On the frontlines of college access:
Navigating the administrative burden of applying to public universities

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Abstract

This study extends administrative burden into new theoretical terrain on two fronts. First, analyzing the effect of high school counselors on the odds of submitting postsecondary applications conceptualizes frontline workers as a potential moderator of administrative burden. Second, by extending administrative burden into the field of education, this study demonstrates the utility of administrative burden's theoretical framework across public domains. Leveraging administrative data from Washington State within a series of multilevel models, the study finds that a higher level of frontline workers increases application rates in two circumstances. First, higher levels of frontline staff increase the odds of application submission for applications that are disproportionately burdensome, such as the application used by the state's public flagship university. Second, higher levels of frontline workers are also associated with a higher odds of application submission for low-income and underrepresented minority students who submit applications with minimal levels of administrative burden. These findings, in the context of street-level bureaucracy and access to public postsecondary education, make a meaningful contribution to the development of the administrative burden framework.

Introduction

Administrative burden provides a theoretical framework to analyze how application barriers shape the take-up of, and access to, public programs and policies. Moynihan, Herd, and Harvey (2015) define administrative burden, a term introduced by Burden, Canon, Mayer, and Moynihan (2012), as the "costs that individuals experience in their interactions with the state" (p. 45). Administrative burden has been studied as administrators implementing public policy (Burden et al. 2012), government's regulation of the private sector (Arendsen et al. 2014), and citizens accessing public programs and resources (Herd, DeLeire, Harvey, and Moynihan 2013; Heinrich 2016; Moynihan and Herd 2010; Moynihan, Herd, and Harvey 2015; Moynihan, Herd, and Ribgy 2013). Contributing to this growing literature on how citizens access public programs and resources, the present study examines the administrative burden faced by citizens in their pursuit of public postsecondary education and the extent to which frontline workers may moderate such burden.

This study extends administrative burden into two new theoretical domains. First, analyzing the effect of high school counselors on the odds of submitting postsecondary applications conceptualizes frontline workers as potential moderators of administrative burden. This proposed theoretical intersection between administrative burden and street-level bureaucracy provides an opportunity to explore how frontline workers may moderate the barriers that arise from administrative burden. Second, by extending administrative burden into a new public realm, education, this study demonstrates the versatility and utility of administrative burden's theoretical framework across an increasingly diverse set of public contexts. This study answers the call for more public administration research on education in general (Raffel 2007) and higher education in particular (Hicklin and Meier 2008; Lowry 2007). This research also reinforces Heinrich and

Lynn's (2001) argument that multilevel models have "considerable potential for governance research" (p. 134). In the specific context of administrative burden, this study's multilevel approach demonstrates the utility of modeling Level 2 organizational-level management variables that affect a Level 1 phenomenon, that is, the citizen experience of administrative burden.

Administrative burden, frontline staff, and the take-up of public programs and policies

Take-up is the process through which a citizen applies, and thus gains access to, a public program or policy (Currie, 2006). Interventions to increase utilization by boosting take-up have been examined for such programs as Medicaid (Aizer 2003; Moynihan, Herd, and Harvey 2015), the State Children's Health Insurance Program (Wolfe and Scrivner 2005), the Earned Income Tax Credit (Kopczuk and Pop-Eleches 2007), and the Supplemental Nutrition Assistance Program (Schanzenbach 2009). Each of these studies examines the submission of an application as a primary outcome of interest.

Moynihan, Herd, and Harvey (2015) bring together much of the extant literature on take-up in their conceptualization of administrative burden. Specifically, the authors focus on three types of costs associated with the burden of submitting applications (p. 46):

1. Learning costs – a citizen must learn about the program, her eligibility for the program, and how to access the program.

2. Compliance costs – a citizen must complete an application, provide documentation, and respond to discretionary demands.

3. Psychological costs – the stigma, loss of autonomy, and increases in stress that may accompany program processes and participation, especially in an unpopular public program.

Extant research on postsecondary application behavior analyzed within this administrative burden framework supports an argument that those who apply to college indeed experience learning costs, compliance costs, and psychological costs that may deter them from submitting an application.

However, prior to examining the college application process through administrative burden's framework of learning, compliance, and psychological costs, the college application process itself must be positioned as an analog of the administrative steps through which citizens take-up programs and policies. Consider first the mechanics of the general take-up process. For a given program or policy, political actors or managers identify a program or policy's targeted group. Program administrators then create an application to collect information that enables means-testing or other determinants of eligibility. Individuals from the targeted group, in turn, submit applications to gain access to the program or policy. Program staff fitting the definition of street-level bureaucrats (Lipsky 1980/2010; Maynard-Moody and Portillo 2010) employ varying degrees of discretion in reviewing the application's materials and, ultimately, make a decision to accept or reject the application.

The college application process comprises each of these steps. For public universities in particular, Blume (2014) discusses instances where state legislatures, governors, and citizen-led governing boards influence the information that is, or is *not*, collected on applications. This is not to say that the admissions process at public universities, especially selective institutions, are analogous to a local government office that processes food stamp applications. Admissions

decisions at universities represent the assessment of an individual's competitiveness relative to the applicant pool among a set of diverse, often competing institutional priorities (Bontrager and Green 2014; Lucido 2014). Rather, the process by which an individual submits an application to a public university is analogous to the take-up of other public programs because the process represents a citizen-state interaction in which the submission of an application is a necessary condition for the citizen to access the state's resources, be them food stamps or public postsecondary education. The citizen-side characteristics of the college application process are similar to other public contexts in which applications are submitted such that administrative burden's theoretical frame provides valuable insight into the barriers that arise in a citizen's pursuit of public postsecondary education.

Moynihan, Herd, and Harvey (2015) observe that "education is [a] policy area where burdens matter," and note that in the case of attending college, "high-achieving low-income students face learning costs that their better-advised high-income peers do not" (p. 45). The authors review recent policy experiments demonstrating an increased probability of a student submitting an application based on such burden-relieving interventions as assistance with applying for federal financial aid (Bettinger et al. 2012) or packets containing application-fee waivers, information about colleges, and background on the net costs of attending college (Hoxby and Turner 2013). These experiments, designed from an economic perspective of lowering the costs of college-related application processes, are devoid of any theoretical application of administrative burden. Hence, expanding on the findings from these narrowly tailored experiments, I review here how all three types of administrative burden costs are experienced in the college application process.

The *learning costs* associated with applying to college involve such activities as investigating the universities to which a student might apply, visiting college campuses,

researching the specifics of an institution's admissions policies, and gauging one's competitiveness for admission given an institution's level of selectivity. Learnings costs for students from disadvantaged backgrounds are likely to be particularly steep given that these students often face challenges in navigating admissions processes (Holland 2015; Woods and Domina 2014) and gauging their eligibility for selective colleges (McDonough 1997).

