyone proposing a new alternative school must demonstrate interest in the venture, either by getting local parents to state their interest in writing or actually requiring the school to preenroll a certain number of students.

AGS_Direct_Parent_Funding

Parents' share of funding as stipulated in (or likely to follow from) the relevant legislation
Share of core service costs paid for directly by parents (do not include fees for extracurricular activities).

AGS_Copay_Penalty

By how many dollars is the school's funding reduced for every dollar of copayment charged to parents?
Enter 0 if there is no penalty for copayments. This is a measure of the severity of any controls on the highest price that alternative government schools may charge.

AGS_per_Pupil_Spending

Average per pupil expenditure
When rating policies that do not make this figure explicit, please approximate the expected initial per pupil spending figure.

AGS_Freedom_over_Admissions

Schools' freedom over admissions policy		
	Extensive_Constraints	0
	Some_Limited_Constraints	0.5
	Complete_Admissions_Freedom	1

Extensive_Constraints:
- students are automatically assigned to schools by the jurisdiction, or
- schools must accept every applicant until they are oversubscribed, at which point they must use a random lottery (typical voucher program requirement)

Some_Limited_Constraints:
- no discrimination by gender, race, religion

Complete_Admissions_Freedom:
- self-explanatory

AGS_Degree_of_Choice

Degree of parental choice among alternative government schools		
	Only_by_Choice_of_Residence	0
	Yes_within_Their_District	0.5
	Yes_Jurisdiction_Wide	1

Charter school programs almost always allow anyone in the given jurisdiction to choose a charter school, so the answer will usually be "Yes_Jurisdiction_Wide" for U.S. charter schools. When the Alternative Government School category is used to rate different kinds of alternative schools, including ones that may not necessarily be schools of choice, the other possible answers come into play.

AGS_Teacher_Requirements

How heavy are the requirements for entering the teaching labor force?		
	Multi_Year_Govt_Mandated_Training	0
	Up_to_1_Year_Govt_Mandated_Training	0.33
	Any_College_Degree_Plus_Background_Checks	0.8
	Anyone_Can_Teach	1

This question is concerned with the mandatory educational requirements for teacher certification. Multi-year government-mandated training covers the typical U.S. case, in which prospective public school teachers must obtain a degree in education from an accredited teacher-training program at a college or university. Even most jurisdictions that have alternative certification programs fall into this category because the alternative certification routes are typically temporary and require candidates to eventually complete a full degree in education. The up-to-1-year category is for jurisdictions with stronger alternative certification routes. The final two categories apply mainly to private schools (for which this question is also asked, below).

AGS_Staffing_Freedom

To what extent do regulations and/or bargaining agreements limit the freedom of principals to hire and fire employees?

Principal_Has_Virtually_No_Say	0
Constrained_by_Collective_Bargaining	0.33
Hires_Fires_within_Policy_Guidelines	0.66
Hires_Fires_at_Will	1

See description in Conventional Government Schools section.

AGS_Curriculum_Freedom

Describe any curriculum mandates

Zero_Curriculum_Freedom	0
Extensive_AND_Detailed_Framework	0.25
Extensive_OR_Detailed_Framework	0.5
Limited_General_Framework	0.75
Complete_Curriculum_Freedom	1

AGS_Textbook_Freedom

Describe any textbook selection mandates

All_Textbooks_Mandatory	0
Some_from_List_and_Some_Mandatory	0.25
Choose_All_from_Approved_List	0.5
Choose_Some_from_Approved_List	0.75
Complete_Textbook_Freedom	1

See note in section on Conventional Government Schools.

AGS_Testing_Freedom

Describe any testing mandates

Extensive_or_High_Stakes_Govt_Tests	0
Some_Government_Imposed_Tests	0.33
Some_but_Schools_Choose_Tests	0.66
Complete_Testing_Freedom	1

AGS_Budget_Freedom

Describe any constraints on how the budget is allocated

Budget_Is_Totally_Centralized	0
Heavy_Allocation_Constraints	0.33
Some_Allocation_Constraints	0.66
Complete_Budget_Freedom	1

Budget_Is_Totally_Centralized: e.g., several major budget items set by the jurisdiction/authorizer for all schools
Heavy_Allocation_Constraints: e.g., one or two big budget items set by jurisdiction/authorizer
Some_Allocation_Constraints: e.g., 65 percent of spending must be in classroom
Complete_Budget_Freedom: jurisdiction/authorizer imposes no budget allocation mandates

AGS_Religions_Permitted

Number of religions permitted to operate schools and/or provide devotional instruction

One_Religion_or_None	0
Select_Few_Religions	0.4
All_Major_Religions	0.7
All_Religions	1

This question exists mainly to differentiate U.S. charter schools from alternative government schools in other nations that allow (or insist on) religious instruction, and also to differentiate between U.S. charter schools and U.S. private schools.

AGS_For_Profit_Policy

What is the policy on for-profit alternative government schools?

Not_Permitted	0
Permitted_with_Intermediaries	0.75
Permitted	1

The Permitted_with_Intermediaries category covers the common case of states that require charter schools to be run by nonprofit boards but allow those boards to contract out the schools' operation to a for-profit school management organization.

AGS_Parent_Funding_Reality *Applies only to "Market Ratings"*

Actual share of total spending derived directly from parental fees

AGS_For_Profit_Reality *Applies only to "Market Ratings"*

Actual share of alternative government schools operated for profit

AGS_Schools_per_Metro_Area *Applies only to "Market Ratings"*

Average (or expected average) number of schools per metropolitan area

AGS_Actual_Enrollment *Applies only to "Market Ratings"*

Jurisdiction-wide alternative government school enrollment

Input Data for Nonvoucher Private Schools

NVP_Registration

Must nonvoucher private schools register with the government, and, if so, how onerous is the process?

Prohibitive_Registration	0
Onerous_Registration	0.33
Moderate_Registration	0.66
No_Registration	1

The following examples can be used as a guide in completing this field:

- No_Registration: private schools need not register with the state
- Moderate_Registration: less than one day of paperwork, prompt processing of requests by state authorities, virtually all schools accepted
- Onerous_Registration: more than a day of paperwork, two- to three-week processing time by authorities, 75 percent or more of schools approved
- Prohibitive_Registration: more than a day of paperwork, four or more week processing time, fewer than 75 percent of schools approved

NVP_Burden_of_Proof

Burden of proof of consumer demand

More_Than_50_Preenrolled	0
Up_to_50_Preenrolled	0.25
More_Than_50_Expressing_Interest	0.5
Up_to_50_Expressing_Interest	0.75
No_Proof_of_Demand_Required	1

This refers to laws requiring that anyone proposing a new independent school must demonstrate interest in the venture, either by getting local parents to state their interest in writing or actually requiring the school to preenroll a certain number of students.

NVP_Location

Does the government impose restrictions on where new schools may open?

Yes	1
No	0

Do not count local zoning regulations that are not specific to schools.

NVP_Mandatory_Membership

Is membership in a government-accredited private school association mandatory?	Yes	1
	No	0

NVP_Facilities

Facilities requirements for new schools	Very_Expensive_Requirements	0
	Moderately_Expensive_Requirements	0.33
	Inexpensive_Requirements	0.66
	None_beyond_Health_and_Safety	1

NVP_Post_Bond

New schools must post bond or fulfill other financial requirement?	Yes	1
	No	0

NVP_Teacher_Requirements

How heavy are the requirements for entering the teaching labor force?	Multi_Year_Govt_Mandated_Training	0
	Up_to_1_Year_Govt_Mandated_Training	0.33
	Any_College_Degree_Plus_Background_Checks	0.8
	Anyone_Can_Teach	1

See explanation in Conventional Government Schools category.

NVP_Staffing_Freedom

To what extent do regulations and/or bargaining agreements limit the freedom of principals to hire and fire employees?	Principal_Has_Virtually_No_Say	0
	Constrained_by_Collective_Bargaining	0.33
	Hires_Fires_within_Policy_Guidelines	0.66
	Hires_Fires_at_Will	1

See description in Conventional Government Schools section.

NVP_Religions_Permitted

Number of religions permitted to operate schools and/or provide devotional instruction	One_Religion_or_None	0
	Select_Few_Religions	0.4
	All_Major_Religions	0.7
	All_Religions	1

NVP_For_Profit_Allowed

Can nonvoucher private schools be operated for profit?	Yes	1
	No	0

NVP_For_Profit_Discrimination

Does the tax code discriminate against for-profit schools?	Yes	1
	No	0

For example, are nonprofit schools exempted from paying federal income tax (giving them a significant economic advantage over for-profit schools)?

NVP_Price_Controls

Describe any price controls	Very_Aggressive_Cap	0
	Moderately_Aggressive_Cap	0.5
	Complete_Price_Freedom	1

It is difficult to assign a numeric value to price controls on nonvoucher private schools because there is no benchmark against which to measure them. That is, if private school prices are not allowed to fluctuate in accordance with market forces, then we cannot know precisely how restrictive a particular price cap is, because there is no market price against which to compare it. Hence, this field allows for only three very crude degrees of price control.

NVP_Curriculum_Freedom

Describe any government curriculum mandates	Zero_Curriculum_Freedom	0
	Extensive_AND_Detailed_Framework	0.25
	Extensive_OR_Detailed_Framework	0.5
	Limited_General_Framework	0.75
	Complete_Curriculum_Freedom	1

NVP_Textbook_Freedom

Describe any textbook selection mandates	All_Textbooks_Mandatory	0
	Some_from_List_and_Some_Mandatory	0.25
	Choose_All_from_Approved_List	0.5
	Choose_Some_from_Approved_List	0.75
	Complete_Textbook_Freedom	1

See note in section on Conventional Government Schools.

NVP_Testing_Freedom

Describe any testing mandates

Extensive_or_High_Stakes_Govt_Tests	0
Some_Government_Imposed_Tests	0.33
Some_but_Schools_Choose_Tests	0.66
Complete_Testing_Freedom	1

NVP_Budget_Freedom

Describe any constraints on how the budget is allocated

Budget_Is_Totally_Centralized	0
Heavy_Allocation_Constraints	0.33
Some_Allocation_Constraints	0.66
Complete_Budget_Freedom	1

Budget_Is_Totally_Centralized: e.g., several major budget items set by the jurisdiction for all schools
Heavy_Allocation_Constraints: e.g., one or two big budget items (e.g., teachers' salaries) set by jurisdiction
Some_Allocation_Constraints: e.g., 65 percent of spending must be in classroom
Complete_Budget_Freedom: jurisdiction imposes no budget allocation mandates

NVP_Freedom_over_Admissions

Schools' freedom over admissions policy

Extensive_Constraints	0
Some_Limited_Constraints	0.5
Complete_Admissions_Freedom	1

See explanation in section on Conventional Government Schools.

