Does Merit-Based Aid "Crowd Out" Need-Based Aid?

William R. Doyle

Abstract The advent of merit-based state financial aid programs has had several first order effects, such as changes in enrollment. However, these programs may also have second order effects, such as declining state support for need-based state financial aid programs. I hypothesize that the advent of merit-based state financial aid may be an example of Baumgartner and Jones' punctuated equilibria. Results from estimation of models for dynamic panel data suggest instead that need-based aid has changed only incrementally in the states, without an observable effect of merit-based aid.

Keywords Financial aid · Merit aid · Policy · Panel data · Dynamic models

As of 2007, 16 states had adopted broad-based merit aid programs, providing financial aid to students who meet some form of academic criteria. The adoption of these grant programs is one of the most important changes in state policy for higher education in the past two decades (Heller 2002)

Previous to the advent of merit-based grant programs, the vast majority of state aid was provided on a need-based basis. States differed greatly in the total amount provided of aid they provided to students. Even given these differences, states generally conformed with the federal methodology for providing aid, which embodied a strictly need-based approach (Heller 2002).

Since states have begun adopting merit-based grant programs, observers of state higher education policy have begun worrying about a second order effect of these programs. Could it be that as states implement a merit-based program, they will simultaneously defund or even discontinue their need-based programs (Dynarski 2002; Heller and Marin 2002; Heller 2002)? This study seeks to answer this question by looking at patterns of state spending on both merit- and need- based spending for higher education over the last 20 years.

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It is important to note at the outset that this paper does not and can not answer a related and equally important question, namely: would the funding expended on merit-based programs have been available for need-based programs? Many critics of broad based merit aid programs essentially argue on this point, suggesting that for both purposes of efficiency and equity this money would have been better spent on need-based aid (Mortenson 1997). Given the data used for this study, there is simply no way to know whether states would have spent this money differently given different circumstances.

However, the data do allow us to investigate whether states' spending on the two types of programs is related, and how the massive investment in merit-based aid that has taken place has affected the growth of need-based aid. The question for this paper is: Does increased state spending on merit aid result in lower spending on need-based aid?

The plan of this paper is as follows. I first provide a brief background by describing the history of need- and merit-based aid in the states. I also describe the current debate in the policy community regarding the relative tradeoffs between need- and merit-based aid. I next describe the econometric models used to specify the relationship between need- and merit-based aid. In this paper I make use of dynamic models for panel data, which can model the impact of the growth of merit aid on year-to-year changes in need-based aid. I next turn to my findings, and conclude by discussing the policy implications of this analysis.

Background

The literature on trade-offs between state-based merit aid and state-base need aid can be divided into three areas. In the first two sections, I briefly discuss the literature covering the history, advantages, and disadvantages of both merit- and need-based aid. There have been few studies covering the explicit trade-offs between need- and merit-based aid. I cover this literature in the third part of this section.

Need-Based State Aid

At the state level, the earliest programs in existence were primarily designed to reward student performance. New York's Regents scholarship is an example of such a program (Beadie 1999). The amounts awarded by states were small, and based primarily on student performance (Hauptman 2001; Creech and Davis 1999).

The majority of modern need-based state aid programs began with the establishment of the State Student Incentive Grant (SSIG) program in the 1960s and 1970s. Before the federal government created SSIG, only 16 states had a need-based program. Within 20 years all states in the nation had some form of need-based aid (Heller 2002).

Need-based aid has continued to be the dominant form of financial aid. This can be seen in Fig. 1, which shows per FTE aid on both a need- and merit-based basis. As the figure shows, most of the states which have broad-based financial aid award their aid on a need-based basis. The criteria for awarding aid is generally consistent with the federal criteria.

This pattern has changed recently as states began to adopt merit-based programs. In 1984, almost all aid (90%) was awarded on a need-based basis. This proportion had dropped to 80% by 2005. This trend can be observed in Fig. 2, which shows the relative shares of need- and merit-based aid overall. Most of the growth in merit-based aid has occurred in a few states, including Georgia, Florida, South Carolina and Louisiana (see Fig. 1).
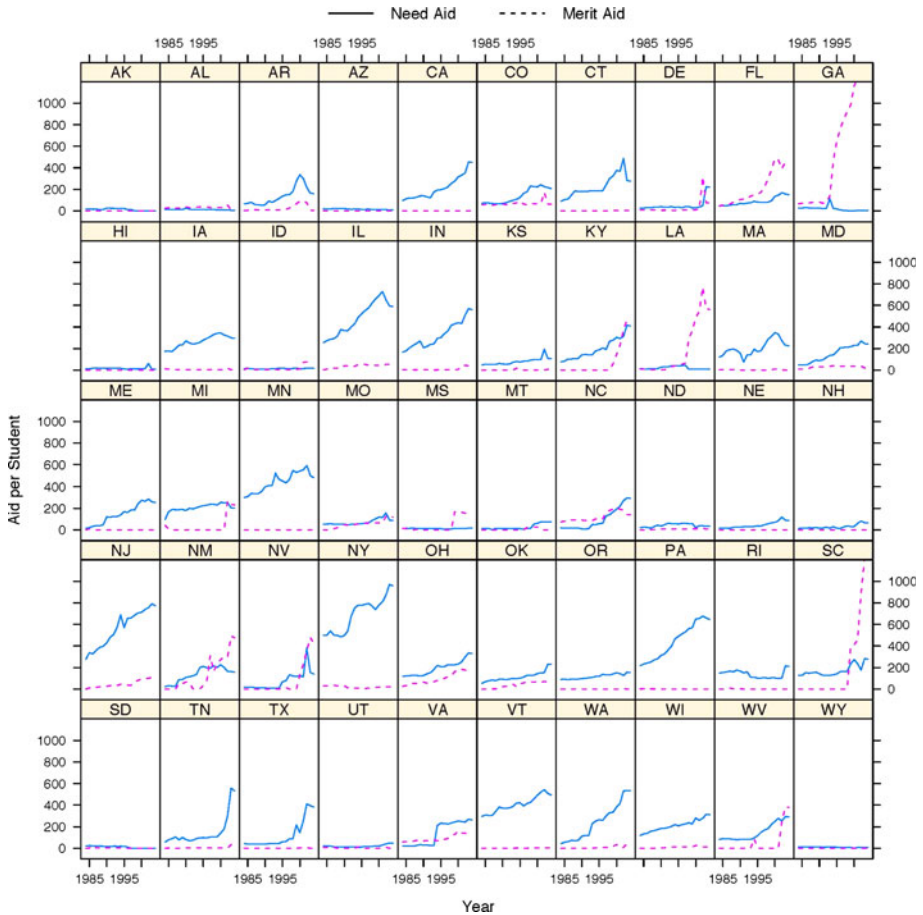
Fig. 1 Need- and merit-based aid per full time equivalent student, all states, 1984–2005. *Source*: Author's Tabulation from National Association of State Student Grant And Aid Programs, 1985–2006