The submission of an application for admission is the observable behavior that represents applying to college but the college application process often spans a high school student's junior and senior years (Avery and Kane 2004). Given the duration of the process, the *compliance costs* of applying to college are substantial. Completing an application typically starts with paying for and taking standardized tests (either the SAT or ACT) in the student's junior year (Klasik 2012). High school students in the 11th grade must also organize lists of colleges and universities to which they will apply since applications are due in the early part of the 12th grade (Kirst and Bracco 2004). The submission of a college application involves filling out extensive forms, submitted on paper or online, writing essays, sending standardized test scores and high school transcripts to colleges, and paying application fees, all of which can represent substantial compliance costs to manage. At more selective institutions, further compliance costs may include letters of recommendation and in-person interviews that are encouraged or required as part of an application.

Administrative burden's *psychological costs*, the stigma, loss of autonomy, and increases in stress that may accompany program processes and participation, are a well-researched area of the take-up, implementation, and program evaluation literature (Currie 2006; Lipsky 1980/2010; Soss 1999). Salient here is the disproportionate stress that individuals from particular backgrounds experience in navigating components of the college application process. The potential for

stereotype threat[1] observed in women and African Americans, for example, is a documented psychological barrier and source of stress that negatively affects scores on the college entrance SAT exam. McDonough (1997) also documents the emotional stress that low-income high school students face in navigating the many steps in the college application process. McDonough attributes this stress to the fact that low-income students are often the first in their family to attend college.

Counselors as Frontline Workers

This study conceptualizes public high school counselors as street-level bureaucrats and a potential moderator of the learning, compliance, and psychological costs that comprise administrative burden. Smith (2011) notes in passing that the contemporary role of American high school counselors has much in common with Lipsky's (1980/2010) classic conception of street-level bureaucrats. Lipsky (2010) himself notes, in the preface to the updated edition of his seminal 1980 publication, that "high school counselors" are on the front lines in a manner that is structurally similar to "judges, police offices, and social workers" such that one could easily "compare these [frontline] work settings with each other" (xii). Beyond these brief references, however, no study has yet applied the broader street-level bureaucracy literature to public high school counselors.

The broader theoretical intersection between administrative burden and street-level bureaucracy is important to acknowledge given that each represents a dimension of a citizen's

[1] Steele (1997) defines stereotype threat as "the social-psychological threat that arises when one is in a situation or doing something for which a negative stereotype about one's group applies" (p. 614). From its inception, stereotype threat has been tested using the college entrance SAT exam to empirically demonstrate the ways in which females and African Americans underperform on intellectual and academic tests (e.g. Steele & Aronson, 1995; Steele, 1997).

relationship with the state. As noted earlier, Moynihan, Herd, and Harvey (2015) define administrative burden as the costs that individuals experience in their interactions with the state. Lipsky (1980/2010) likewise positions street-level bureaucracy as the intermediary between citizen and state in noting that "street-level bureaucrats implicitly mediate aspects of the constitutional relationship of citizens to the state" (p. 4).

Research on high school counselors takes on one of two themes that extend in a straightforward manner to administrative burden's learning, compliance, and psychological costs related to the take-up of postsecondary education. The first theme revolves around the general impact that counselors have on students' college application and enrollment rates. This research demonstrates a positive relationship between the amount of counseling resources in high schools and the postsecondary enrollment choices of students in those schools. Belasco (2013), for instance, finds that more one-on-one interactions between student and counselor increase the odds of enrollment at a four-year university.

The second theme in the counselor literature focuses on how counselors support students from disadvantaged backgrounds in their pursuits of postsecondary education. This literature illustrates the ways in which counselors play an active role in students' college application process especially across first-generation, low-income (Holland, 2015; McDonough, 1997), and underrepresented racial/ethnic groups (Gonzalez, Stoner, & Jovel, 2003; McKillip et al., 2012; Muhammad, 2008). The varying counselor roles in this context include providing emotional (McDonough, 1997), guidance (McKillip et al., 2012), and technical (Belasco, 2013) support to disadvantaged students as they navigate the barriers associated with college enrollment.

Hypotheses and background

With application behavior identified as a consequential juncture in the logic of taking up public postsecondary education, Hypotheses #1 uses public postsecondary application rates to test the extent to which public high school counselors increase the odds of application submission:

H1: Higher levels of frontline workers increase the odds of application submission.

The established role that counselors play in supporting students from low socioeconomic status (low-SES) and underrepresented minority (URM) backgrounds (Freeman, 2005; Holland, 2015; McDonough, 1997) yields Hypotheses #2:

H2: Higher levels of frontline workers increasing the odds of application submission for low-income students and students from underrepresented minority backgrounds.

Washington State serves as a qualitatively typical case to study frontline workers and the administrative burden associated with applying to public universities. Washington State is a typical case in that the state's characteristics align with national characteristics across important hypothesis-related dimensions. The K-12 public school student-to-counselor ratio in Washington in 2010, for example, was 510 to 1 compared to a national average of 471 to 1 (NACAC, 2012).[3] Principals in Washington have discretion in setting counselor levels at public high schools so the number of counselors at a public high school differs to varying extents relative to the school's

[3] National figures for student-to-counselor ratios specific to public high schools are sparse but Hurwitz and Howell (2014) estimate that in 2008 (the most recent year of data they use in their study) the public high school student-to-counselor ratio nationwide was 319 to 1 (p. 318); Washington State's public high school student-to-counselor ratio was 342 to 1 between 2006 to 2010. Hurwitz and Howell (2014) observe that public high school student-to-counselor ratio in the United States ranged from a high of approximately 400 to 1 in Arkansas to, at the low end, the general vicinity of 200 to 1 in New England states (p. 318).

enrollment (Senate Ways and Means Committee, Washington State Legislature, 2011). The proportion of students aspiring to earn a bachelor's degree or higher in 2010 in Washington also mirrors the proportion of students nationwide with similar postsecondary aspirations (73.7% and 74.8%, respectively).[4] Finally, the distribution of public universities in the state also offers a typical range of options. The state system of public four-year universities in Washington comprises one selective flagship university (the University of Washington), one moderately selective land grant university (Washington State University), and three regional comprehensive universities of varying selectivity (Western Washington, Central Washington, and Eastern Washington Universities). This mix of public postsecondary institutions in the state, and the characteristics of the applications students must submit to such institutions to enroll, provides variation to analyze how frontline workers may ease administrative burden across organizational contexts.