NVP_Tuition

Average tuition

Note that this field is required even for pure policy evaluations, because it is impossible to assess the import of various government expenditures except in the context of private-sector tuition prices.

A rough approximation will do if precise figures are unavailable.

NVP_Avg_Personal_Credit

Average size of any personal use education tax credits

Leave blank if there are no tax credits for parents to use against their own children's educational expenses.

NVP_Personal_Credit_Eligibility

Percent of parents eligible for, and capable of benefiting from, personal use tax credits

Leave blank if there are no tax credits for parents to use against their own children's educational expenses.

NVP_Scholarship_Credit_Size

Average size of any scholarships funded by donation tax credit programs

Leave blank if there are no tax credits for donations to private scholarship funds (or for donations directly to the education of someone else's child).

NVP_Scholarship_Credit_Eligibility

Percent of parents eligible for, and capable of benefiting from, tax-credit-funded scholarships

Leave blank if there are no tax credits for parents to use against their own children's educational expenses.

NVP_Has_Sunset

Education tax credit program has a sunset clause (i.e., will expire at on a certain date)?	Yes	1
	No	0

NVP_Actual_Enrollment *Applies only to "Market Ratings"*

Actual total enrollment in nonvoucher private schools

NVP_For_Profit_Reality *Applies only to "Market Ratings"*

Actual share of alternative government schools operated for profit

Input Data for Voucher-Accepting Private Schools

VP_Avg_Voucher

Average dollar value per pupil of any voucher or subsidy

Leave blank if there is no voucher/subsidy program.

VP_Voucher_Eligibility

Percent of parents eligible for, and capable of benefiting from, personal use tax credits

Leave blank if there is no voucher/subsidy program.

VP_Copay_Penalty

By how many dollars is the school's funding reduced for every dollar of copayment charged to parents?

Enter 0 if there is no penalty for copayments. This is a measure of the severity of any controls on the highest price that voucher schools may charge.

VP_Has_Sunset

Education tax credit program has a sunset clause (i.e., will expire at on a certain date)?	Yes	1
	No	0

VP_Registration

Must voucher schools register with the government, and, if so, how onerous is the process?	Prohibitive_Registration	0
	Onerous_Registration	0.33
	Moderate_Registration	0.66
	No_Registration	1

See description in Nonvoucher Private School section.

VP_Burden_of_Proof

Burden of proof of consumer demand	More_Than_50_Preenrolled	0
	Up_to_50_Preenrolled	0.25
	More_Than_50_Expressing_Interest	0.5
	Up_to_50_Expressing_Interest	0.75
	No_Proof_of_Demand_Required	1

See description in Nonvoucher Private School section.

VP_Location

Does the government impose restrictions on where new schools may open?	Yes	1
	No	0

Do not count local zoning regulations that are not specific to schools.

VP_Mandatory_Membership

Is membership in a government-accredited private school association mandatory?	Yes	1
	No	0

VP_Facilities

Facilities requirements for new schools	Very_Expensive_Requirements	0
	Moderately_Expensive_Requirements	0.33
	Inexpensive_Requirements	0.66
	None_beyond_Health_and_Safety	1

VP_Post_Bond

New schools must post bond or fulfill other financial requirement?	Yes	1
	No	0

VP_Teacher_Requirements

How heavy are the requirements for entering the teaching labor force?

Multi_Year_Govt_Mandated_Training	0
Up_to_1_Year_Govt_Mandated_Training	0.33
Any_College_Degree_Plus_Background_Checks	0.8
Anyone_Can_Teach	1

See explanation in Conventional Government Schools category.

VP_Staffing_Freedom

To what extent do regulations and/or bargaining agreements limit the freedom of principals to hire and fire employees?

Principal_Has_Virtually_No_Say	0
Constrained_by_Collective_Bargaining	0.33
Hires_Fires_within_Policy_Guidelines	0.66
Hires_Fires_at_Will	1

See description in Conventional Government Schools section.

VP_Religions_Permitted

Number of religions permitted to operate schools and/or provide devotional instruction

One_Religion_or_None	0
Select_Few_Religions	0.4
All_Major_Religions	0.7
All_Religions	1

VP_For_Profit_Permitted

Can nonvoucher private schools be operated for profit?

Yes	1
No	0

VP_For_Profit_Descrimination

Does the tax code discriminate against for-profit schools?

Yes	1
No	0

For example, are nonprofit schools exempted from paying federal income tax (giving them a significant economic advantage over for-profit schools)?

VP_Curriculum_Freedom

Describe any government curriculum mandates

Zero_Curriculum_Freedom	0
Extensive_AND_Detailed_Framework	0.25
Extensive_OR_Detailed_Framework	0.5
Limited_General_Framework	0.75
Complete_Curriculum_Freedom	1

VP_Textbook_Freedom

Describe any textbook selection mandates

All_Textbooks_Mandatory	0
Some_from_List_and_Some_Mandatory	0.25
Choose_All_from_Approved_List	0.5
Choose_Some_from_Approved_List	0.75
Complete_Textbook_Freedom	1

See note in section on Conventional Government Schools.

VP_Testing_Freedom

Describe any testing mandates

Extensive_or_High_Stakes_Govt_Tests	0
Some_Government_Imposed_Tests	0.33
Some_but_Schools_Choose_Tests	0.66
Complete_Testing_Freedom	1

VP_Budget_Freedom

Describe any constraints on how the budget is allocated

Budget_Is_Totally_Centralized	0
Heavy_Allocation_Constraints	0.33
Some_Allocation_Constraints	0.66
Complete_Budget_Freedom	1

Budget_Is_Totally_Centralized: e.g., several major budget items set by the jurisdiction for all schools
Heavy_Allocation_Constraints: e.g., one or two big budget items (e.g., teachers' salaries) set by jurisdiction
Some_Allocation_Constraints: e.g., 65 percent of spending must be in classroom
Complete_Budget_Freedom: jurisdiction imposes no budget allocation mandates

VP_Freedom_over_Admissions

Schools' freedom over admissions policy

Extensive_Constraints	0
Some_Limited_Constraints	0.5
Complete_Admissions_Freedom	1

See explanation in section on Conventional Government Schools.

VP_Tuition

Average tuition
Please estimate or leave blank if data are unavailable.

VP_Actual_Enrollment *Applies only to "Market Ratings"*

Actual total enrollment in private voucher schools

VP_For_Profit_Reality *Applies only to "Market Ratings"*

Actual share of private voucher schools operated for profit

Appendix B:
Component Score Computation Details, by School Type

By combining the overview presented earlier in this paper with the input data list from Appendix A, it is now possible to explain how each of the component scores for the four school types is calculated. To do so, it is best to begin with two general points about the weighting of our input items: the decision to use different weights for the different terms and the way in which weights are applied in the index.

Some indices of economic and educational freedom give equal weight to all the inputs that they measure. The two main arguments for taking that approach are that it is simpler (and simplicity is a virtue) and that it is less arbitrary than assigning individual weights. We have decided that, for the purposes of the CEMI, the simplicity advantage of an unweighted index does not justify the associated loss of accuracy. We also conclude that a weighted index, if done thoughtfully, can be *less* arbitrary than an unweighted one. (This discussion, it should be noted, is unrelated to the weighting of the four school type scores used to arrive at the overall index rating. That subject is taken up in Appendix C.)

On the question of simplicity, consider the case of two input variables: government testing mandates and government curriculum mandates. Both types of regulations restrict the ability of schools to specialize, but testing mandates are intrinsically less restrictive than curriculum mandates. At worst, testing mandates shape the curriculum, inhibiting diversity to some degree. Curriculum mandates, by contrast, can spell out every detail of what every child is taught—a considerably heavier burden. So, to weight these two inputs equally is to misrepresent their relative impacts on the education marketplace.

More generally, there is no such thing as an "unweighted" sum. In reality, an "unweighted" sum is just a sum in which all the terms are assigned equal weight. Unless there is reason to believe that all the terms are in fact equally important, it is arbitrary and incorrect to weight them equally. Hence, we have opted to assign weights to each of the input terms used in the index on the basis of logical distinctions such as the one between testing and curriculum mandates. Throughout most of this section we will refer to these weights as named constants. Their actual values can be found in the Excel spreadsheet used to compute the ratings, available on Cato's website (http://cato.org/cemi/cemi_2006.xls). There will, of course, not be perfect unanimity among scholars as to the precise weights that should be adopted, but some consensus is, we hope, achievable, at least on the rank ordering of the weights for different inputs.

We apply our weights in two different ways. The first is via a traditional weighted sum, and it is used in the calculation of the *Operational and Entry Freedom* term. Each aspect of schools' freedom is quantified by an input variable, multiplied by its corresponding weight, and then summed to get a value between 0 and 1 (where 0 represents no freedom and 1 represents complete freedom).

But, as readers will recall, the main terms in our index calculation (see Equation 2) are multiplied together, not added. And, because we are not summing them, a weighted sum is not applicable. It is, however, possible to apply weights to the terms in a product, particularly when each term has the range 0 to 1. Here is how the process works: In the simple product, $z = x \times y$, x and y have the same weight, and if either one is equal to 0, the sum is 0. But what if one term is less important than the other and shouldn't be allowed to reduce the product all the way to 0 when it has the value 0? In that case, we want to reduce the range of that variable. Instead of allowing it to vary from 0 to 1, we allow it to vary only between (1 – weight) and 1. We can do this as follows:

$$z = [(1 - \text{weight}) + x \times \text{weight}] \times y$$

Two simple corollaries of this formula are that it reduces to z = y when *weight* is set to 0, and it reduces to z = x × y when *weight* is set to 1. In other words, the default and maximum weight for a term in a weighted product is 1, and the minimum weight is 0, which is equivalent to simply omitting the term from the equation. More generally, the minimum value of z, when x has the weight "*weight*," will always equal (1 – *weight*) × y.

In the discussion of the index calculations that follows, you will see many terms that are weighted in this way. Any terms in a product that do not have an explicit weight associated with them have the full weight of 1.