Studies of need-based aid have identified several strengths of these types of programs. First, as decades of research have shown, lowering the price of higher education results in higher levels of attendance (Heller 1999, 1997; Dynarski 2003; Leslie and Brinkman 1987). Low income students are more price-responsive than their peers, and so programs that focus on lowering the price for these students will induce more students to attend than other forms of financial aid (Heller 1997; Leslie and Brinkman 1987; Ellwood and Kane 2000). As a result of their focus on the most needy students, these programs are efficient (Hoenack 1982). This efficiency means that these programs are more affordable for the state as a whole than other, more broad-based subsidies (Hearn and Longanecker 1985).

Even given these substantial advantages, there are some downsides to these types of programs. Many need-based programs have suffered from a loss of purchasing power (defined as the proportion of tuition and fees covered by grant aid) (National Center for Public Policy and Higher Education 2002). Griswold and Marine (1996) find in their case study that need-based aid can be more easily cut than appropriations to higher education, since few understand or are affected by need-based aid programs in the states. Last, these
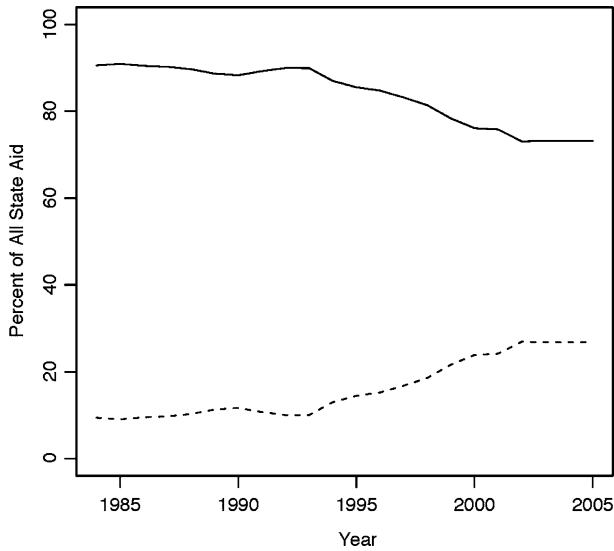
Fig. 2 Percent of all state aid awarded on need or merit basis. *Source*: Author's tabulations from NASSGAP

programs suffer from the same concerns about complexity as federal programs. (Dynarski and Scott-Clayton 2006).

Merit-Based State Aid

Rewarding students for high levels of academic performance has been a historic goal of scholarship programs. However, the broad-based merit aid programs adopted in the 1990s were qualitatively different than their predecessors, in that they provided substantial financial assistance for very modest levels of student achievement. The shift to these large merit aid programs (many of them financed by lottery revenues) is one of the biggest changes to occur in state financial aid since the implementation of the SSIG program. (Heller and Marin 2002, 2004; Heller 2002; Doyle 2006).

The policy shift to broad-based merit aid programs began in 1993, with Georgia Governor Zell Miller's proposal to create he HOPE (Helping Outstanding Pupils Educationally) scholarship program. This program, which would be funded by a lottery, would cover tuition at public institutions for students who maintained a B average and had family incomes below $66,000. The program was later changed to have no income maximum, and to provide aid for students at private institutions (Heller 2002). Since Georgia's foray into broad based aid, 22 other states have also adopted some form of a merit aid program (McDonough et al. 2007). The rapid growth of these programs in the 1990s has slowed in the last few years (Doyle 2006).

Most merit aid programs share a set of common characteristics. These programs typically provide an amount of aid equivalent or close to tuition at public institutions in the state for students who have achieved a certain level of either GPA, test scores, or both at the high school level. Many but not all of these programs are funded by lottery revenues (Heller and Marin 2002, 2004; Heller 2002).