The administrative burden individuals face in their pursuit of postsecondary education is not unique to public universities. What is unique is the relationship, both political (Cohen and Noll 1998; Hicklin and Meier 2008; Lowry 2007; McLendon 2003) and administrative (Coates, Humphreys, and Vachris 2004; Rabovsky 2014; Volkwein and Malik 1997), *between the public university and the state*. This study's focus on applications submitted to public universities admittedly does not capture the entirety of the postsecondary marketplace. Students inevitably submit applications to private universities, trade schools, and two-year community colleges, all of which fall outside the scope of this study. As with public management and public administration studies that examine either public schools (e.g. Barrows et al., 2016; Destler, 2016; Weiss & Piderit, 1999) or public universities (e.g. Fryar & Hawes, 2011; Hicklin & Meier, 2008; Long,

[4] These data capturing postsecondary aspirations, available upon request from the author, are derived for students in Washington State from the U.S. Department of Education's nationally-representative High School Longitudinal Study of 2009.

2007; Rabovsky, 2014) as the public organization of interest, this study conceptualizes public high schools and public universities as a system of public governance.

Moynihan, Herd, and Ribgy (2016) note that the characteristics of applications themselves (e.g. length, required documents that must be submitted with applications, etc.) are crucial to an analysis of administrative burden because the application is the gateway through which the citizen accesses a public program or policy. The applications from each of Washington's five public universities were systematically evaluated with a protocol similarly to Moynihan, Herd, and Ribgy[5] (2016) to assess administrative burden in a manner that contextualizes this study's hypotheses, empirical analysis, and findings. The resulting analysis of applications (Table 1) provides two indicators to gauge an application's potential burden.

TABLE 1: PUBLIC UNIVERSITIES' APPLICATION CHARACTERISTICS, 2010

	Application Magnitude			Application Reporting Burden[7]			
	Length of Application[8]						
	Pages	Words	Number of Questions	Academics	Socio-economics	Personal	Residency
Univ. of Washington	20	10,969	232	5	2	4	3
Washington State Univ.	4	1,325	96	5	3	2	3
Western Washington Univ.	6	2,717	138	5	3	4	3
Central Washington Univ.	4	1,050	63	5	3	0	3
Eastern Washington Univ.	6	1,234	89	5	3	4	3

Interrater reliability[9] for reporting burden levels, 0.957 ($p<0.001$)

[5] A full description of the process for qualitative document analysis is found in Appendix A.
[7] For the measures of application reporting burden, scores ranged from "0" if no information was requested in this area of the application to "6" in cases where "Information was required and proof/verification was required; applicant provides information in an open-ended format."
[8] Paper applications were coded because no public university archived its online application, assuming that the paper application mirrors the online application.
[9] Cohen's weighted kappa (Cohen, 1968) was used because of the ordinal nature of the administrative burden scale; see Appendix A for more details.

First, burden is assessed in terms of its magnitude, measured by the length of the application (in pages and words) and the number of questions a hypothetical applicant would need to answer to complete the application. Second, reporting burden is measured to reflect the extent or range of information an applicant must provide during the application process.

Whereas Moynihan, Herd, and Ribgy (2016) incorporate these burden measures into their quantitative analysis, the figures in Table 1 are used to contextualize the statistical findings for frontline workers and the odds of application submission within administrative burdens' theoretical framework. Independent of the statistical analysis, however, a cursory glance of Table 1 reveals noteworthy variation in application burden across public universities. First, all five public universities have equivalent levels of reporting burden for academics and residency, and nearly uniform burden relative to a student's reporting of her socioeconomic circumstances. The area of personal reporting burden (which includes such factors as extracurricular activities, nonacademic involvements, and hardships the student has experienced) is the only category that appears to vary.

Second, the substantial magnitude of the University of Washington's application compared to those of the other four public universities is readily apparent in Table 1. Note that the page length and number of words comprising the University of Washington application is more than three times that of the next most burdensome application, Western Washington University. The discussion section of this study returns to these figures from Table 1.

Methods

This study estimates a series of hierarchical generalized linear models (HGLMs) since the citizen-level behavior of interest (i.e. the act of submitting an application) is nested within public organizations (high schools) with hypothesis-related variables of interest at this higher organizational level. The HGLM approach extends a conventional generalized linear model in that

modeled intercepts and slopes can vary randomly at the group level. A strong theoretical case for the use of multilevel models has been made in the literature (Lynn, Heinrich, and Hill 2000; Heinrich and Hill 2010; Heinrich and Lynn 2001; Hicklin 2010). Echoing May and Winter (2007), this study employs multilevel models as a "conceptually and statistically superior" approach to detect "theoretically relevant cross-level interactions and main effects" (p. 461) given its focus on organization-level variables.

HGLMs allow for greater statistical precision compared to ordinary least squares estimates by accounting for organization-level Level 2 effects on Level 1 (citizen-level) outcomes of interest (Garson 2013; Raudenbush and Byrk 2001). Specifically, Level 1 [Eq. 1] models for student *i* at public high school *j* the log odds of application submission, controlling for student *i*'s GPA at graduation, the number of AP courses completed during high school, and if the student ever took calculus.[10] The inclusion of each of these variables represents elements of the core criteria by which admissions offices make their admission decisions (Bastedo, Howard, & Flaster, 2016; Lucido, 2014) and therefore serve as important predictors of a student's odds of application submission to a particular postsecondary institution. The student's gender membership in an underrepresented racial/ethnic group (URM), and receipt of free or reduced price lunch (FRPL) are included; an interaction between free and reduced price lunch receipt and underrepresentation is also included (FRPL x URM) as is a dummy variable capturing if the student is a low-income African American male[11] (FRPL.BLACK.MALE):

[Eq. 1]

[10] Student SAT/ACT scores are unavailable since these data are not typically housed in state administrative records.
[11] This indicator is included based on the empirical evidence that African-American/Black young men from low-income backgrounds face disproportionate barriers in accessing postsecondary education in the United States (Harper, 2006; Harper & Griffin, 2011).

$$\eta_{ij} = \beta_{0j} + \beta_{1j}(\mathrm{GPA}_i) + \beta_{2j}(\mathrm{AP}_i) + \beta_{3j}(\mathrm{Calculus}_i) + \beta_{4j}(\mathrm{Gender}_i) + \beta_{5j}(\mathrm{URM}_i) + \beta_{6j}(\mathrm{FRPL}_i) + \beta_{7j}(\mathrm{FRPL}_i \times \mathrm{URM}_i) + \beta_{8j}(\mathrm{FRPL.BLACK.MALE}_i)$$

where η_{ij} is a logit link function generating the log odds of the outcome i.e. $\log(\varphi_{ij}/1-\varphi_{ij})$ with φ_{ij} as the probability of application submission for student *i* at high school *j*. The nature of the HGLM model is such that the intercept at Level 1, β_{0j}, randomly varies and is modeled at Level 2 by organization-level characteristics, management variables pertaining to frontline workers, and organization-citizen cross-level effects;