Consider an example. Recall that our *Consumer Freedom and Incentives* term is calculated as

$$\text{Consumer Freedom and Incentives} = \text{Incentive for Parental Responsibility} \times \text{Parental Freedom of Choice}$$

As discussed earlier, a school system in which there is 0 parental choice is a completely nonmarket system, and so *Parental Freedom of Choice* must be allowed to fall in the full range from 0 to 1, so that it can zero out the entire product when it takes on the value 0. On the other hand, a system in which there is some parental choice, but no financial incentive for parental responsibility (i.e., no direct payment of tuition by parents), can still be somewhat marketlike. Hence, *Parental Freedom of Choice* deserves a weight of less than 1, so that it cannot, by itself, reduce the product of the two terms to 0. As a result, we calculate *Consumer Freedom and Incentives* as follows:

$$\text{Consumer Freedom and Incentives} = [1 - \_\text{Parent\_Funding\_Weight} + (\_\text{Parent\_Funding\_Weight} \times \text{Incentive for Parental Responsibility})] \times \text{Parental Freedom of Choice}$$

where *_Parent_Funding_Weight* has a value less than 1 but greater than 0.

With that, we can begin our exploration of the index component score calculations, starting with one of the simplest among them, Alternative Government Schools (a.k.a., charter schools).[16] We present these calculations in a top-down format, starting with the final, most general calculation and then working backward through the more detailed calculations on which it is based until the raw input data terms are reached.

> A note on notation: In the equations that follow, raw inputs to the index are underlined while constants are denoted with a leading underscore ("_") character. This is to help readers distinguish between intermediate calculations and the raw data and constants from which they are computed.

Alternative Government Schools

The final calculation for the component score of Alternative Government Schools is

$$\text{AGS\_Score} = \text{AGS\_Consumer\_Freedom\_and\_Incentives} \times \text{AGS\_Producer\_Freedom\_and\_Incentives}$$

where

AGS_Consumer_Freedom_and_Incentives = AGS_Degree_of_Choice x
[(1 – _Parent_Funding_Weight) +
AGS_Raw_Parent_Funding_Effect x
_Parent_Funding_Weight]

and

AGS_Producer_Freedom_and_Incentives = AGS_Potential_for_Competition x
AGS_Incentive_for_Efficiency

The second of these equations shows an example (*AGS_Raw_Parent_Funding_Effect*) of a term that has a weight of less than 1 using the multiplicative weighting system explained above.

Now let's look at how we arrive at the terms referred to in these equations. *AGS_Degree_of_Choice* is one of our raw input measures and as such is described in Appendix A, and

AGS_Raw_Parent_Funding_Effect = 2 x AGS_Parent_Funding_Share – AGS_Parent_Funding_Share ^ 2

AGS_Parent_Funding_Share is another raw input value, and we take a quadratic function of it because such a relationship has been observed to exist experimentally.[17] These equations conclude the computation of the *AGS_Consumer_Freedom_and_Incentives* term in our AGS component score.

Turning now to the producer side of things,

AGS_Potential_for_Competition = AGS_School_Autonomy x AGS_Innovation_and_Expansion

where

AGS_Innovation_and_Expansion = AGS_Weighted_Profit_Motive_Effect x
AGS_Weighted_Absence_of_Price_Ceiling_Effect

where

AGS_Weighted_Profit_Motive_Effect = (1 – _Profit_Motive_Weight) +
AGS_Raw_Profit_Motive_Effect x _Profit_Motive_Weight

and, in the case of a policy only rating,

AGS_Raw_Profit_Motive_Effect = 2 x AGS_For_Profit_Policy – AGS_For_Profit_Policy ^ 2

In the case of a market rating,

AGS_Raw_Profit_Motive_Effect = 2 x (AGS_For_Profit_Policy x AGS_For_Profit_Reality)
– (AGS_For_Profit_Policy x AGS_For_Profit_Reality) ^ 2

and

AGS_Weighted_Absence_of_Price_Ceiling_Effect = (1 – _Price_Ceiling_Weight) +
(1 – AGS_Copay_Penalty) x _Price_Ceiling_Weight

where *AGS_For_Profit_Policy, AGS_For_Profit_Reality*, and *AGS_Copay_Penalty* are all raw input terms.

Finally, school autonomy is captured by the following equations:

```
AGS_School_Autonomy = AGS_Freedom_of_Entry x _Entry_Weight
                    + AGS_Freedom_over_Admissions x _Admissions_Weight
                    + AGS_Curriculum_Freedom x _Curriculum_Weight
                    + AGS_Textbook_Freedom x _Textbooks_Weight
                    + AGS_Testing_Freedom x _Testing_Weight
                    + AGS_Budget_Freedom x _Budget_Weight
                    + AGS_Staffing_Freedom x _Staffing_Weight
                    + AGS_Teacher_Requirements x _Teacher_Certification_Weight
                    + AGS_Religions_Permitted x _Religions_Permitted_Weight
                    + _Unmeasured_Freedoms_Weight
```

where all the "*AGS_*" variables are raw inputs except the freedom of entry term, and that is defined as

```
AGS_Freedom_of_Entry = AGS_Non_District_Authorizers_Allowed x
                         _AGS_Non_District_Authorizers_Weight
                     + AGS_Authorizer_Count_Effect x _AGS_Num_Authorizers_Weight
                     + AGS_Binding_Appeals x _AGS_Binding_Appeals_Weight
                     + (1 - AGS_Govt_Founders_Only) x _AGS_Govt_Founders_Only_Weight
                     + AGS_Creation_Paths x _AGS_Creation_Paths_Weight
                     + AGS_Burden_of_Proof x _AGS_Burden_of_Proof_Weight
```

where

```
AGS_Authorizer_Count_Effect = 1 – {(_Authorizers_Mid_Point – 1) x
                                [AGS_Num_Authorizers + (_Authorizers_Mid_Point – 2)]}
                                / [AGS_Num_Authorizers + (_Authorizers_Mid_Point – 2)]^2
```

Though this equation initially appears somewhat complex, its purpose is trivial: it is simply a normalization function that forces the raw input data on the number of schools per metropolitan area into a range between 0 and 1, as required to keep the overall index ratings in the range 0 to 100. This normalization function is asymptotic, approaching the value 1 as the number of schools per metro area approaches infinity, and it takes on the value of 0.5 when the number of schools per metro area is equal to the constant *_Authorizers_Mid_Point*. So, the more charter school authorizers there are, the higher the equation's value, but changes at the low end of the range (i.e., below the specified midpoint) have more of an impact than changes at the high end of the range. *AGS_Num_Authorizers* is, of course, a raw input value to the index.

That concludes the calculation of the component score of Alternative Government Schools.

Conventional Government Schools

Conventional Government Schools are the most complex of the four components of the index because of the more varied regulatory frameworks under which they operate. Instead of having a single calculation for this component score, we have three separate calculations,

depending on the kind of parental choice that exists within this sector. If the only form of parental choice allowed under Conventional Government Schooling is to move to a different school district (the typical case in the United States), the calculation is

```
CGS_Score = CGS_Residential_Market = CGS_Consumer_Freedom_and_Incentives_Residential x
                                     CGS_Producer_Freedom_and_Incentives_between_Districts
```

If there is a public school choice program that allows parents to choose a school within their own school district, the calculation is

```
CGS_Score = CGS_Intra_District_Market = _CGS_Residential_Market + (1 – CGS_Residential_Market) x
                                        (CGS_Consumer_Freedom_and_Incentives_Choice_Plan x
                                        CGS_Producer_Freedom_and_Incentives_within_Districts)
```

and if there is jurisdiction-wide (i.e., statewide) public school choice, the calculation is

```
CGS_Score = CGS_Jurisdiction_Wide_Market = CGS_Intra_District_Market +
                                           (1 – CGS_Intra_District_Market) x
                                           CGS_Consumer_Freedom_and_Incentives_Choice_Plan x
                                           CGS_Producer_Freedom_and_Incentives_between_Districts
```

The rationale behind each of these calculations is straightforward. In the first case, *CGS_Residential_Market*, we simply compute the freedom and incentives that exist under a system in which families must move residence in order to obtain schooling from a different supplier (i.e., district). When an interdistrict choice plan exists, there are two ways in which choice can be exercised: by moving to a different district (as in the previous calculation) or by choosing a different school within the family's current public school district. To reflect the additive character of these choices, the *CGS_Intra_District_Market* score takes the *CGS_Residential_Market* score as a floor value and then adds to it on the basis of the freedoms and incentives prevailing in the intradistrict choice program. Finally, a jurisdiction-wide choice program takes intradistrict choice as its floor value and adds to that the ability of families to choose schools outside their districts without having to change residence.

We explain each of these calculations in the following three sections.

CGS_Residential_Market

The terms making up this function are *CGS_Consumer_Freedom_and_Incentives_Residential* and *CGS_Producer_Freedom_and_Incentives_between_Districts*. We explore each in turn.

```
Consumer_Freedom_and_Incentives_Residential = CGS_Parental_Responsibility x
                                              _Residential_Choice_Attenuator
```

where

```
CGS_Parental_Responsibility = (1 – _Parent_Funding_Weight)
                              + CGS_Direct_Parent_Funding x _Parent_Funding_Weight
```

The value of *CGS_Direct_Parent_Funding* depends on whether we are rating an existing school choice program or a policy proposal. In the first case,

```
CGS_Direct_Parent_Funding = 2 x CGS_Parent_Funding_Reality – CGS_Parent_Funding_Reality ^ 2
```

and in the second case,

CGS_Direct_Parent_Funding = 2 x CGS_Parent_Funding_Policy – CGS_Parent_Funding_Policy ^ 2

The *_Residential_Choice_Attenuator* term is a constant between 0 and 1. Its purpose is to capture the fact that being forced to move residences just to change from one service provider to another significantly abates consumers' freedom of choice.

Continuing to the next term in the computation of *CGS_Residential_Market*, we have

CGS_Producer_Freedom_and_Incentives_between_Districts = CGS_Potential_for_Competition_Exclusively_between_Districts x CGS_Incentive_for_Efficiency x CGS_Innovation_and_Expansion

where

CGS_Potential_for_Competition_Exclusively_between_Districts = CGS_Jurisdiction_Allowed_Autonomy x CGS_District_Density x _District_Competition_Attenuator

and

CGS_Jurisdiction_Allowed_Autonomy = CGS_Freedom_of_Entry x _Entry_Weight
+ CGS_Freedom_over_Admissions x _Admissions_Weight
+ CGS_Curriculum_Freedom_Jurisdiction x _Curriculum_Weight
+ CGS_Textbook_Freedom_Jurisdiction x _Textbooks_Weight
+ CGS_Testing_Freedom_Jurisdiction x _Testing_Weight
+ CGS_Budget_Freedom_Jurisdiction x _Budget_Weight
+ CGS_Staffing_Freedom_Jurisdiction x _Staffing_Weight
+ CGS_Teacher_Requirements_Jurisdiction x _Teacher_Certification_Weight
+ CGS_Religions_Permitted x _Religions_Permitted_Weight
+ _Unmeasured_Freedoms_Weight

where all of the "*CGS_*" terms are raw input variables except for *CGS_Freedom_of_Entry*, which is always assigned the constant value *_No_Market_Entry*. For conventional government schools, the market plays no direct role in determining where and when new schools are created. Nevertheless, consumer demand can have some indirect effect on the creation of such schools, via the political process. That attenuated effect is captured by *_No_Market_Entry*, which is a small but non-0 value.