State merit aid programs have increased enrollment. As with any other reduction in the price of higher education, a lower price means more students will enroll (Dynarski 2000). However, these programs do appear to affect enrollment more in 4 year institutions than community colleges (Cornwell et al. 2006). Beyond simply lowering the price of higher education for many students, these programs have much lower levels of complexity. Case studies suggest that students in high schools have higher levels of knowledge regarding these programs (Turner et al. 2004).

The primary disadvantage of merit-based programs is that they focus aid on a group of students who most likely would have gone onto higher education without any additional aid. As a result, these programs do little or nothing to address long-standing gaps in college attendance, whether by race or by income level (Heller and Marin 2002, 2004; Heller 2002). In fact Dynarski (2000) finds that the HOPE scholarship actually increased gaps in enrollment by race and ethnicity in Georgia. Many of these programs also require students to maintain a certain GPA while enrolled in higher education. Programs like New Mexico's Lottery Success Scholarship and Tennessee's Education Lottery Scholarship have seen low levels of retention of the scholarship, and many students who do not retain these scholarships do not persist in higher education (Binder and Ganderton 2002; Tennessee Higher Education Commission 2007).

Tradeoffs Between Need- and Merit-Based Aid

State policymakers face very different kinds of tradeoffs when attempting to choose between a need-based and merit-based enrollment programs. Need-based programs—for all of their theoretical advantages in terms of efficiency and proper focus of aid—have suffered from a lack of political popularity and a gradual erosion of purchasing power (Griswold and Marine 1996; National Center for Public Policy and Higher Education 2002). Merit-based programs, for all of their political popularity, can be shown to be inefficient and to do little or nothing to equalize long standing gaps in college attendance (Dynarski 2000; Cornwell et al. 2006).

A further question is whether, when making the choice to create a merit-based program, policymakers are also making the choice to de-fund or even eliminate need-based aid in the state. Most states that have adopted a broad-based merit aid program had little or no need-based aid to speak of. Once in place, do merit-based programs necessarily eliminate need-based programs?

There has been little or no research on this subject. Many have commented one way or another, but the premise of this study is to demonstrate in a systematic way whether an additional side-effect of merit-based financial aid is to weaken or even eliminate need-based aid in states.

Three studies have directly taken up the question of trade-offs between merit-based and need-based aid at the state level. First, Creech and Davis (1999) describe the choices facing policymakers between the two types of aid, and offer a "mixed" form of aid as one policy solution. Second, Heller (2002) suggests a more stark tradeoff between need- and merit-based aid. Finally, Dynarski (2002) provides initial evidence that in some states, the introduction of merit aid may have had implications for need-based aid.

Creech and Davis (1999) describe the tradeoffs facing policymakers when deciding which type of state student financial aid to favor in designing their programs. The authors describe the history and background of each type of aid, and conclude:

Student financial aid programs play a major role in who participates in postsecondary education. No one advocates denying financial assistance to students who do have the financial ability to pay college tuition. Nor does anyone advocate giving a "free ride" to students who can readily afford college. But few states, if any, have sufficient funds available to to provide access and choice to all who want to attend college or some other form of postsecondary education. Thus state leaders have to implement student aid programs and policies that most effectively and efficiently enhance participation in postsecondary education for as many citizens as possible (Creech and Davis 1999, p. 134).

The authors conclude that given this tradeoff, states can either continue to provide the bulk of their funding for one type of program or create more "mixed" programs, with lower eligibility requirements than traditional programs and more broadly distributed funds. Such programs, they argue, would combine the positive incentive effects of merit-based programs with the broad coverage of need-based programs. At least in their policy recommendations, the authors do not imply that states must choose either to fund merit-or need-based aid.

In contrast, Heller (2002) suggests that states do face a clear choice when designing financial aid programs. Heller (2002) also provides a historical view of the development of need- and merit-based state grant programs. In his study, he traces the impact of the new merit aid programs in the states where they have been implemented, and discusses the effects of these programs on students, institutions and states. He concludes by suggesting a stark choice facing policymakers:

Policymakers need to reexamine the purposes of state financial aid, to determine whether public funds should be used to reward academic achievement and subsidize the behavior of many who would attend college anyway, or whether they should be used to provide critical public support to those who desperately need it to attain a postsecondary education (Heller 2002, p. 258).

Heller frames the issue for policymakers as strictly either/or: states should decide whether their programs should be merit-based or need-based, with little middle ground.

Dynarski (2002) reviews the empirical evidence on merit-based aid, finding that the programs do increase attendance, but with differential effects in terms of racial and ethnic groups. She also describes evidence suggesting that these programs shift students from 2-year to 4-year institutions. In her concluding section regarding the future consequences of merit-based aid, she describes the impact of these programs during a recession:

Public universities are experiencing leaner times this year as their state appropriations are reduced. Aid for low-income students is also vulnerable. West Virginia's need-based aid program could not deliver scholarships to all those low-income students who were eligible during the 2002-2003 academic year. The same year, the state's new merit program, which has no income cap, was launched with full funding (Dynarski 2002, p. 37).

Dynarski's provides initial evidence that in some states, such as West Virginia, the introduction of merit-based programs coincided with a loss of funding for need-based aid programs. Similar to West Virginia, Tennessee's need-based aid program has not been fully funded for several years, even as a broad-based and generous merit aid program was introduced (Jack 2006).