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\mathrm{ENROLL}_j) + \gamma_{02}(\overline{\mathrm{FRPL}_j}) + \gamma_{03}(\mathrm{DIST}_j) + \gamma_{04}(\mathrm{CounselorFTE}_j) + \gamma_{05}(\mathrm{CounselorFTE}_j \times \mathrm{URM}_i) + \gamma_{06}(\mathrm{CounselorFTE}_j \times \mathrm{FRPL}_i) + r_{0j} \quad \text{[Eq. 2.1]}$$

That is, for each high school *j*, Level 2 includes the enrollment of the school ($ENROLL_j$) and the percentage of students at the school eligible for free and reduced-price lunch ($\overline{FRPL_j}$). The model also contains the distance ($DIST_j$, in drive-time minutes) between the public high school and the in-state postsecondary institution for which the odds of application submission is calculated. Level 2 also contains the key variables to test this study's hypotheses that pertain to alleviating administrative burden. In Equation 2.1, $CounselorFTE_j$ represents an average number of counselors between 2006 to 2010 as a full-time equivalent count (FTE) at high school *j*.[12]

[12] Based the street-level bureaucracy literature, frontline staff were also measured as caseloads (i.e. the ratio of a frontline worker to the number of students in a school). The statistical findings on caseloads in this study are relatively weak so the figures, and a discussion around their interpretation, appear in Appendix B.

Two interactions at Level 2 leverage the multilevel model's ability to examine statistical relationships across the hierarchical structure of the data. Specifically, the level of counseling resources at school *j* (*CounselorFTE)* interacts with individual-level characteristics (receipt of free or reduced price lunch, FRPL, and being from an underrepresented minority group, URM) that are known to predict disadvantage in the pursuit of postsecondary education (Perna, 2000; McDonough, 2005; Klasik, 2012). Smith (2006) observes that multilevel models are well-suited when hypotheses seek to test to what level of the hierarchy variation in individual outcomes are attributable (p. 82). These interactions, known as cross-level effects, illustrate how specific subpopulations of students may be differentially affected by organization-level factors such as the effect of frontline workers on low-income students (Hypothesis 2).

Finally, to account for variation in district-level resources, Level 2's random intercept is modeled at Level 3 as a function of district-level expenditures per student. Specifically,

$$\gamma_{00} = \pi_{000} + \pi_{00j}(\text{EXPENDITURES}) + u_{00j} \qquad \text{[Eq. 3]}$$

Ideally per-student expenditures would be included at the school level but these school-level budget data have only become available in Washington since 2013. As such, the model leverages the budget data available for the relevant years, which exist only at the higher, district level.

Multilevel models are warranted when outcomes are significantly correlated at the group level. This level of correlation, expressed as the intraclass correlation coefficient, represents what Snijders and Bosker (2012) call "the degree of resemblance between micro-units belonging to the same macro-unit" (p. 17). Following the Snijders and Bosker (2012) formula to calculate an intraclass correlation coefficient for a logistic distribution, namely $p = \frac{\tau_0^2}{\tau_0^2 + \pi^2/3}$ where τ_0^2 is the

intercept's variance and $\pi^2/_3$ is the variance for the logistic distribution of Level 1 residuals, a substantial level of within-group correlation is observable across the application outcomes modeled in this study (Table 2).

TABLE 2: INTRACLASS CORRELATION COEFFICIENTS FOR APPLICATION SUBMISSION BY UNIVERSITY

Application submission	p
Flagship	0.26
Land Grant	0.12
Comprehensives	0.13

A general rule of thumb for interpreting intraclass correlation coefficients is that any value greater than 0.05 suggests that within-group correlation will bias standard errors and, accordingly, a multilevel model is warranted to address such bias (O'Connell, Goldstein, Rogers, and Peng 2008).

I fit three separate GLMMs to examine application submission to the state's flagship university, application submission to the state's land grant university, and application submission to one of the state's three regional comprehensive universities. I use separate models based on empirical and theoretical considerations. Empirically, I use three models because application submission is not mutually exclusive. A student may choose to apply to the state's flagship university and the state's land grant university, thus making a single model (e.g. a multilevel multinomial logit) inappropriate. Theoretically, I assume that the potential for frontline workers to alleviate administrative burden will vary across the three types of institutions to which students apply. I contend here, based on the discussion earlier of varying application burden levels across institutions, that institutional heterogeneity and varying levels of application burden makes

application behavior distinct based on the institution and the characteristics of each institution's application.[13]

Data

This study leverages statewide administrative data to analyze the extent that frontline workers in public high schools moderate the administrative burden of applying to college. The core of these data is the universe of students who graduated from Washington public high schools in 2010 (n=50,582). Provided by the state's Office of Superintendent for Public Instruction (OSPI), these data contain each student's demographic characteristics and academic records.

Application data from each of the state's five public universities were merged to these baseline student-level data. The application data contain records for Washington resident high school graduates who applied for admission to the state's public universities for fall quarter of 2010. From these application data, three dichotomous variables are constructed to serve as dependent variables: application submission to the state's flagship university, application submission to the state's land grant university, and application submission to one of the state's three regional comprehensive universities.

Additional organizational and district-level characteristics were merged to each student record. The Office of the Superintendent for Public Instruction (OSPI) provided the state administrative personnel records containing the counselor full-time equivalents (FTEs) for each of the state's high schools from 2006 to 2010. The U.S. Department of Education's National Center

[13] The error terms of these three models are likely correlated and therefore produce unbiased, but inefficient, estimates. Noting that in this situation the estimation of models in "seemingly unrelated regressions" would yield efficient estimates, Long (2004, p. 328) uses semiparametric generalized least squares to estimate such a system. The implementation of this approach relative to multilevel modeling, however, presents a technical challenge beyond the scope of this study and, as such, I proceed with the use of three distinct multilevel models with an acknowledgment of their inefficiency.

for Education Statistics Common Core of Data (NCES-CCD) provided school characteristics such as school-wide enrollment and percentage of students receiving free or reduced-price lunch. Using a geographic package for the statistical software R with a built-in application program interface (Kahle and Wickham 2016), a code loop cycled through each Washington high school's latitude and longitude coordinates to query Google Maps and collect the drive time (in minutes) between every public high school and every public university in the state.[14] District-level expenditures-per-student were gathered from financial data housed at the state's Office of Superintendent for Public Instruction's division of public finance. Each of these school-level and district-level variables were included in the data set as controls based on existing research suggesting an association between the variable and postsecondary application or enrollment behavior (Table 3).