We then multiply the *CGS_Jurisdiction_Allowed_Autonomy* term by a function of the district density:

CGS_District_Density = 1 – (1 / CGS_Districts_per_Metro_Area)

This is actually a simplification of a slightly more elaborate "Choice Index" suggested by Caroline Minter Hoxby.[18] Hoxby defines the competitive density of the traditional public sector as the probability that any two randomly selected students in a given metropolitan area are enrolled in different school districts. This can be computed as

$$\text{Hoxby's Choice Index} = 1 - \sum_{n=1}^{N} (\text{Market Share of District}_n)^2$$

To avoid having to collect data on the size of every district, we adopt a simplified version of Hoxby's equation that assumes all districts in a given metropolitan area are the same size. Under that assumption, her equation reduces to the formula presented above for *CGS_District_Density*. Of course, even when there are numerous districts in a given metropolitan area, the fact that competition exists only between districts (and not within them) has a significant damping effect on the intensity of the competition (as compared to a scenario in which each school is allowed to freely compete on an individual basis with the other schools in its district). To capture that damping effect, we multiply *CGS_District_Density* by a constant in the range 0 to 1, *_District_Competition_Attenuator*.

Returning to the two other terms in the *CGS_Producer_Freedom_and_Incentives_between_Districts* function, we have

CGS_Incentive_for_Efficiency = 1 – _Price_Floor_Weight

and

CGS_Innovation_and_Expansion = CGS_Weighted_Profit_Motive_Effect x
CGS_Weighted_Absence_of_Price_Ceiling_Effect

Note that the efficiency incentive term always takes on the lowest possible value allowed by the *_Price_Floor_Weight* constant. That is because conventional government schools have no incentive to economize (unlike fee-charging schools, which gain a competitive advantage if they are able to offer their services at less cost).

For the terms in the innovation and expansion calculation, we have

CGS_Weighted_Profit_Motive_Effect = (1 – _Profit_Motive_Weight) +
CGS_Raw_Profit_Motive_Effect x _Profit_Motive_Weight

and

CGS_Weighted_Absence_of_Price_Ceiling_Effect = 1 – _Price_Ceiling_Weight

where *CGS_Weighted_Absence_of_Price_Ceiling_Effect* always takes on the lowest value allowed by the *_Price_Ceiling_Weight* constant because, at any given point in time, there is an iron-clad ceiling on spending by conventional government schools (government schools cannot, at their discretion, start spending more than the amount provided by their districts).

Note that the raw profit motive effect term is computed in exactly the same way as it is for Alternative Government Schools. So, in the case of a "policy only" rating,

CGS_Raw_Profit_Motive_Effect = 2 x CGS_For_Profit_Policy – CGS_For_Profit_Policy ^ 2

and in the case of a market rating,

CGS_Raw_Profit_Motive_Effect = 2 x (CGS_For_Profit_Policy x CGS_For_Profit_Reality) –
(CGS_For_Profit_Policy x CGS_For_Profit_Reality) ^ 2

where *CGS_For_Profit_Policy* and *CGS_For_Profit_Reality* are raw input data.

That brings us to the end of the computation of the CGS component score for the case of policies and education systems in which the only way to choose a conventional government school is to move to a different neighborhood.

CGS_Intra_District_Market

We can now look at the second of the three public school choice scenarios: the within-district choice option measured by *CGS_Intra_District_Market*. As shown above,

```
CGS_Intra_District_Market = CGS_Residential_Market + (1 – CGS_Residential_Market) x
                            (CGS_Consumer_Freedom_and_Incentives_Choice_Plan x
                            CGS_Producer_Freedom_and_Incentives_within_Districts)
```

Even when there is a within-district choice plan, families still have the option of moving to another district, so we start with the *CGS_Residential_Market* score computed above and then add to it. Note that, in order to ensure that our rating remains in the 0 to 1 range after adding in the *CGS_Residential_Market* score, we multiply the rest of the calculation by (1 – *CGS_Residential_Market*).

Moving on to the next term,

```
CGS_Consumer_Freedom_and_Incentives_Choice_Plan =  CGS_Degree_of_Choice x
                                                   CGS_Parental_Responsibility
```

where *CGS_Degree_of_Choice* is a raw input term and where

```
CGS_Parental_Responsibility = (1 – _Parent_Funding_Weight) + CGS_Direct_Parent_Funding x
                               _Parent_Funding_Weight
```

and where *CGS_Direct_Parent_Funding* is a raw input term.

The final term in the computation of *CGS_Intra_District_Market* is

```
CGS_Producer_Freedom_and_Incentives_within_Districts = CGS_Potential_for_Competition_
                                                       Exclusively_within_Districts x
                                                       CGS_Incentive_for_Efficiency x
                                                       CGS_Innovation_and_Expansion
```

where the latter two terms have already been explained in the preceding section, and the first term is computed as follows:

```
CGS_Potential_for_Competition_Exclusively_within_Districts = CGS_School_Autonomy
```

where

```
CGS_School_Autonomy = CGS_Freedom_of_Entry x _Entry_Weight
                    + CGS_Freedom_over_Admissions x _Admissions_Weight
                    + CGS_Curriculum_Freedom_Jurisdiction
                       x CGS_Curriculum_Freedom_District x _Curriculum_Weight
                    + CGS_Textbook_Freedom_Jurisdiction x _Textbooks_Weight
                    + CGS_Testing_Freedom_Jurisdiction x _Testing_Weight
                    + CGS_Budget_Freedom_Jurisdiction x CGS_Budget_Freedom_District
```

x _Budget_Weight
+ CGS_Staffing_Freedom_Jurisdiction x _Staffing_Weight
+ CGS_Teacher_Requirements_Jurisdiction x _Teacher_Certification_Weight
+ CGS_Religions_Permitted x _Religions_Permitted_Weight
+ _Unmeasured_Freedoms_Weight

Note that the above computation is very similar to the computation of *CGS_Jurisdiction_Allowed_Autonomy*, with the key difference that for two of the terms (curriculum and budget freedom) we multiply the jurisdiction-wide freedom by the district-level freedom. In so doing, we arrive at the degree of autonomy that schools are left with when both district-level and jurisdiction-wide mandates are taken into account.

CGS_Jurisdiction_Wide_Market

Now we turn to the last of the three possible ways of calculating the component score for conventional government schools: the situation in which there is a jurisdiction-wide (a.k.a., statewide) government school choice program.

CGS_Jurisdiction_Wide_Market = CGS_Intra_District_Market + (1 – CGS_Intra_District_Market) x
CGS_Consumer_Freedom_and_Incentives_Choice_Plan x
CGS_Producer_Freedom_and_Incentives_between_Districts

Since a jurisdiction-wide choice program is a superset of a within-district program, we start with the *CGS_Intra_District_Market* score and then add to it. The other two terms in the jurisdiction-wide market calculation have already been explained above, and so this concludes the calculation of the component score for conventional government schools.

Voucher-Accepting Private Schools

If there is no voucher or voucherlike private school subsidy program, this component of the index is automatically zeroed out. If vouchers exist, the component score is computed as

VP_Score = VP_Consumer_Freedom_and_Incentives x VP_Producer_Freedom_and_Incentives

where

VP_Consumer_Freedom_and_Incentives = (1 – _Parent_Funding_Weight) +
VP_Raw_Parent_Funding_Effect x _Parent_Funding_Weight

and

VP_Raw_Parent_Funding_Effect = 2 x VP_Estimated_Parent_Funding_Share –
VP_Estimated_Parent_Funding_Share ^ 2

and where the computation of *VP_Estimated_Parent_Funding_Share* depends on whether or not we know the actual share of voucher schools operated for profit. If we have data on the actual share of voucher schools operated for profit (as may be the case when doing market as opposed to pure policy ratings), then

VP_Estimated_Parent_Funding_Share = [VP_Actual_Percent_For_Profit +
(1 – VP_Actual_Percent_For_Profit) x 0.8] x
[1 – (VP_Avg_Voucher / VP_Tuition) x VP_Voucher_Eligibility]

But if the actual for-profit share of voucher schools is unknown,

$$\begin{aligned}\text{VP\_Estimated\_Parent\_Funding\_Share} = {} & [\text{VP\_Estimated\_Percent\_For\_Profit} + \\ & (1 - \text{VP\_Estimated\_Percent\_For\_Profit}) \times 0.8] \times \\ & [1 - (\underline{\text{VP\_Avg\_Voucher}} / \underline{\text{VP\_Tuition}}) \times \underline{\text{VP\_Voucher\_Eligibility}}]\end{aligned}$$

In the latter case, we estimate the share of schools operated for profit on the basis of the raw data input values *VP_For_Profit_Permitted* and *VP_For_Profit_Discrimination*. If profit making by voucher schools is prohibited,

$$\text{VP\_Estimated\_Percent\_For\_Profit} = 0$$

If it is permitted, but discriminated against (such as by the existing federal tax exemption offered to nonprofit schools),

$$\text{VP\_Estimated\_Percent\_For\_Profit} = 0.05$$

which is roughly the share of profit-making K-12 schools in the United States today.

If it is permitted and not discriminated against,

$$\text{VP\_Estimated\_Percent\_For\_Profit} = 0.9$$

The rationale behind the first line in the calculation of *VP_Estimated_Parent_Funding_Share* is that for-profit schools are usually fully funded by tuition whereas nonprofit schools are roughly 80 percent funded by tuition. We then take that first line as an upper bound on the parent share of school spending and multiply it by a function of the size and ubiquity of vouchers, since every dollar of voucher funding is a dollar that does not come directly out of parents' pockets.