One key reason why need-based aid programs may decline even as merit-based programs flourish is that lawmakers have little discretion over merit-based programs, while they can remove funding for need-based aid (Selingo 2001). Merit-based programs in many states tend to operate as entitlements or quasi-entitlements, with all eligible students guaranteed to receive funding. In contrast, few states provide need-based aid on an entitlement basis. In many states where merit-based aid programs have been adopted, policymakers have found that it is very difficult to change them, while need-based programs—even large ones such as the Illinois Monetary Assistance Program—have proven relatively easy to change in times of fiscal stress (Doyle 2008).

All three of the works cited above share a common concern regarding state support for student financial aid, namely: funding a merit-based program necessarily means defunding a need-based program. This study seeks to evaluate the empirical evidence on this question. In the next section, I describe several possible reasons why support for merit-based aid might (or might not) necessarily imply lack of support for need-based aid.

Conceptual Framework

There are two questions that can be addressed regarding the changes in state financial aid that have occurred over the last few decades. First, what accounts for the amount of aid awarded in any given state. Second, what accounts for *changes* in aid awarded over this same time period. This study addresses the second question. In this section, I describe a framework that provides insight into the tradeoffs between need- and merit-based aid, and suggests several possible hypotheses to account for observed changes in need-based over time.

If policy analysts are correct that merit-based aid has displaced need-based aid, then this could be an example of a punctuated equilibria, as described by Baumgartner and Jones (1991). If on, the other hand, past changes in need-based aid are sufficient to predict current changes in these programs, then Lindblom's theory of incrementalism may be reflected in the results.

In addition to this primary tradeoff between punctuated equilibria and incrementalism, I also suggest several possible alternative explanations for observed changes in need-based aid in any given year. These include: a budgetary explanation, with fewer dollars meaning less aid of any sort; a political framework, with changes in elected officials accounting for changes in need-based aid; an "enrollment ecology" framework, which would suggest that aid should change based on attendance patterns, and a financial aid framework, which suggests that need-based aid should follow patterns in tuition in the states.

Displacement of Need-Based Aid by Merit-Based Aid

The first perspective I suggest is that the adoption of merit-based aid programs within states would result in the reduction or even the outright elimination of need-based aid as a result of the changing policy landscape in states with large merit-based programs. Dynarski (2003) and Heller (2002) have argued that the adoption of merit aid programs represent not a new policy but a new policy direction for states. These authors suggest that these programs indicate that state policymakers are no longer interested in using financial aid for the purposes of access, but instead for the purpose of *affordability*, particularly for the middle class.

According to this view, the role of financial aid has long been centered on access, which meant focusing aid on those students who would not attend college without some extra assistance. An emphasis on affordability indicates a changed perspective, in which financial aid would be directed to students who are already intending to attend higher education. The purpose of financial aid in the latter case is to lower the cost for students who would have already attended higher education.

This perspective can be informed by Baumgartner's punctuated equilibrium theory, which suggests that large changes in policy occur can occur over short periods of time if parties that have been locked out of the current policy debate are able to take advantage of alternative venues for action:

> We have shown that at least in some cases the numerous policy venues characteristic of a pluralist system provide opportunities for those on the losing side of a policy debate to find a more favorable venue for the consideration of their issue. In order to take advantage of these multiple venues, they must be able to alter the accepted image of the issue. The changes which can stem from shifting images and venues can be quite dramatic (Baumgartner and Jones 1991, p. 1069).

The changes that have occurred in state financial aid could be interpreted as an example of a punctuated equilibrium in the realm of state policy for higher education. Those who sought to make changes in the existing federal system of higher education would most likely have been frustrated by its operations as a closed "sub-government" (Parsons 1997). However, by changing the venue to the state level, policymakers interested in this new focus on affordability were able to effect changes in a new venue, which resulted in a rather rapid policy shift in other states as well.

As Baumgartner's theory would suggest, the advent of this new understanding of state policy for higher education would have clear implications for both need- and merit-based aid. Most important, the analysis should show that need-based aid began to decline more than would be expected whenever merit-based aid increases.

A contrary perspective is offered by incrementalism, a theory first propounded by Lindblom (1959). This perspective would suggest that the most likely changes in any program, including need-based aid, would be small and cautious. As Lindblom suggests, policymakers do not typically start from scratch in making decisions about policy options in any given year. Instead, they use the past as their guide to the present. From the point of view of this perspective, the best predictor of state investment in financial aid in any given year would be the amount spent in the previous year.

The tradeoff between these two perspectives can be seen, therefore, by testing the extent to which changes in merit-based aid in a given state result in changes in need-based aid, controlling for the pre-existing condition of need-based aid in the state.

Budgetary Framework

A budgetary perspective on the impact of merit-based aid on need-based aid would take as its starting point the implicit scarcity of resources in any state. As the state has less money, less will be spent on any given policy.

In the case of need-based aid, increased tax collections should lead to more spending, and vice versa. The introduction of merit aid programs, which are financed by lotteries in most states, should not dramatically alter year-to-year changes in financing for merit aid (Dynarski 2002). Thus, from a budgetary perspective, there is no reason to suspect that merit-based aid should affect need-based aid, after controlling for the impact of changing tax revenues.