TABLE 3: DESCRIPTIVE CHARACTERISTICS OF PUBLIC HIGH SCHOOLS AND DISTRICTS
(Schools, n = 295; Districts, n = 183)

Variable	Mean (sd.)	Median	Data source
Total public high school enrollment	882.3 (551.1)	741	NCES
Proportion eligible for federal free or reduced-price lunch	0.42 (0.17)	0.38	NCES
Counselor FTE	2.51 (1.52)	2	OSPI
Student-to-counselor ratio/caseload	340 to 1 (103.4)	341	OSPI
Distance between high school and flagship university (minutes)	84.1 (73.1)	58.5	Google Maps
Distance between high school and land grant university (minutes)	216.9 (75.8)	248.1	Google Maps
District expenditures-per-student	$12,470 (3,170)	$12,060	OSPI

[14] Drive time in minutes was included to control for the importance of geography in postsecondary choice making; the majority (57.4%) of incoming first-year students attending four-year colleges in the United States attend an institution within 50 miles of their permanent home (Hillman and Weichman 2016). Washington State's geography - specifically the Puget Sound - make drive time minutes a more accurate measure of distance compared to miles.

Results

The results reviewed in this section suggest that *higher* numbers of frontline workers increase the odds of application submission but this relationship varies across 1) postsecondary institution types and 2) student demographics. In the case of submitting applications to the flagship university or the regional comprehensive university, for instance, a modest positive overall effect of frontline workers on the odds of application submission is amplified for the low-income and nonwhite subpopulations of students.[15]

The results presented here focus on the organization-level covariates hypothesized to moderate administrative burden – namely, counselors as frontline workers and the cross-level effects of interacting these frontline variables with student demographic characteristics – and require a careful interpretation of the multilevel models' coefficients. For instance, the interpretation of how a greater number of frontline workers affects the application odds of a low-income student requires consideration of three coefficients: the student-level (Level 1) free and reduced-price lunch coefficient, the organization-level (Level 2) counselor FTE coefficient, and the coefficient for the cross-level interaction between organization-level counselor FTE and student-level free and reduced-price lunch variable. In this example, the odds ratio is ultimately the exponentiation of the sum of these coefficients:

$$e^{(\beta_{6j}(\text{FRPL=1}) + \gamma_{04}(\text{CounselorFTE=1}) + \gamma_{08}(\text{CounselorFTE=1}\times\text{FRPL}_i\text{=1}))} \qquad \text{[Eq. 4]}$$

This example is useful to illustrate the complexity of simultaneously interpreting multiple coefficients in the model and demonstrates the utility gained from standardizing and centering the model's continuous variables. The interpretation of this particular combination of variables

[15] This section of the study uses the term "effect" to describe a particular variable's effect on the baseline odds and does not imply a causal relationship in a manner that "effect" is sometimes used.

assumes that all other variables in the model are held at their mean while the counselor FTE variable is increased one standard deviation (in this case, $\sigma = 1.52$) above the mean.

Beginning with application submission to the state's flagship university as the dependent variable, Table 4 contains the results of the Level 1 model and the Level 1 model with frontline workers modeled as full-time equivalents (FTE) as the sole Level 2 variable.[16] These coefficients provide a starting point to interpret the effect of the counselor FTE on the baseline odds of application submission. Consider the odds ratio for increasing counselor FTE by one standard deviation, which is 1.288 or a 28.8% increase (1.0 - 1.288 = 0.288) relative to the baseline odds of application submission, 0.019. This baseline odds of application submission is interpreted as a 1.86% chance (i.e. 0.019/(0.019+1) = 0.0186) that a public high school student in Washington will submit an application to the state's flagship university. The multiplicative effect on the baseline odds of increasing the count of frontline workers by one standard deviation yields a new overall odds of application submission of 0.024 to 1, which converts to a 2.37% probability of application submission. This example demonstrates Buis's (2012) observation that when interpreting odds ratios, a "baseline value can play an important role in evaluating how large an effect is" (p. 167).

Examining the full models for application submission to the flagship university (Table 5) reveals intuitive Level 1 and Level 2 effects on the odds of application submission given the existing literature on postsecondary application behavior. A higher GPA, more AP classes, and taking calculus sometime during high school all increase the odds of submitting an application to the state's flagship university. Males and students from underrepresented backgrounds also have higher odds of application submission compared to females and White/Asian-American students, respectively. But while students who are both low-income and from underrepresented background

[16] These baseline models contain Level 2 and Level 3 random intercepts but no other higher-level covariates beyond the frontline FTE variable.

have no higher odds of application submission compared to their nonwhite peers who are not low-income, the odds of application submission to the state's flagship university for a low-income African-American male are 34.3% lower when compared to all other students in the state.

Independent of all other school and district characteristics, increasing frontline worker FTEs by one standard deviation above the average (recalling $\bar{x} = 2.51$, $\sigma = 1.5$) increases the odds of application submission to the state's flagship university by 14.2%. The cross-level effect between counselors and low-income students is likewise significant. Recalling Equation 4, the interpretation of an increase in frontline workers on the odds of application submission for a low-income student therefore requires the consideration of the exponentiated sum of these three coefficients, yielding a cross-level effect that increases in the odds of application submission by 38.1%.[17]

[17] In this calculation, FRPL is set to zero because the associated coefficient in Table 6 is indistinguishable from zero.

TABLE 4: APPLICATION SUBMISSION TO FLAGSHIP UNIVERSITY, BASELINE MODEL

	Student-Level Model		Student-Level Model with Counselor = FTE	
	Est. (s.e.)	Odds Ratio (95% CI)	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-3.310	0.017	-3.943	0.019
	(0.035)	(0.014 - 0.020)	(0.089)	(0.016 - 0.023)
GPA	1.239***	3.451	1.719***	5.580
	(0.021)	(3.307 - 3.603)	(0.029)	(5.272 – 5.906)
Number of AP classes (log)	0.755***	2.129	0.738***	2.091
	(0.018)	(2.052 - 2.209)	(0.027)	(1.984 – 2.204)
Ever took calculus	0.443***	1.558	0.423***	1.527
	(0.038)	(1.445 - 1.679)	(0.043)	(1.402 - 1.661)
Free/Reduced Price Lunch (FRPL)	-0.309***	0.734	-0.032	0.969
	(0.045)	(0.671 - 0.802)	(0.051)	(0.876 - 1.072)
Underrepresented Minority (URM)	0.184***	1.203	0.302***	1.352
	(0.055)	(1.078 - 1.340)	(0.061)	(1.199 - 1.525)
Male	0.307***	1.359	0.373***	1.452
	(0.030)	(1.280 - 1.443)	(0.033)	(1.362 - 1.550)
FRPL x URM	0.056	1.058	0.147	1.158
	(0.102)	(0.865 - 1.292)	(0.111)	(0.931 - 1.440)
Low-Income African-American Male	-0.421**	0.656	-0.455**	0.634
	(0.129)	(0.508 - 0.843)	(0.136)	(0.486 - 0.828)
Counselor FTE			0.253***	1.288
			(0.058)	(1.150 - 1.443)
AIC	27,864.5		27,558.3	
BIC	27,917.7		27,664.8	