Next, let us turn to the second term in the *VP_Score* calculation,

$$\begin{aligned}\text{VP\_Producer\_Freedom\_and\_Incentives} = {} & \text{VP\_Potential\_for\_Competition} \times \\ & \text{VP\_Incentive\_for\_Producer\_Efficiency}\end{aligned}$$

where

$$\begin{aligned}\text{VP\_Potential\_for\_Competition} = {} & \text{VP\_School\_Density} \times \text{VP\_School\_Autonomy} \times \\ & \text{VP\_Conditions\_for\_Innovation\_and\_Expansion}\end{aligned}$$

Calculating school density for the private sector is more difficult than for the public sector because data on the number of schools per jurisdiction or metropolitan area are not currently available. This leaves us with two choices: either we can try to find a proxy for private-sector competitive density, or we can just say that it is equal to 1 (the maximum) as a shortcut.

If we chose the former path, it might make sense to use entry barriers as a guide to the likely density of providers in the marketplace, but entry barriers are already weighted by the index for their own sake. Hence, we could either increase their weight, or just fall back on assigning a density of 1 to the private sector.

We have opted, in this initial version of the index, to simply assign a value of 1 to private-sector school density. This seems a reasonable simplification because free education markets tend not to be dominated by monopolists or cartels (see the Asian tutoring markets, for example) and

so competitive density is generally close to 1 when total enrollment share of the private sector is substantial. Conversely, when private-sector enrollment share is small, the upward bias to private-sector component scores caused by assuming a density of 1 has a negligible effect, because the private sector as a whole receives a very low weight in the computation of our overall index score.

Fortunately, we are planning to collect better data on existing private school counts and enrollments so that we may subsequently be able to avoid this simplification altogether.

Continuing with our explanation,

VP_School_Autonomy = VP_Freedom_of_Entry x _Entry_Weight
+ VP_Admissions x _Admissions_Weight
+ VP_Curriculum x _Curriculum_Weight
+ VP_Testing x _Testing_Weight
+ VP_Textbooks x _Textbooks_Weight
+ VP_Budget x _Budget_Weight
+ VP_Staffing x _Staffing_Weight
+ VP_Religions_Permitted x _Religions_Permitted_Weight
+ VP_Teacher_Certification x _Teacher_Certification_Weight
+ _Unmeasured_Freedoms_Weight

where

VP_Freedom_of_Entry = VP_Registration x _P_Registration_Weight
+ (1 – VP_Location) x _P_Location_Weight
+ (1 – VP_Mandatory_Membership) x _P_Mandatory_Membership_Weight
+ VP_Facilities x _P_Facilities_Weight
+ (1 – VP_Post_Bond) x _P_Post_Bond_Weight
+ VP_Burden_of_Proof x _P_Burden_of_Proof_Weight

and

VP_Conditions_for_Innovation_and_Expansion = VP_Weighted_Profit_Motive_Effect x
VP_Weighted_Absence_of_Price_Ceiling_Effect

where

VP_Weighted_Profit_Motive_Effect = (1 – _Profit_Motive_Weight) + VP_Raw_Profit_Motive_Effect x
_Profit_Motive_Weight

and where the computation of *VP_Raw_Profit_Motive_Effect* varies according to whether the rating being calculated is a pure policy rating or a market rating. For market ratings,

VP_Raw_Profit_Motive_Effect = 2 x VP_Actual_Percent_For_Profit – VP_Actual_Percent_For_Profit ^ 2

For policy ratings,

VP_Raw_Profit_Motive_Effect = 2 x VP_Estimated_Percent_For_Profit – VP_Estimated_Percent_For_Profit ^ 2

The other term in the calculation of *VP_Conditions_for_Innovation_and_Expansion* is

VP_Weighted_Absence_of_Price_Ceiling_Effect = (1 – _Price_Ceiling_Weight) + (1 – VP_Copay_Penalty) x _Price_Ceiling_Weight

where *VP_Copay_Penalty* is a raw input data term.

Finally, returning to the second term in the *VP_Producer_Freedom_and_Incentives* calculation,

VP_Incentive_for_Producer_Efficiency = (1 – _Price_Floor_Weight) + [1 – MIN(1,VP_Net_Avg_Voucher / NVP_Avg_Tuition x 3)] x _Price_Floor_Weight

where

VP_Net_Avg_Voucher = VP_Avg_Voucher x VP_Voucher_Eligibility

The producer efficiency term measures schools' incentive to find ways of delivering their services at a lower cost (or, put another way, it measures the absence of any price-floor effect that would be created by a large voucher value). The larger the voucher, the less incentive schools have to economize. Voucher size can reasonably be expected to vary between 0 and 3 times the amount of average private school tuition. We capture that variation by dividing the net average voucher by average nonvoucher private school tuition times 3, and if that quotient is greater than 1, we reset it to be equal to 1 so that we maintain our 0 to 1 range for all values in the index calculation. We then subtract that quotient from 1 (to capture the inverse relationship between voucher amount and incentive for efficiency) and weight it according to the value of the *_Price_Floor_Weight* constant.

Nonvoucher Private Schools

This component of the metric deals with private schools that do not accept government vouchers or other subsidies but may benefit indirectly from education tax credit programs. It is computed as

NVP_Score = NVP_Consumer_Freedom_and_Incentives x NVP_Producer_Freedom_and_Incentives

where

NVP_Consumer_Freedom_and_Incentives = (1 – _Parent_Funding_Weight) + NVP_Raw_Parent_Funding_Effect x _Parent_Funding_Weight

and

NVP_Raw_Parent_Funding_Effect = 2 x NVP_Estimated_Parent_Funding_Share – NVP_Estimated_Parent_Funding_Share ^ 2

and where the computation of *NVP_Estimated_Parent_Funding_Share* depends on whether or not we know the actual share of nonvoucher schools operated for profit. If we have that figure (as may be the case when doing market as opposed to pure policy ratings), then

NVP_Estimated_Parent_Funding_Share = [NVP_Actual_For_Profit_Share + (1 – NVP_Actual_For_Profit_Share) x 0.8] x (1 – NVP_Net_Avg_Scholarship / NVP_Avg_Tuition)

But if the actual for-profit share of nonvoucher schools is unknown,

NVP_Estimated_Parent_Funding_Share = [NVP_Estimated_For_Profit_Share + (1 – NVP_Estimated_For_Profit_Share) x 0.8] x (1 – NVP_Net_Avg_Scholarship / NVP_Avg_Tuition)

where

NVP_Net_Avg_Scholarship = NVP_Scholarship_Credit_Size x NVP_Scholarship_Credit_Eligibility

Note that both *NVP_Scholarship_Credit_Size* and *NVP_Scholarship_Credit_Eligibility* are raw input data.

When the actual share of for-profit nonvoucher schools is unknown, we estimate it in precisely the same way as for voucher-accepting private schools (see preceding section).

Next, we turn to the second term in the *NVP_Score* calculation,

NVP_Producer_Freedom_and_Incentives = NVP_Potential_for_Competition x NVP_Incentive_for_Producer_Efficiency

where

NVP_Potential_for_Competition = NVP_School_Density x NVP_School_Autonomy x NVP_ Innovation_and_Expansion

The school density and school autonomy terms are calculated just as they are for voucher-accepting private schools (though using the nonvoucher school input data, of course), while

NVP_Innovation_and_Expansion = NVP_Weighted_Profit_Motive_Effect x NVP_Weighted_Absence_of_Price_Ceiling_Effect

where *NVP_Weighted_Profit_Motive_Effect* is calculated in the same way as its voucher-accepting school counterpart, and

NVP_Weighted_Absence_of_Price_Ceiling_Effect = (1 – _Price_Ceiling_Weight) + NVP_Price_Controls x _Price_Ceiling_Weight

where *NVP_Price_Controls* is a raw input data term.

Finally, returning to the second term in the *NVP_Producer_Freedom_and_Incentives* calculation, the computation of *NVP_Incentive_for_Producer_Efficiency* is analogous to the computation for the voucher-accepting school version of this variable, with the only difference being that *NVP_Net_Avg_Scholarship* is used instead of *VP_Net_Avg_Voucher*.

Appendix C:
Weight Calculations for the Four School Types

Once the four component scores of the index have been calculated (see Appendix B), we have to combine them to arrive at an overall score for the policy or education system under consideration. As explained in the body of this paper, component weighting is trivial when we are rating existing school systems. We simply take the enrollments in each of the four school types and divide them by the total enrollment across all school types. That gives us the weights we need in order to perform a weighted sum of the four component scores, arriving at an overall rating between 0 and 1. That done, we simply multiply the result by 100 and have an overall score.

The component weighting process is more complex in the case of policy ratings, because we do not have actual enrollment figures in the different sectors to use as weights. Lacking that information, we weight the different school types on the basis of the extent to which they are discriminated against (or favored) in terms of freedom and government funding.

To do this, we follow a two-step process. Step one apportions relative weightings between the public and private sectors as wholes, and step two breaks the weightings down within each sector (i.e., alternative vs. conventional government schools and voucher-accepting vs. non-voucher schools).

We begin by calculating a Subsidy_and_Regulatory_Bias function for each of the four school types. These are computed as follows:

CGS_Subsidy_and_Regulatory_Bias = (1 – _Subsidy_Bias_Weight + CGS_per_Pupil_Spending / Max_Subsidy x _Subsidy_Bias_Weight) x (1 – _Autonomy_Bias_Weight + CGS_School_Autonomy / Max_Autonomy x _Autonomy_Bias_Weight)

AGS_Subsidy_and_Regulatory_Bias = (1 – _Subsidy_Bias_Weight + AGS_per_Pupil_Spending x AGS_School_Cap_Effect / Max_Subsidy x _Subsidy_Bias_Weight) x (1 – _Autonomy_Bias_Weight + AGS_School_Autonomy / Max_Autonomy x _Autonomy_Bias_Weight)

NVP_Subsidy_and_Regulatory_Bias = {1 – _Subsidy_Bias_Weight + [(VP_Net_Personal_Credit + NVP_Net_Avg_Scholarship) x NVP_Sunset_Clause_Effect] / Max_Subsidy x _Subsidy_Bias_Weight} x (1 – _Autonomy_Bias_Weight + NVP_School_Autonomy / Max_Autonomy x _Autonomy_Bias_Weight)

VP_Subsidy_and_Regulatory_Bias = [1 – _Subsidy_Bias_Weight + (VP_Net_Avg_Voucher x VP_Sunset_Clause_Effect / Max_Subsidy) x _Subsidy_Bias_Weight] x (1 – _Autonomy_Bias_Weight + VP_School_Autonomy / Max_Autonomy x _Autonomy_Bias_Weight)

where *Max_Subsidy* and *Max_Autonomy* are, respectively, the highest subsidy and the highest level of autonomy enjoyed by any of the four school types.