Political Framework

The literature on partisanship and higher education policy is relatively recent. Most of the findings have indicated that states with a more liberal legislature should support more funding for higher education, all other things being equal. The political framework would suggest that, controlling for past values of the amount of need-based aid awarded, states with an increasingly liberal legislature should award more need-based aid than would otherwise be expected (Klingman and Lammers 1984).

Enrollment Ecology

The distribution of students among institutions in the state could also play a role in year-to-year changes in the amount of aid awarded. Student enrollment in more expensive institutions could push state policymakers to provide more funding in the form of need-based aid. The same can not be said of merit-based aid program, which typically do not take student need into account.

As more students enroll in private institutions, need-based aid may go up for one of two reasons. First, if the state has included a strong tuition equalization program as part of its need-based aid, then more funding will shift to those students (Blaydon 1978). Second, as private institutions gain in enrollment, their ability to lobby for more support in the form of need-based aid should increase (Berdahl 1978).

Financial Aid

From the perspective of financial aid professionals, any form of need based aid should increase when college prices go up or family income goes down. This is the central intuition behind "high tuition, high aid" or "tuition rationalization" (Hearn and Longanecker 1985). In this study, I investigate whether changes in public 4 year tuition are related to increases in need-based student aid, since a plurality of full time students enroll in public 4 year institutions. If policymakers in states are following a high tuition, high aid strategy, than any year-to-year changes in tuition should be followed quite quickly by changes in need-based aid.

The extant literature on the tradeoffs between need-based and merit-based aid suggest that merit-based aid is a new way of understanding the role of the state in helping students pay for college. The design suggested by this conceptual framework involves testing this hypothesis while controlling for a variety of other competing explanations, each of which could possibly account for changes in the growth of need-based aid in the states.

Data

The data in this analysis come from a panel dataset constructed from a variety of sources. All data cover the period of time from 1984 (when state-by-state data on student financial aid first became available) to 2005 (the last year that data are available for every indicator).

Dependent Variable

The dependent variable in this study is the amount of need-based aid awarded in each state per full time equivalent (FTE) students. This variable is derived from the National

Association of State Student Grant and Aid Programs annual survey, which has provided data on the total amount of aid awarded to students in all 50 states since 1984. The number of FTE is drawn from the National Center for Education Statistics *Digest of Education Statistics* 2001. I include FTE as a baseline, in order to aid in the comparability of this indicator across states.

Primary Independent Variable

The primary independent variable in this study is the total amount of merit-based aid awarded in the state per FTE. This variable is lagged 1 year in all model specifications in order to accurately represent the policy processes that are in place. If merit-based aid does "crowd out" need-based aid, as a result of changes in the policy equilibrium as described by Baumgartner, then the effects of this form of aid should be felt subsequent to changes in its overall level.

Controls

In addition to the primary independent variable of merit-based aid, I also include a series of controls. Each of these controls is included in order to ensure that any relationship to be estimated between need based aid and merit-based is robust to alternative hypotheses.

To control for the impact of *budgetary restrictions*, I include a variable for tax collections per capita (United States Department of Commerce, Bureau of Economic Analysis 2003). Tax collections per year are included as a control for the overall budgetary capacities of the state: a state that has lower levels of tax collections will be less able to spend funds on need-based aid than will a state with higher levels of tax collections per capita. Tax collections in any given year essentially set the boundary conditions for spending in all areas—I use tax collections instead of appropriations for higher education because appropriations may well be endogenous to both need- and merit-based aid, as well as the control for tuition levels. It is less likely, although not impossible, that tax collections are endogenous to aid and tuition amounts.

To control for the impact of *policy liberalism*, I include Berry et al's (1998) indicator of policy liberalism in state governments. To control for the differential impact of various *enrollment ecologies* across states, I include the percent of Full Time Equivalent Students (FTES) that are enrolled in private institutions in the state (US Department of Education 2001). Last, to control for the impact of *financial aid* concerns, I include the level of public college tuition (averaged across institutions) in the state (US Department of Education 2001).

All of the above controls are included only to ensure that the estimated effect of changes in merit-based aid on need-based aid can not be adequately explained by other variables.

Model Specification

I estimate four models in this analysis. I first estimate a simple Ordinary Least Squares model, which does not take into account either temporal dimensions or state-specific effects. Estimates from this model, however, are useful in understanding the direction of bias in other models. I then estimate a fixed-effect, or within group model. Next, I consider the class of dynamic panel data models. Within this class of models, I estimate

the Anderson-Hsiao instrumental variables model, and two separate specifications of the Arellano-Bond estimator, which makes use of Generalized Method of Moments (GMM).

Ordinary Least Squares

The OLS estimates use the following model specification:

$$y_{it} = \alpha + \delta y_{i,t-1} + \beta x_{i,t-1} + \gamma \mathbf{z}_{i,t-1} + \varepsilon_{it}$$

where: y_{it} need-based aid per FTE in state i in year t; α an intercept term; δ A coefficient on the lagged value of need-based aid per FTE, $y_{i,\ t} - 1$; $x_{i,t-1}$ the amount of merit-based aid per FTE awarded in the previous year; β a coefficient for the merit-based aid variable; $z_{i,t-1}$ A vector of state-specific controls as described in the data section, lagged 1 year. These include government liberalism, percent of FTE in privates, tax collections per capita, and public 4 year tuition; γ a vector of coefficients for the state-specific controls; ε_{it} an error term

In this model as in all subsequent models, the coefficient of interest is β. A negative and significant estimate of this coefficient would indicate that past levels of merit-based aid are negatively related to current values of need-based aid. This would provide support for the "crowding out" hypothesis.