TABLE 5: APPLICATION SUBMISSION TO FLAGSHIP UNIVERSITY, FULL MODEL

	Full Multilevel Model with Counselor = FTE	
	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-3.797***	0.022
	(0.072)	(0.019 – 0.027)
GPA	1.719***	5.577
	(0.029)	(5.267 - 5.905)
Number of AP classes (log)	0.721***	2.057
	(0.027)	(1.951 - 2.169)
Ever took calculus	0.439***	1.552
	(0.044)	(1.425 - 1.691)
Free/Reduced Price Lunch (FRPL)	-0.025	0.975
	(0.052)	(0.880 - 1.080)
Underrepresented Minority (URM)	0.310***	1.364
	(0.063)	(1.206 - 1.542)
Male	0.368***	1.445
	(0.033)	(1.353 - 1.543)
FRPL x URM	0.109	1.116
	(0.137)	(0.894 - 1.393)
Low-Income African-American Male	-0.421***	0.657
	(0.122)	(0.502 - 0.859)
High school enrollment	0.266***	1.305
	(0.088)	(1.098 - 1.550)
Proportion of FRPL in school	-0.124***	0.754
	(0.063)	(0.679 - 0.838)
Distance between school and college	-0.542***	0.583
	(0.087)	(0.515 - 0.659)
District-level per-student expenditures	0.242***	1.273
	(0.038)	(1.195 – 1.313)
Counselors	0.133**	1.142
	(0.041)	(1.054 - 1.238)
Counselors x FRPL	0.190***	1.218
	(0.059)	(1.077 - 1.353)
Counselors x URM	-0.062	0.924
	(0.052)	(0.849 - 1.040)
AIC	26,779.7	
BIC	26,938.1	

Frontline workers have a modest effect on the baseline odds of application submission to the state's land grant university when modeled with only Level-1 student variables (Table 6). Similar to the magnitude and direction of the effects for the comparable flagship university models, a one-standard deviation increase in the number of frontline staff corresponds to a 12.7% increase in the odds of application submission to the state's land grant university. The relativity of the baseline odds is again worthwhile to consider since the baseline odds of application submission to the state's land grant university is between 0.07 and 0.08 to 1 odds, compared to the less than 0.02 to 1 baseline odds of application submission to the state's flagship university.

The effects of frontline workers on the odds of application submission to the state's land grant institution are modest when considering the full multilevel models (Table 7). Holding all other student and organization-level variables at their mean, the odds of submitting an application to the state's land grant university increase by 8.2% given a one standard deviation increase in counselor FTE.

Turning to the odds of application submission at a regional comprehensive university, the model with only student covariates and the frontline FTE variable (Table 8) continues to follow a general pattern. An increase in the number of frontline workers is associated with an increased odds of application submission, in this case by 7.6% to regional comprehensive universities. For the full multilevel models (Table 9) a frontline worker effect on the baseline odds of application submission is indistinguishable from zero for regional comprehensive universities writ large. And while the interaction between counselor FTE and a student's low-income status is positive and significant, as is the interacted term representing counselor FTE and underrepresented minority status, this is again a scenario where all related coefficients must be accounted for in calculating an appropriate odds of application submission. In the case of a student eligible for free or reduced

price lunch, where the exponentiated sum of the three coefficients equals 0.633, the odds of application submission improve only marginally given an increase of one-standard deviation in counselor FTE. Put another way, the odds of application submission to a regional comprehensive university are already 40.8% lower for a student eligible for free or reduced price lunch (1.0 - 0.592 = 0.408); for this same low-income student relative to an increase in frontline workers at the high school by one standard deviation, the odds ratio changes only marginally to a 36.7% lower odds of application submission (1.0 - 0.633 = 0.367).

The association between membership in an underrepresented racial group and the odds of application submission to a regional comprehensive university is indistinguishable from zero. The increase in the odds of application submission to a regional comprehensive university for this minority student population given an increase in counselors by one standard deviation, however, is a modest 7.6%. This means a baseline of 0.181 to 1 odds (15.3% probability) of submitting an application to a regional comprehensive increases to an odds of 0.194 to 1, or a 16.3% probability, of application submission for underrepresented students given an increase in frontline FTE.

TABLE 6: APPLICATION SUBMISSION TO LAND GRANT UNIVERSITY, BASELINE MODEL

	Student-Level Model		Student-Level Model with Counselor = FTE	
	Est. (s.e.)	Odds Ratio (95% CI)	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-2.571	0.076	-2.518	0.081
	(0.046)	(0.070 - 0.084)	(0.050)	(0.073 - 0.089)
GPA	0.729***	2.074	0.730***	2.075
	(0.021)	(1.990 - 2.161)	(0.021)	(1.991 - 2.162)
Number of AP classes (log)	0.275***	1.316	0.268***	1.308
	(0.025)	(1.254 - 1.381)	(0.025)	(1.246 - 1.373)
Ever took calculus	-0.001	0.999	0.002	1.002
	(0.045)	(0.916 - 1.090)	(0.045)	(0.918 - 1.094)
Free/Reduced Price Lunch (FRPL)	-0.507***	0.602	-0.503***	0.605
	(0.050)	(0.546 - 0.665)	(0.050)	(0.548 - 0.667)
Underrepresented Minority (URM)	0.094*	1.098	0.095*	1.100
	(0.055)	(0.985 - 1.224)	(0.055)	(0.986 - 1.226)
Male	0.135***	1.145	0.135***	1.145
	(0.110)	(1.078 - 1.216)	(0.031)	(1.078 - 1.216)
FRPL x URM	0.409***	1.506	0.412***	1.510
	(0.102)	(1.234 - 1.838)	(0.102)	(1.237 - 1.844)
Low-Income African-American Male	0.016	1.016	0.016	1.016
	(0.110)	(0.819 - 1.262)	(0.110)	(0.818 - 1.261)
Counselor FTE			0.117***	1.127
			(0.036)	(1.051 - 1.208)
AIC	33,279.2		33,270.2	
BIC	33,376.8		33,376.5	