Each of the above *Subsidy_and_Regulatory_Bias* functions is thus a weighted product of the net subsidy available for the given type of schooling and the level of autonomy it enjoys, relative to the maximum subsidy and maximum autonomy levels enjoyed by any school type.

Also note that

NVP_Sunset_Clause_Effect = 1 – _Sunset_Clause_Weight + _Sunset_Clause_Weight x (1 – NVP_Has_Sunset)

VP_Sunset_Clause_Effect = 1 – _Sunset_Clause_Weight + _Sunset_Clause_Weight x (1 – VP_Has_Sunset)

After we have calculated each of the four *Subsidy_and_Regulatory_Bias* values, we obtain a public-sector–to–private-sector bias ratio by taking the largest public-sector bias term (*Max_Government_Bias*) and dividing it by the largest private-sector term (*Max_Private_Bias*) plus itself, as follows,

Government_vs_Private_Bias_Ratio = Max_Government_Bias / (Max_Government_Bias + Max_Private_Bias)

This provides us with a simple measure of public- versus private-sector bias. A system that heavily favors the public sector and discriminates against the private sector will get a score near 1; the reverse system will get a score near 0; and a system that treats them more or less equally will receive a score near 0.5.

Admittedly, this is somewhat arbitrary, and we would ideally like to put this theoretical construct on an empirical footing. The most obvious way to do that is to tie our *Government_vs._Private_Bias_Ratio* values to actual enrollment figures for existing school systems, since enrollment decisions are the ultimate expression of how strongly the bias toward one sector or the other is felt. We can do that by fitting a curve to the relationship between the government sector's share of total enrollment and the raw *Government_vs._Private_Bias_Ratio*.

Using curve-fitting software, we find that a sigmoidal (i.e., S-shaped) function provides the best fit, having a relatively horizontal slope at the extremities of its range but a steep slope in the middle of its range.[19] That function is

Government_Sector_Weight = _a / {[1 + EXP(_b – _c x Government_vs_Private_Bias_Ratio)] ^ (1 / d)}

We can now compute the school type component weights for policy ratings using our individual bias values calculated above in conjunction with this *Government_Sector_Weight* term, as follows,

AGS_Weight = Government_Sector_Weight x [AGS_Subsidy_and_Regulatory_Bias / (AGS_Subsidy_and_Regulatory_Bias + CGS_Subsidy_and_Regulatory_Bias)] ^ (2 – AGS_For_Profit_Policy)

CGS_Weight = Government_Sector_Weight – AGS_Weight

NVP_Weight = MAX{(1 – Government_Sector_Weight) – VP_Voucher_Eligibility, (1 – Government_Sector_Weight) x [NVP_Subsidy_and_Regulatory_Bias / (NVP_Subsidy_and_Regulatory_Bias + VP_Subsidy_and_Regulatory_Bias)]}

VP_Weight = 1 – Government_Sector_Weight – NVP_Weight

The two components that need some further explanation are *AGS_Weight* and *NVP_Weight*. The exponent term in *AGS_Weight* is meant to account for the very significant role that the

profit motive plays in driving the expansion of successful service providers. When charter schools are permitted to operate for profit, this exponent is reduced to (2 – 1) = 1, and hence has no effect on the calculation. When charter schools are either forbidden outright to operate for profit, or must have nonprofit intermediary boards that may contract out to for-profit education management firms, the exponent value is greater than 1, and hence attenuates the weight assigned to charter schools.

The *NVP_Weight* term is calculated as the maximum of either the total private-sector share less the maximum share of students eligible for vouchers, or the total private-sector share times the relative bias of NVP versus VP schools. This is to ensure that eligibility limits on the number of voucher students are properly recognized.

A useful test of the above weighting system is to compare the policy and market ratings for the 50 states. Doing so, we find a modest Pearson's R correlation coefficient of 0.56 (where 0 represents no correlation and 1 represents a perfect linear correlation). Much of the discrepancy between the policy and market ratings—the reason our Pearson's R is not higher—stems from the elevated weights often accorded to the charter school component under policy ratings. This is because many states have open-ended charter school laws that permit substantial growth in the number of charter schools over time. Since these laws are relatively new, *current* enrollment in the charter sectors of these states (on which market ratings are based) does not fully reflect *potential future* growth. Unlike market ratings, policy ratings assign the weight to the charter school sector on the basis of that sector's growth prospects, not its current size, hence the disparity between market and policy ratings.

If we look only at states that do not allow charter schooling, or that impose caps on the maximum number of charter schools, then we expect our correlation between market and policy ratings to be substantially higher, since those states leave little room for their charter sectors (if they exist) to grow beyond their current size. That is indeed the case. Pearson's R for the policy and market ratings of the 28 states falling into this category is a much higher 0.88, which supports the soundness of the policy weighting system described in this section.

Note that the component weighting formula described in this section relies on six constants: *_a, _b, _c, _d, _Autonomy_Bias_Weight*, and *_Subsidy_Bias_Weight*. We optimized the values of these constants using a nonlinear equation solver. Specifically, we determined the values of these constants that minimized the sum of the squares of the differences between the market and policy component weights of the four school types for the 28 states mentioned above plus the Netherlands. As we collect data for more nations, we intend to rerun this optimization to reassess the values of the constants in question.

Appendix D:
CEMI Regressions against Educational Outcomes

As we noted in the body of the text, the relationship between CEMI ratings and the scope and vigor of market activity is not necessarily linear, even if CEMI is a reasonable measure of market freedoms and incentives. And, since all the U.S. states enjoy such similar (and very low) levels of market activity, it is conceivable that their CEMI ratings would not be significantly correlated with educational outcomes. Nevertheless, it is inevitable with an index of this kind that linear regression will be used to search for relationships between its ratings and whatever educational outcome measures happen to be readily available. Cognizant of that reality, we have run a series of multiple linear regressions using a variety of different educational outcome measures and a reasonable suite of controls for other factors commonly associated with those outcomes.

Our outcome measures include: on-time high school graduation rates, the average of fourth grade NAEP reading and mathematics scale scores, the average of eighth grade NAEP reading and mathematics scale scores, the average of fourth and eighth grade NAEP reading and mathematics scale scores, and a composite index of fourth and eighth grade reading and math scale scores with graduation rates.

The NAEP was chosen because it is the only test administered to representative samples of students from every state. Reading and mathematics were selected as the subjects of interest because they represent two of the three "Rs" and because other NAEP subject tests (such as science) do not have complete coverage of all the states. The fourth and eighth grades were chosen because they are the only ones for which state-level NAEP data are available.

Each of these regressions controlled for five socioeconomic and demographic variables commonly associated with educational outcomes (in addition to the CEMI rating variable):

- The share of householders receiving state or local assistance
- The share of children living with foreign-born householders
- The share of children not living in married-couple families
- An index of parents' level of education
- The share of white students (averaged across fourth and eighth grades)

The first three variables are derived from Census 2000 data. The fourth is computed from data obtained from the National Center for Children in Poverty at Columbia University (it nevertheless covers all children). The Parental Education Index is calculated as the percentage of students whose most educated parent has a high-school diploma, plus two times the percentage of students whose most educated parent has at least some college, times 100. The average share of white students across fourth and eighth grades is drawn from 2005 NAEP data, and the NAEP test scores are for 2005 as well. The on-time graduation rates are drawn from the 2006 NCES study, "The Averaged Freshman Graduation Rate for Public High Schools from the Common Core of Data: School Years 2002–03 and 2003–04." We use the 2002–03 data because of missing values for 2003–04.

Other control variables such as alternative measures of poverty, the share of Hispanic families, the share of Asian and Pacific Islander students, the share of students for whom the language spoken at home was not English, and the share of disabled students were also included in various regressions, but were not found to be statistically significant and/or were found to lower the overall predictive power of the model.

The results of our five regressions are shown in Tables D-1 through D-5. In each case, the coefficient for the CEMI market rating term is positive and statistically significant, though its effect size is not large (as can be seen from the Beta coefficients presented in the tables).

Readers should of course keep in mind that, since CEMI ratings are not truly cardinal values, these regression results are not necessarily generalizable to other populations (particularly to other political jurisdictions whose CEMI ratings differ from the range of ratings of the U.S. states). A brief analysis of the results given in Tables D-4 and D-5 is presented after each of those tables.

Table D-1
Graduation Rate Regression

Regression Statistics	
Multiple R	0.8069
R Square	0.6511
Adjusted R Square	0.6024
Standard Error	4.5885
Observations	50.0000

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	6.0000	1689.1400	281.5233	13.3713	1.73568E-08
Residual	43.0000	905.3378	21.0544		
Total	49.0000	2594.4778			

	Coefficients	*Beta Coeffs*	*Std. Err.*	*t Stat*	*P-value*
Intercept	92.7362**		24.6195	3.7668	0.0005
Living with foreign-born householder	0.0712	0.0890	0.1176	0.6059	0.5478
Not living in married-couple family group	-0.9391**	-0.6287	0.2649	-3.5450	0.0010
Parental Education Index	0.0342	0.0472	0.1030	0.3319	0.7416
CEMI Market Rating	0.3037*	0.1957	0.1452	2.0924	0.0423
Householder receiving state or local assistance	-0.3846	-0.1237	0.3070	-1.2526	0.2171
% white (avg 4th & 8th grades)	0.0505	0.1256	0.0712	0.7103	0.4814

* Coefficient is statistically significant at the $p < 0.05$ level.

** Coefficient is statistically significant at the $p < 0.01$ level.

Table D-2
NAEP Fourth Grade Math and Reading Regression

Regression Statistics	
Multiple R	0.8514
R Square	0.7249
Adjusted R Square	0.6865
Standard Error	3.2913
Observations	50.0000

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	6.0000	1227.2324	204.5387	18.8814	1.28092E-10
Residual	43.0000	465.8110	10.8328		
Total	49.0000	1693.0434			

	Coefficients	*Beta Coeffs*	*Std. Err.*	*t Stat*	*P-value*
Intercept	169.2101**		17.6595	9.5818	0.0000
Householder receiving state or local assistance	-0.6104**	-0.2431	0.2202	-2.7715	0.0082
Living with foreign-born householder	0.2139*	0.3307	0.0843	2.5361	0.0149
Not living in married-couple family group	0.0643	0.0533	0.1900	0.3382	0.7368
Parental Education Index	0.2732**	0.4674	0.0739	3.7000	0.0006
CEMI Market Rating	0.3152**	0.2515	0.1041	3.0277	0.0042
% white (avg 4th & 8th grades)	0.1764**	0.5423	0.0510	3.4553	0.0012

* Coefficient is statistically significant at the $p < 0.05$ level.