Fixed Effects

Estimating the impact of merit-based aid on need-based aid via Ordinary Least Squares results in a biased estimate of δ, as the lagged values of the dependent variable would be correlated with the error term ε (Bond 2002). The fixed effects model controls for state-specific effects by including an additional dummy variable for every state in the model. The coefficient for this variable α_i indicates that a separate intercept is estimated for all states. All other variables remain as defined above.

$$y_{it} = \alpha_i + \delta y_{i,t-1} + \beta x_{i,t-1} + \gamma \mathbf{z}_{i,t-1} + \varepsilon_{it}$$

The fixed effects model can only estimate the within-state impact of the independent variable on the dependent variable. Although this model does solve the problem of correlation of the lagged value of the dependent variable with the error term due to group specific effects, there remains a correlation between group means (estimated by α) and the error term, which would also result in biased estimates (Bond 2002).

First-Differenced Dynamic Models

Estimators for dynamic models using panel data have been designed to overcome the problems with fixed-effects estimators described above. All of the dynamic models considered in this paper begin by first-differencing the data, subtracting the previous year's value from the current year's value:

$$\triangle y_{it} = y_{it} - y_{i,t-1}$$

A variable that has been differenced for a given value of t has had the previous year's value subtracted from the current year's value. A lagged variable that has been differenced has had the value from 2 year's ago subtracted from the previous year's value.

All of the dynamic estimators described in this paper are attempting to estimate a model of the form:

$$\triangle y_{it} = \delta \triangle y_{i,t-1} + \beta \triangle x_{i,t-1} + \gamma \triangle \mathbf{z}_{i,t-1} + \triangle \varepsilon_{it}$$

The first estimator used was described by Anderson and Hsiao in their 1991 paper (Anderson and Hsiao 1982). This estimator takes an instrumental variables approach. Instead of using the actual value of $\triangle y_{it}$ the authors suggest using an instrumented value, with past values of y_{it} serving as the instruments. The authors demonstrate that under generally applicable conditions, this estimator provides unbiased estimates of the coefficient β.

However, although this estimator is unbiased, it is not the most efficient. This is because it makes use of only a limited subset of all possible values of the instrumental variables. A more efficient estimator is available which makes use of Generalized Method of Moments (GMM) techniques for estimation. This approach, first introduced by Arellano and Bond (1991) uses all available past values of the dependent variable y when creating instruments for the lagged value of y. As Bond (2002) describes these methods, the instruments in this case vary for every year of y—early years can only take advantage of a small number of instruments, while later years use a longer time-series of instruments for the value of y. Under conditions which can be tested, this estimator is more efficient than the Anderson-Hsiao instrumental variables approach.

One of the key assumptions for the GMM approach described by Arellano and Bond (1991) is that the structure of the autocorrelation in the residuals does not carry beyond a single time lag. That is, the correlation between error terms from 1 year to the next year $E(\varepsilon_{it} \, \varepsilon it - 1)$ can be non-zero, but the second order correlation or, AR(2) estimate, $E(\varepsilon_{it} \, \varepsilon it - 2)$ must be 0 by assumption. Using lags of the lagged dependent variable from two periods back and further as instruments requires that the correlation in the error terms not exist beyond a single time period. To test this, I estimate the AR(1) and AR(2) correlations in the data. Should the AR(2) estimate prove to be statistically significant using the procedure described by Arellano and Bond (1991), I will push back to a greater depth in lags, going from using a 2-year lag for the instruments to a 3-year lag.

The variables for need-based and merit-based aid are both transformed by taking natural logs. This is done to reflect the highly non-normal distribution of these data and to aid in interpretation. As a result of this transformation, the coefficient β can be interpreted as the approximate impact of a percent change in merit-based aid on need-based aid (also expressed in percentage terms). For instance, a coefficient of 1 estimated from such a model would indicate that a one percent change in the independent variable is predicted to increase the dependent variable by one percent. Models of this form are commonly used to estimate elasticity in econometrics (Greene 2003).

Results

Results from all specifications are reported in Table 1. As I will discuss in this section, I did not find a statistically significant relationship between changes in state need-based aid and changes in state merit-based aid.

Ordinary Least Squares results are described in columns 1 and 2 of Table 1. The model with just lagged values of need- and merit-based aid is reported first, followed by the model with all "control" variables as described in the data and methods section. As the table shows, OLS estimates of the impact of merit-based aid on need-based aid are not

Table 1 Results of estimation, all models. Dependent variable = log need-based aid per FTE