TABLE 7: APPLICATION SUBMISSION TO LAND GRANT UNIVERSITY, FULL MODEL

	Full Multilevel Model with Counselor = FTE	
	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-2.482***	0.080
	(0.049)	(0.071 – 0.089)
GPA	0.723***	2.058
	(0.021)	(1.974 - 2.146)
Number of AP classes (log)	0.253***	1.287
	(0.025)	(1.224 - 1.353)
Ever took calculus	-0.013	0.989
	(0.045)	(0.904 - 1.081)
Free/Reduced Price Lunch (FRPL)	-0.494***	0.606
	(0.051)	(0.534 - 0.688)
Underrepresented Minority (URM)	0.110*	1.138
	(0.057)	(0.999 - 1.297)
Male	0.120***	1.128
	(0.031)	(1.061 - 1.199)
FRPL x URM	0.411***	1.511
	(0.103)	(1.234 - 1.851)
Low-Income African-American Male	0.024	1.026
	(0.112)	(0.824 - 1.278)
High school enrollment	0.151*	1.177
	(0.082)	(1.000 - 1.384)
Proportion of FRPL in school	-0.043	0.955
	(0.037)	(0.889 - 1.027)
Distance between school and college	-0.151***	0.861
	(0.037)	(0.800 - 0.927)
District-level per-student expenditures	0.045	1.056
	(0.033)	(0.990 - 1.127)
Counselors	0.079**	1.082
	(0.027)	(1.026 - 1.141)
Counselors x FRPL	0.000	1.000
	(0.041)	(0.917 - 1.091)
Counselors x URM	0.051	1.054
	(0.049)	(0.959 - 1.160)
AIC		32,049.6
BIC		32,208.5

TABLE 8: APPLICATION SUBMISSION TO COMPREHENSIVE UNIVERSITIES, BASELINE MODEL

	Student-Level Model		Student-Level Model with Counselor = FTE	
	Est. (s.e.)	Odds Ratio (95% CI)	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-1.789***	0.186	-1.747***	0.174
	(0.043)	(0.178 - 0.194)	(0.048)	(0.159 - 0.192)
GPA	0.698***	2.041	0.698***	2.009
	(0.017)	(1.977 - 2.108)	(0.017)	(1.943 - 2.077)
Number of AP classes (log)	0.345***	1.366	0.343***	1.408
	(0.021)	(1.321 - 1.413)	(0.021)	(1.351 - 1.468)
Ever took calculus	-0.393***	0.726	-0.391***	0.676
	(0.040)	(0.673 - 0.782)	(0.040)	(0.625 - 0.731)
Free/Reduced Price Lunch (FRPL)	-0.530***	0.559	-0.529***	0.589
	(0.040)	(0.519 - 0.604)	(0.040)	(0.545 - 0.638)
Underrepresented Minority (URM)	-0.029	0.971	-0.029	0.972
	(0.047)	(0.888 - 1.062)	(0.047)	(0.886 - 1.066)
Male	-0.091***	0.924	-0.091***	0.913
	(0.026)	(0.879 - 0.971)	(0.026)	(0.868 - 0.960)
FRPL x URM	0.441***	1.629	0.442***	1.555
	(0.082)	(1.393 - 1.904)	(0.082)	(1.324 - 1.827)
Low-Income African-American Male	-0.041	0.931	-0.040	0.961
	(0.092)	(0.778 - 1.114)	(0.092)	(0.801 - 1.151)
Counselor FTE			0.073**	1.076
			(0.034)	(1.007 - 1.149)
AIC	44,114.4		44,111.6	
BIC	44,212.1		44,210.3	

TABLE 9: APPLICATION SUBMISSION TO COMPREHENSIVE UNIVERSITIES, FULL MODEL

	Full Multilevel Model with Counselor = FTE	
	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-1.711***	0.181
	(0.048)	(0.164 - 0.198)
GPA	0.701***	2.016
	(0.017)	(1.949 - 2.085)
Number of AP classes (log)	0.342***	1.408
	(0.022)	(1.350 - 1.469)
Ever took calculus	-0.382***	0.682
	(0.040)	(0.631 - 0.739)
Free/Reduced Price Lunch (FRPL)	-0.523***	0.592
	(0.041)	(0.547 - 0.642)
Underrepresented Minority (URM)	-0.051	0.950
	(0.048)	(0.864 - 1.045)
Male	-0.091***	0.913
	(0.026)	(0.867 - 0.961)
FRPL x URM	0.480***	1.617
	(0.084)	(1.372 - 1.905)
Low-Income African-American Male	-0.038	0.962
	(0.094)	(0.801 - 1.156)
High school enrollment	0.117	1.125
	(0.078)	(0.965 - 1.311)
Proportion of FRPL in school	-0.025	0.976
	(0.033)	(0.915 - 1.040)
District-level per-student expenditures	0.079***	1.082
	(0.030)	(1.020 - 1.148)
Counselors	0.050	1.051
	(0.080)	(0.899 - 1.223)
Counselors x FRPL	0.066**	1.068
	(0.035)	(0.997 - 1.144)
Counselors x URM	0.073*	1.076
	(0.040)	(0.995 - 1.163)
AIC		42,691.8
BIC		42,842.0

Discussion

Returning to the first hypothesis guiding this study, evidence demonstrates that higher levels of frontline workers increase the odds of application submission to the state's flagship university. Evidence also demonstrates that an increase in frontline workers increases the odds of application submission to the state's land grant university. The magnitude of the frontline worker effect on the odds of application submission for the flagship university, an increase of 14.2%, is nearly twice that of the 8.2% increase in odds attributed to frontline staff relative to the state's land grant university.

Results supporting Hypotheses 2, testing that a higher level of frontline workers increases the odds of application submission for students from low-income and underrepresented minority backgrounds, are statistically significant for low-income students submitting applications to the state's flagship and regional comprehensive universities. Evidence also suggests a higher level of frontline staff increase the odds that students from underrepresented racial backgrounds will submit applications to regional comprehensive universities. Baseline context in this case, however, is important. For a one standard deviation increase in counselor FTE, the overall odds of a low-income student applying to the flagship university increases from 2.2% to 3.0%. Likewise, the modest benefit that more frontline staff offer to low-income students in applying to regional comprehensive universities (an increase in FTE is associated with an 6.8% increase in the odds of application submission) is not enough to offset the strong negative association between poverty and the overall lower odds of application submission.