** Coefficient is statistically significant at the $p < 0.01$ level.

Table D-3
NAEP Eighth Grade Math and Reading Regression

Regression Statistics	
Multiple R	0.8580
R Square	0.7361
Adjusted R Square	0.6993
Standard Error	3.6032
Observations	50.0000

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	6.0000	1557.3467	259.5578	19.9920	1.595E-11
Residual	43.0000	558.2733	12.9831		
Total	49.0000	2115.6200			

	Coefficients	*Beta Coeffs*	*Std. Err.*	*t Stat*	*P-value*
Intercept	211.0559**		19.3329	10.9169	0.0000
Householder receiving state or local assistance	-0.5781*	-0.2060	0.2411	-2.3979	0.0209
Living with foreign-born householder	0.2184*	0.3022	0.0923	2.3662	0.0225
Not living in married-couple family group	-0.0162	-0.0120	0.2080	-0.0777	0.9384
Parental Education Index	0.2822**	0.4318	0.0808	3.4902	0.0011
CEMI Market Rating	0.2720*	0.1941	0.1140	2.3864	0.0215
% white (avg 4th & 8th grades)	0.2015**	0.5543	0.0559	3.6062	0.0008

* Coefficient is statistically significant at the $p < 0.05$ level.

** Coefficient is statistically significant at the $p < 0.01$ level.

Table D-4
NAEP Fourth and Eighth Grade Math and Reading Regression

Regression Statistics	
Multiple R	0.8666
R Square	0.7510
Adjusted R Square	0.7163
Standard Error	3.2663
Observations	50.0000

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	6.0000	1383.9764	230.6627	21.6206	1.5953E-11
Residual	43.0000	458.7512	10.6686		
Total	49.0000	1842.7277			

	Coefficients	*Beta Coeffs*	*Std. Err.*	*t Stat*	*P-value*
Intercept	190.1330**		17.5252	10.8491	0.0000
Householder receiving state or local assistance	-0.5942**	-0.2268	0.2186	-2.7190	0.0094
Living with foreign-born householder	0.2161*	0.3204	0.0837	2.5829	0.0133
Not living in married-couple family group	0.0240	0.0191	0.1886	0.1275	0.8991
Parental Education Index	0.2777**	0.4553	0.0733	3.7893	0.0005
CEMI Market Rating	0.2936**	0.2245	0.1033	2.8417	0.0068
% white (avg 4th & 8th grades)	0.1889**	0.5569	0.0507	3.7300	0.0006

* Coefficient is statistically significant at the $p < 0.05$ level.

** Coefficient is statistically significant at the $p < 0.01$ level.

Table D-4 presents the results of a regression in which the outcome measure was the mean of fourth and eighth grade NAEP reading and mathematics scale scores. The r-squared value of 0.75 for this regression suggests that our model does a reasonable job of explaining the variation in test scores from state to state. The CEMI market rating term is significant at the relatively strict $p < 0.01$ level, and its Beta coefficient[20] is 0.22, suggesting a relatively modest effect size.

Table D-5
NAEP Fourth and Eighth Grade Math and Reading with On-Time Graduation Rate Regression

Regression Statistics	
Multiple R	0.9007
R Square	0.8113
Adjusted R Square	0.7850
Standard Error	0.4203
Observations	50.0000

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	6	32.6745	5.4457	30.8218	4.74679E-14
Residual	43	7.5974	0.1767		
Total	49	40.2719			

	Coefficients	*Beta Coeffs*	*P-value*	*Darlington*	*Std. Err.*	*t Stat*
Intercept	-3.6088		0.1169		2.2553	-1.6001
Householder receiving state or local assistance	-0.0749*	-0.1933	0.0109	0.0311	0.0281	-2.6623
Living with foreign-born householder	0.0225*	0.2258	0.0425	0.0192	0.0108	2.0909
Not living in married-couple family group	-0.0626*	-0.3362	0.0134	0.0292	0.0243	-2.5783
Parental Education Index	0.0250*	0.2772	0.0112	0.0308	0.0094	2.6497
CEMI Market Rating	0.0448**	0.2318	0.0016	0.0498	0.0133	3.3699
% white (avg 4th & 8th grades)	0.0189**	0.3764	0.0059	0.0368	0.0065	2.8960

* Coefficient is statistically significant at the $p < 0.05$ level.

** Coefficient is statistically significant at the $p < 0.01$ level.

Table D-5 presents the results of a regression in which the outcome measure was the average of two normalized[21] variables: the mean fourth and eighth grade NAEP math and reading scores and the on-time graduation rates. In other words, we took the mean of all four NAEP test scores, normalized it, and then averaged it together with the normalized graduation rates.

As can be seen from the r-squared value of 0.81 for this regression, our model does a respectable job of explaining the variation in our composite educational outcome measure. The CEMI market rating term is significant at the relatively strict $p < 0.01$ level, and its Beta coefficient is 0.23, suggesting, again, a relatively modest effect size.

Of course, it should be kept in mind that the standard deviation of our sample of metric scores is quite small (less than five points) because existing state school systems are all so close together at the low end of the score range. Implementing substantial education market

reforms would lead to a rise in CEMI scores equivalent to 10 or more of these sample standard deviations, which, on the basis of this regression, would be associated with a more than two standard deviation improvement in the educational outcome measure (10 times .23).

Another measure of the explanatory power of an independent variable is Darlington's Usefulness Statistic, otherwise known as the semi-partial correlation squared. This value is equivalent to the r-squared value of the full model minus the r-squared value of the model after dropping out the independent variable in question. Interestingly, as can be seen from Table D-5, the CEMI market rating has the single highest Darlington's value of all the independent variables. It thus uniquely explains more of the *total* variance in educational outcomes than race, wealth, parental level of education, or the other factors for which we controlled. That said, none of the independent variables uniquely explains more than 5 percent of the total variance, suggesting that much of their explanatory effect is due to interrelations among them.

Appendix E: Robustness Testing

Given the unavoidable subjectivity involved in the calibration of CEMI's weighting values, it is useful to test how its ratings respond to variations in the weights we have chosen. In this section, we present the results of two robustness tests. In the first test, we recomputed CEMI's ratings 500 times, each time randomizing its internal weights within a 10 percent range (i.e., + or – 5 percent of the values we have chosen).[22] In the second test, we repeated the first process but randomized the weights 500 times within a 20 percent range (i.e., + or – 10 percent of the values we have chosen). A variety of statistics summarizing the results of both tests are given in Tables E-1 and E-2.

Some explanation of these results is in order. The first four lines of each table give the standard deviations for the scores received by each state, nation, or policy across all 500 randomized trials. The next four lines give the average range of the ratings and rankings across those 500 trials—the mean difference between the highest score a state, nation, or policy receives in any of the trials and its lowest score. The final eight lines of the table show what fraction of jurisdictions or policies had scores that did not vary by more than a quarter of the range of possible values (quartile), and by more than a third of the range of possible values (tercile).

The upshot of these tests is that CEMI is quite robust when its constants are varied within a 10 percent range and moderately robust when they are varied within a 20 percent range. The worst result is that only 64 percent of the market ranks are stable within a quartile of their range (that range being 1 to 52, since ranks were computed for the 50 states plus Sweden and the Netherlands). Why did the market ranks fluctuate so much more than the market ratings? The answer is that, since U.S. states have such similar education systems, their CEMI ratings are very close to one another. As a result, even small changes in CEMI ratings can produce

Table E-1
Robustness Test, 10 Percent Range

Statistic	Value
Mean of the std deviations of the market ratings	1.48
Mean of the std deviations of the policy ratings	2.36
Mean of the std deviations of the market ranks	1.54
Mean of the std deviations of the policy ranks	1.20
Mean difference between min and max market ratings	7.92
Mean difference between min and max policy ratings	12.56
Mean difference between min and max market ranks	8.23
Mean difference between min and max policy ranks	6.17
Percent of market ratings that were stable within a quartile	100
Percent of policy ratings that were stable within a quartile	90
Percent of market ranks that were stable within a quartile	89
Percent of policy ranks that were stable within a quartile	98
Percent of market ratings that were stable within a tercile	100
Percent of policy ratings that were stable within a tercile	98
Percent of market ranks that were stable within a tercile	91
Percent of policy ranks that were stable within a tercile	98

Table E-2
Robustness Test, 20 Percent Range

Statistic	Value
Mean of the std deviations of the market ratings	1.75
Mean of the std deviations of the policy ratings	2.62
Mean of the std deviations of the market ranks	2.27
Mean of the std deviations of the policy ranks	1.55
Mean difference between min and max market ratings	9.31
Mean difference between min and max policy ratings	13.69
Mean difference between min and max market ranks	11.64
Mean difference between min and max policy ranks	8.32
Percent of market ratings that were stable within a quartile	100
Percent of policy ratings that were stable within a quartile	89
Percent of market ranks that were stable within a quartile	64
Percent of policy ranks that were stable within a quartile	97
Percent of market ratings that were stable within a tercile	100
Percent of policy ratings that were stable within a tercile	95
Percent of market ranks that were stable within a tercile	83
Percent of policy ranks that were stable within a tercile	100

much different rank orderings of the states. State rankings on CEMI's market scale should thus not be used in isolation from their actual rating scores, and this is a reasonable practice to apply for policy rankings and ratings as well.

Appendix F: Future Developments

Forecast Ratings

Education policies are not static. Not only do they tend to change over time, but some of the changes that they undergo appear to follow consistent patterns. Among the most noticeable trends is that government funding of schools generally precipitates government control.[23] Having studied dozens of education systems from ancient times to the present, we find that whenever the state pays for K-12 schooling, its funding is either tied to a comprehensive package of regulations from the outset, or a substantial regulatory burden develops over time.

If this relationship between government spending and regulatory encroachment could be formalized, it would be an extremely valuable addition to the index. At present, a CEMI policy rating is based exclusively on the policy details as originally specified and takes no account of likely changes to those details over time. This poses a problem in the case of policies that include substantial government funding of private schools without (initially) imposing significant regulations on them. Since such regulations seem to follow government funding of elementary and secondary schooling without exception, it is important for policymakers to be aware of that. When crafting legislation, it is preferable to know the likely long-term outcomes of a policy and not simply its short-term effects.