	(1) OLS No controls	(2) OLS Full model	(3) F.E No controls	(4) F.E. Full model	(5) IV No controls	(6) IV Full model	(7) GMM (depth = 2) No controls	(8) GMM (depth = 2) Full model	(9) GMM (depth = 3) No controls	(10) GMM (depth = 3) Full model
ln need aid	1.001 (0.006)	0.997 (0.007)	0.875 (0.020)	0.876 (0.020)	1.001 (0.006)	0.998 (0.008)	0.707 (0.069)	0.504 (0.292)	0.675 (0.171)	0.558 (0.179)
ln merit aid	0.001 (0.009)	0.001 (0.009)	0.003 (0.017)	0.004 (0.017)	−0.006 (0.012)	−0.013 (0.013)	0.015 (0.023)	−0.002 (0.064)	−0.006 (0.041)	0.017 (0.040)
Liberalism		0.553 (0.280)		0.357 (0.464)		0.587 (0.317)		1.021 (2.437)		−0.250 (2.764)
Private enroll		−0.025 (0.049)		−0.117 (0.474)		−0.037 (0.072)		−2.372 (3.409)		1.075 (3.782)
Taxes (1,000s)		−0.012 (0.030)		−0.046 (0.095)		−0.010 (0.029)		−0.096 (0.693)		0.025 (0.618)
Tuition (10,000s)		0.084 (0.105)		0.153 (0.194)		0.064 (0.090)		0.022 (0.926)		−0.859 (1.672)
Constant	0.058 (0.037)	−0.043 (0.071)	0.576 (0.092)	0.576 (0.206)	0.000 (0.000)	0.000 (0.000)				
N	1000	999	1000	999	1000	999	948	948	950	948
Sargan (χ^2)							37.51	26.69	28.35	22.39
D.F. Sargan							344	340	304	300
p-value, Sargan							1.00	1.00	1.00	1.00
AR(2)							2.52	1.82	2.32	2.16
AR(2) p							0.01	0.07	0.02	0.03
AR(3)									−1.36	−1.28
AR(3) p									0.17	0.20
R^2 or χ^2	0.97	0.97	0.83	0.83	4.75 + e05	4.75 + e05	7925.594	18145.495	1990.33	8692.321
χ^2 p					0.00	0.00	0.00	0.00	0.00	0.00

Note: All independent variables lagged 1 year

statistically significant, but are nearly identical whether or not other controls for other state characteristics are included .[1]

The results from the fixed effects model are reported in columns 3 and 4 of Table 1. Again, the standard errors for the coefficient for merit-based aid are nearly double the coefficient estimate. These values are also very similar in both the parsimonious (column 3) and full (column 4) specifications of the model.

Instrumental variables estimate from the approach described by Anderson and Hsiao (1982) are displayed in columns 5 and 6 of Table 1. These results do not show any impact of merit-based aid on need-based aid, after controlling for previous values of need-based aid. These results could be affected by improper specification of the dynamic model.

I next report estimates using the GMM approach described by Arellano and Bond. As mentioned previously, the identification of this estimator rests on the assumption that there is no second-order serial correlation in the differenced error terms. If so, then the "depth" used for constructing the instrument matrix must be pushed back. This process is in effect looking for past values of the endogenous variable that are uncorrelated with current differenced value of this variable. Results of this test are shown in Table 1. As columns 7 and 8 of Table 1, labeled GMM (depth = 2) show, the second order serial correlation ($AR(2)$) is statistically significant for this specification. For this reason, I use a model with depth equal to 3, which is shown in columns 9 and 10 in Table 1. As the table shows, the value for δ, the coefficient on the lagged value of the differenced dependent variable, is highly statistically significant. However, the coefficient for changes in merit aid is not statistically significant. I again can not find evidence that after controlling for past changes in need-based aid, changed in merit-based aid affect changes in need-based aid.

It is interesting to note that the GMM estimates of δ, the coefficient for the lagged value of need-based aid, are much smaller than the IV estimates. As the last columns of Table 1 show, these estimates range from 0.7 to 0.5, indicating that the a 1% increase in need-based aid in a previous year will result in a 0.5% increase in the next year. The almost perfect elasticity estimated in the OLS or fixed effects models is revised substantially downward in the GMM estimates, indicating that the year-to-year impact of previous values of need-based aid in the states is not as great as other estimates would lead one to believe.

The conclusion from this part of the analysis provides substantial support for the idea of incrementalism in setting levels of need-based aid. Within states, there is little evidence of the kind of "punctuated equilibrium" described by Baumgartner and Jones at work in this policy arena Baumgartner and Jones 1991, 1993.

Another possible specification of this model is to exclude the lagged value of the dependent variable, thus estimating the impact of the previous year's value of merit-based aid on the current year value of need-based aid, without controlling for past values of need-based aid. This does not speak directly to the incrementalism hypothesis, but may help to reveal any pattern of direction between merit- and need-based aid. These results are reported in Table 2. As with the original specification, however, the coefficient on merit-based aid is not significant in any of the models.

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[1] As a check on possible issues of multicollinearity, I calculated variance inflation factors (VIFs) for the set of covariates included in the regressions. This involved two sets of calculations, one for the variables in nominal terms and the other for the variables after first differencing. None of the VIFs exceeded 4. The variable with the highest VIF was public four year tuition, with a VIF of 3.94 when entered in nominal terms and 1.32 when entered as a first difference.