For this reason, we are considering the eventual addition of a third rating type to the index: the "policy forecast." Policy forecasts would attempt to quantify the regulatory encroachment process associated with government funding, perhaps by modeling the historical evidence of this relationship.

A "Universality " Switch

In this initial version, CEMI ratings are pure measures of market freedoms and incentives. But, although we have argued that free education markets have many desirable qualities, there is one respect in which they may not, by themselves, conform to the public's desires and expectations: universal access to good schools. Education markets are working even in some of the most destitute corners of the world, and performing better in those areas than state-run school systems, but that does not mean that low-income families are able to consume the amount and quality of education that most citizens consider to be essential. In other words, there is a public demand for universal access to some "sufficient" amount and quality of schooling. To measure how well that demand is being met, we are contemplating adding a switch to CEMI that, when enabled, will cause it to consider the amount and flexibility (i.e., lack of regulation) of the funding available to low-income families.

Taxpayer Freedom

Parents with school-aged children are not the only or even the primary payers of education taxes, and a broad-based metric for educational freedom should conceivably take into account the compulsion on the general taxpayer to cover the educational costs of other citizens' children. Some of this loss of freedom is captured by the parental funding share term ("Incentive for Parental Responsibility"), because the larger the share of spending being shouldered directly by parents, the less is being asked of other taxpayers. As long as that term is given sufficient weight, it can take into account much of the general taxpayer's loss of freedom.

An interesting caveat to this analysis arises from the use of scholarship donation tax credits instead of education taxes as a third-party funding mechanism. Under traditional government schooling or school voucher programs, *all* taxpayers must pay for *all* officially recognized sorts of schools. That is not the case under scholarship donation tax credit programs.

With donation tax credits, taxpayers *choose* the scholarship granting organization (SGO) to which they make their donations. That means taxpayers can avoid making donations to SGOs that fund schools whose curricula violate their convictions.

For example: prominent atheist Michael Newdow (who sued his daughter's public school for its regular recitations of the "one nation under God" section of the Pledge of Allegiance) would be free to donate to SGOs that funded only secular schools. Left-leaning citizens would be free to donate only to SGOs that forbid participating schools from discriminating against gay students. Conservative Christians could avoid donating to SGOs they perceived as hostile to Christianity, and so on.

That is to say that the burden of compulsion under a scholarship donation tax credit program is decidedly lighter than it is under tax-funded school systems such as vouchers or government-run schools. Although we do not specifically take account of this disparity in the current version of the metric, it is under consideration for a future version.

Finer Measurement of Competitive Density

Vigorous competition depends on both the number and the proximity (or "density") of the competitors. The effects of competition also depend, obviously, on the number and concentration of the competitors. If there are 50 schools within a 100-mile radius, there will be less competition than if there are 50 schools within a 10-mile radius, or 75 schools within a 100-mile radius. The more practical alternatives enjoyed by the typical parent, the more vigorous will be the competition between schools. This "competitive density" effect is not adequately captured in the current version of the index.

Consider, for example, two different school voucher scenarios that both cap the number of participating students at 30,000. If all those students were concentrated in a single metropolitan area, the additional demand would likely lead to the creation of new private schools and hence would intensify the competitive density of that area. If, on the other hand, the voucher-receiving students were evenly distributed across an entire state, few if any new schools would be created, as there would likely be too few new voucher students in any one locality to justify opening new schools. Under the second scenario, competitive density would remain unchanged. At present, this important distinction would go unnoticed by CEMI.

Notes

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1. James Tooley and Pauline Dixon, "Private Education Is Good for the Poor: A Study of Private Schools Serving the Poor in Low-Income Countries," Cato Institute White Paper, December 7, 2005, http://www.cato.org/pub_display.php?pub_id=5224.

2. See, for instance, ibid.; James Tooley and David Salisbury, eds., *What America Can Learn from School Choice in Other Countries* (Washington: Cato Institute, 2005); and Andrew J. Coulson, "How Markets Affect Quality: Testing a Theory of Market Education against the International Evidence," in *Educational Freedom in Urban America*, ed. David Salisbury and Casey Lartigue (Washington: Cato Institute, 2004), pp. 265–324.

3. The seminal work in the field is E. G. West, *Education and State: A Study in Political Economy* (1965; Indianapolis: Liberty Books, 1994). For a broader survey of the evidence from ancient times to the present, see Andrew J. Coulson, *Market Education: The Unknown History* (New Brunswick, NJ: Transaction Books, 1999).

4. See, for instance, David E. Campbell, "The Civic Side of School Reform: How Do School Vouchers Affect Civic Education?" working paper, University of Notre Dame, 2002, http://www.princeton.edu/~csdp/events/pdfs/campbell2.pdf; Richard G. Niemi and Christopher Chapman, "The Civic Development of 9th- through 12th-Grade Students in the United States: 1996," statistical analysis report, National Center for Education Statistics, 1998, http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=1999131; and Paul T. Hill, "What Is Public about Public Education?" research report, University of Washington and The Brookings Institution, 2000, http://www.brook.edu/dybdocroot/GS/brown/PublicEd.PDF.

5. See, for instance, Stephen Arons, *Compelling Belief: The Culture of American Schooling* (Amherst: University of Massachusetts Press, 1986); and Coulson, *Market Education*.

6. http://cato.org/CEMI.

7. Coulson, "How Markets Affect Quality." One especially large-scale study found a quadratic relationship between parent funding and school efficiency. See Estelle James, E. M. King, and Ace Suryadi, "Finance, Management, and Costs of Public and Private Schools in Indonesia," *Economics of Education Review* 15, no. 4 (1996): 387–98. Higher parental funding share was always found to be better than lower parental funding share, but the magnitude of the improvement decreased as the parent funding share approached 100 percent. On the basis of this and related work, it is reasonable to include in our metric a quadratic term corresponding to the share of total education spending that comes (or is expected to come) directly from parents.

8. In the jargon of mathematicians, many of the input factors on which CEMI ratings are based are "ordinal" rather than "cardinal." Ordinal numbers convey relative rankings between things, but not the magnitude of the differences. Consider, for example, the severity of government textbook mandates. While we can say that mandating all of a school's textbooks reduces market freedom more than requiring schools to choose their textbooks from an approved list (an ordinal statement), we cannot know the exact difference in the market-stifling effect of these two government mandates (which would imply cardinal knowledge). In order to produce CEMI rating numbers, however, it is necessary to estimate the magnitude of such differences, subjectively weighting (or "calibrating") the various factors on which ratings are based. The stability of CEMI ratings in the face of variations in these estimated weights (known as its "robustness") is discussed in Appendix E.

9. James Gwartney and Robert Lawson, *Economic Freedom of the World: 2006 Annual Report* (Vancouver: Fraser Institute, 2006, http://www.freetheworld.com/release.html; Jay P. Greene, "The Education Freedom Index," Manhattan Institute Civic Report no. 14, September 2000, http://www.manhattan-institute.org/html/cr_14.htm; and Claudia R. Hepburn, "The Canadian Education Freedom Index," Fraser Institute Studies in Education Policy series, September 2003, http://www.fraserinstitute.ca/shared/readmore.asp?sNav=pb&id=575.

10. An important corollary of our multiplicative approach is that the metric's "sensitivity" to changes in individual input values is not constant across the range of ratings. As an example, consider two different

education systems: one that is dominated by private, parent-funded, parent-chosen schools and another dominated by government schools to which students are automatically assigned. The first scenario is obviously more marketlike than the second and will receive a higher score. As a result, a change in one input variable will have a bigger impact on the score of the first system, in raw points, than it will on the score of the second. For instance, say that both systems initially allow schools to set their own curricula but then subsequently impose an explicit state curriculum. The resulting decrease in the rating of the private-sector system will be larger, in terms of raw points, than the decrease in the rating of the public-sector system. We believe this is as it should be. A system in which students are automatically assigned to schools is so far from a market that changes in curriculum mandates amount to shuffling chairs around on a sinking *Titanic*, whereas such changes would make a significant difference to an otherwise free education market.

11. The Kumon chain of tutoring schools, for instance, enrolls roughly three million students in over three dozen countries. Other large networks include the K-12 Objetivo chain in Brazil (roughly 600,000 students) and, at the higher education level, the University of Phoenix in the United States.

12. Pliny the Younger, *Letters and Panegyricus [of] Pliny*, with an English translation by Betty Radish (London: William Heinemann, 1969), pp. 277–83.

13. Although Idaho does not have an explicit cap on the total number of charter schools that can be created, it limits the number that may be created at both the state and the district level in any given year. For the foreseeable future, this will have an effect similar to that of a rigid cap, and so we have treated Idaho as though its total charter count is capped.

14. That is, plus or minus 5 percent of the values we have chosen.

15. That is, plus or minus 10 percent of the values we have chosen.

16. Readers familiar with Excel might find it helpful to follow along in the Excel spreadsheet that is used to perform these calculations, which can be found on the Cato Institute website (http://cato.org/).

17. Please see note 7 for the rationale on this point. At the time of this writing we have been unable to obtain the exact quadratic equation used in the James, King, Suryadi study, and so adopt $y = 2x - x^2$ as a reasonable place holder.

Arguably we could have included this function under the producer freedom and incentives portion of our calculation, but because we attribute this effect to the fact that parents who are paying directly for their children's education are more demanding, we have categorized it under the consumer freedom and incentives portion. Either way, it would have the same impact on the metric's score.

18. Caroline Hoxby, "School Choice and School Productivity," in *The Economics of School Choice*, ed. Caroline Hoxby (Chicago: University of Chicago Press, 2003): 287–342.

19. In performing the fit, we restricted the number of coefficients in the model to four, to eliminate high-order polynomial equations that might fit this particular data set well but that would have no theoretical basis and likely not generalize well to other data sets.

20. Beta coefficients are the normalized versions of the raw independent variable coefficients (i.e., the coefficient multiplied by its variable's standard deviation divided by the standard deviation of the dependent variable). We can thus say that a one standard deviation increase in the independent variable will result in a Beta standard deviation increase in the dependent variable.

21. A variable is normalized by subtracting the mean from each observation and then dividing it by the standard deviation. Normalizing variables before averaging them together ensures that the variance of each is given equal weight.

22. A handful of the more than 100 constants used in the index do not have a fixed range and so were randomized over arbitrary ranges rather than over the 5 or 10 percent ranges of all the other constants.

23. See Coulson, *Market Education*.