Table 2 Results of estimation, all models. Dependent variable = log need-based aid per FTE

	(1) OLS No controls	(2) OLS Full model	(3) F.E. No controls	(4). F.E. Full model	(5) IV No controls	(6) IV Full model	(7) GMM (depth = 2) No controls	(8) GMM (depth = 2) Full model	(9) GMM (depth = 3) No controls	(10) GMM (depth = 3) Full model
ln merit aid	0.007 (0.131)	0.053 (0.123)	0.035 (0.075)	0.041 (0.073)	0.013 (0.137)	0.073 (0.128)	−0.069 (0.021)	−0.055 (0.046)	−0.053 (0.100)	−0.076 (0.060)
Liberalism		0.674 (0.432)		−0.020 (0.200)		0.669 (0.420)		0.077 (0.087)		0.190 (0.480)
Private enroll		1.186 (1.013)		−0.276 (1.972)		1.200 (0.985)		−2.639 (3.439)		−2.006 (3.858)
Taxes (1,000s)		0.082 (0.051)		0.040 (0.050)		0.082 (0.050)		0.040 (0.034)		0.016 (0.140)
Tuition (10,000s)		0.361 (0.141)		0.039 (0.075)		0.363 (0.137)		0.076 (0.064)		0.094 (0.215)
Constant	4.201 (0.392)	1.982 (0.756)	4.125 (0.212)	4.462 (0.713)	4.936 (0.556)	1.899 0.759)				
N	1000	999	1000	999	1000	999	948	948	950	948
Sargan (χ^2)							29.31	27.83	35.16	19.98
D.F., Sargan							174	170	152	148
p-value, Sargan							1.00	1.00	1.00	1.00
AR(2)						2.61	2.27	2.13	2.30	1.91
AR(2) p						0.01	0.02	0.03	0.02	0.06
AR(3)									0.29	−0.20
AR(3) p									0.774	0.839
R^2 or χ^2	0.05	0.35	0.32	0.33	179.06	311.81	9429.83	105.24	226.79	116.29
χ^2 p					0.00	0.00	0.00	0.00	0.00	0.00

Note: All independent variables lagged 1 year

These analyses, involving five different modeling approaches, including three instrumental variables models, fail to find any relationship between changes in funding for merit-based aid programs and changes in funding for need-based aid programs. As far as the evidence provided in this analysis, the two programs do not appear to have a statistically significant association.

Limitations

As this analysis has shown, I am unable to detect any statistically significant impact of merit-based aid on need-based aid. Current values of need-based are best predicted by past values of itself, with few other state-level characteristics showing any demonstrable impact on year-to-year changes in aid.

There are several reasons why this result may not in fact reflect the actual relationship between need- and merit-based aid. The number of states with any sizable merit-based program may still be too small, with too few years in the dataset to pick up what is actually occurring in state capitals. As merit aid programs continue to grow and evolve, and as states continue to struggle with financing for higher education, it may yet well be that existing need-based aid programs will be de-funded or even eliminated outright. In short, it may be too early to detect this particular second-order effects of merit-based aid programs.

Another possible reason for the lack of a significant finding could be that the causal direction suggested by this paper may be backward. States might adopt a merit-based program after declines in their need-based program. The impact of merit-based aid may take place many years after its initial adoption. States that had adopted merit aid during the time period in this study were limited to those that generally had rather small need-based programs (see Fig. 1).

Another reason why I was unable to detect a statistically significant relationship between changes in need-based aid and changes in merit-based aid has to do with the use of first-differenced models. Changing the dependent and independent variables into first-differences constrains the variance in both. For instance, the standard deviation in nominal log need-based aid is 1.1, while the standard deviation in the log of need based aid after first-differencing is 0.21. Similarly, the standard deviation of the log of merit based aid is 1.1, while the standard deviation of the first difference of log merit-based aid is 0.37. However, even the basic OLS and Fixed Effects specifications of the model, which are not based on first differences, fail to detect a statistically significant relationship between need-based and merit-based aid. The more complex models, which did involve first-differencing, confirm that it's unlikely that this result is due to a bias arising from misspecification.

Policy Implications

As mentioned in the introduction, the analysis reported in this paper can not answer what may be the most important questions about the rise of merit-based aid, which is: what *would have* happened to need-based aid in the states in which merit aid was adopted had the governors and legislators not chosen to create these programs? However, as far as the question of *what did* happen to need-based aid in these states after merit-aid programs were adopted, the answer is: very little. Given the models and specifications identified in this analysis, there is no detectable impact of merit-based aid on changes in need-based aid.

This paper does find support for the concept of incrementalism in state budgeting for higher education. As this analysis shows, even in states where large changes were underway in terms of funding for merit-based aid, there is little to no evidence of impacts on need based aid, after controlling for past values. This means that, at least in the realm of need-based state aid, the past is the best guide to the future.

Given the results of this study, there is little evidence so far that merit-based aid programs have been displacing need-based aid programs. However, this does not mean the concerns that have been raised about the effect of merit-based aid on other forms of aid are not valid. Rather, it may be useful to reconceive how the tradeoffs are considered between these two types of aid.

There are other second-order effects of merit-based aid programs that are also worthy of further exploration. One is the impact of such programs on student awareness of financial aid, which has been suggested by case studies but not subject to any systematic evaluation (Turner et al. 2004). The long-term financial viability of such programs is another issue that has so far received little study. Particularly for those driven by lottery revenues, it's not clear what will happen if gambling revenues don't continue to increase—will these states be willing to fund such programs out of their general revenues?

In many states where merit aid programs have been adopted, policymakers have argued that no political will existed to either create or expand need-based financial aid. In such states, it may be a better use of time and effort to shape the political agenda towards making merit-based programs more broadly available and to the extent possible, more progressive. In states with existing need-based programs, these programs should be increased in order to ensure higher levels of affordability. At least at this point, there appears to be little reason to argue that the two types of programs are crowding one another out. Rather, each type of program ought to be designed to maximize enrollment among those who could benefit from higher education.

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