A summary of the evidence for both Hypotheses 1 and 2 points to a reoccurring relationship between a higher FTE count of frontline workers and the increased odds of submitting an application to the state's flagship university. How might administrative burden help make sense of

this? One explanation is that, given the substantial length of the flagship university's application, the learning costs and compliance costs are higher for submitting this particular application compared to applications to other public postsecondary institutions in the state. As such, more frontline workers at a given public high school alleviate these disproportionate costs associated with the disproportionately burdensome application. Beyond the quantitative figures reported in Table 1, consider the qualitative differences between the flagship university application and the regional comprehensive universities' applications. In 2010 the flagship university, on one hand, required students to submit an application containing extensive information for all high school coursework plus essays about extracurricular activities and personal achievements. The state's regional public universities, on the other hand, generally asked students a few basic questions about high school coursework (e.g. "Did you take AP/IB courses?") and in some cases, offered guaranteed admission if a student met minimum requirements (EWU Catalog, 2009, p. 19). One application is clearly more burdensome than the other is and thus presents the potential for frontline workers to intercede to moderate such burdens.

These findings converge to inform three distinct dimensions of administrative burden's theoretical development. The first is that the nuances of citizens' application behavior are complex and deserve careful attention from researchers. Studies of administrative burden thus far have focused on the submission of an application to a single program or agency (as in a state Medicaid program e.g. Moynihan, Herd, and Harvey 2015; Moynihan, Herd, and Ribgy 2013; or with cash transfer programs, e.g. Heinrich 2016). The submission of applications to public universities, alternatively, represents a domain of administrative burden in which the receivers and processors of applications are plural and heterogeneous. The submission of housing applications involving some kind of public program is another example in this domain. A citizen with a Section 8 housing

voucher, for instance, submitting rental applications may experience administrative burden that is largely at the discretion of the housing providers to which applications are submitted (since each landlord would ostensibly control their application process) to say nothing of the administrative burden involved with obtaining the Section 8 voucher.

The second contribution this study makes to administrative burden's theoretical frame relates to an external intervention moderating administrative burden in a manner that increases the odds of successful application submission. Administrative burden thus far has been studied as an endogenous constraint within a public program, such as in the case of increasingly complex eligibility and application rules being implemented to intentionally limit access to Medicaid (Moynihan, Herd, and Ribgy 2013). The present study presents an alternative theoretical perspective because high school counselors are exogenous to the public entity (i.e. public universities) to which applications are submitted. Since the political and practical feasibility are generally low for a state legislature to meddle in the details of a public university's application process (Blume 2014) a more plausible solution to increases access may be the authorization and implementation of support external to the public university. Looking again at an example outside of public universities, one could picture a local public housing agency alleviating administrative burden for its clients not by reforming the application rules to public housing programs but by instead funding case managers as frontline workers to alleviate the learning, compliance, and psychological costs of submitting such applications.[19]

The potential of a frontline worker to ease learning, compliance, and psychological costs related to application submission leads to the final contribution this study makes to the theoretical

[19] Public housing authorities, of course, have frontline workers that help "public housing seekers navigate the at-times byzantine application process" but the extent to which these frontline workers actually ease or impede the application process is unclear (Einstein & Glick, 2016, p. 2).

development of administrative burden. Frontline workers have yet to be formally incorporated into administrative burden's theoretical frame. This study provides conceptual and empirical evidence that frontline workers moderate administrative burden. Moreover, frontline workers appear to ease administrative burden in a manner that potentially affects certain subpopulations more than others. The fact that frontline workers are motivated to achieve positive outcomes for clients is well established in the broader literature on street level-bureaucrats (Maynard-Moody & Portillo, 2010; Meyers & Vorsanger, 2007). The findings presented here support such a claim aligned with extant literature on high school counselors and their desire to cultivate postsecondary opportunities for the students they serve (Smith, 2011). Just as plausible, though, are circumstances in other domains of public management where frontline workers with ulterior motives could exacerbate administrative burden with implicit or explicit mechanisms for gatekeeping. This potential duality of either easing or exacerbating administrative burden requires a context-specific theoretical specification in future studies when modeling frontline workers and their predicted effects on administrative burden.

Appendix A: Qualitative document analysis to assess an application's level of administrative burden

The coding protocol that follows mirrors Moynihan, Herd, and Ribgy's (2013) approach to the greatest extent possible. Like Moynihan and colleagues, the protocol began with an instrument designed around two dimensions of burden, quantifying aspects of the application and qualitatively assessing reporting requirements. Quantified aspects of the application included a question count, count of pages, and total number of words in the physical application. To assess reporting requirements, an ordinal scale was used with seven points representing increasing levels of burden. Moynihan, Herd, and Ribgy (2013) used four categories: state does not ask about item = 0; state asks for information but not proof = 1; state asks for information and requires proof = 2; state requires proof but does not specify what proof is = 3. Note that the requirement of proof without specifying what proof entails assumes a higher level of burden because this ambiguity increases the applicant's compliance costs.

Seven categories of burden were created to capture more of the nuance associated with information requested in a structured format or information requested in an open-ended format, assuming like Moynihan, Herd, and Ribgy's (2013) that a structured request requires less cognitive effort (and thus has a lower compliance cost) compared to an open-ended, ambiguous request for information. The seven categories are:

0 = No information was requested in this area

1 = Information was requested but not required; applicant provides information in a structured format

2 = Information was requested but not required; applicant provides information in an open-ended format

3 = Information was required but proof/verification was not required; applicant provides

information in a structured format

4 = Information was required but proof/verification was not required; applicant provides information in an open-ended format

5 = Information was required and proof/verification was required; applicant provides information in a structured format

6 = Information was required and proof/verification was required; applicant provides information in an open-ended format

In their Medicaid study Moynihan, Herd, and Ribgy (2016) assess burden in three areas of Medicaid applications: income reporting, expense reporting, and residency documentation. The instrument developed for this study assesses administrative burden in four areas of the application: academic qualifications, socioeconomic background, personal context, and residency requirements.

After creating the instrument, a hypothetical identity was created for the application evaluator to assume. Moynihan, Herd, and Ribgy (2016) note this is a critical step in the assessment process to ensure multiple evaluators code application burden consistently across organizational contexts. In other words, in the case of this study an evaluator assumed the identify of a Caucasian female who is a senior in high school at a public high school in Washington. It is from this vantage point that the evaluator qualitatively assesses each application's four categories of administrative burden.

With the coding instrument and hypothetical identity of the applicant created, two graduate students were hired to code each application. A pilot coding exercise was first undertaken with each graduate student using a public university application not included in this study. Each graduate student's scoring was reviewed individually with them and any questions were discussed

that arose during their assessment of burden in this pilot exercise. Each graduate student was then given the five undergraduate applications for public universities in Washington State with accompanying coding worksheets to complete.

Each graduate student returned their completed worksheets at which point data from the worksheets were entered into a statistical software to calculate a measure of interrater reliability. Cohen's kappa (Cohen, 1968) was used because of the ordinal nature of the ratings. A weighted kappa better accounts for the fact that along a rating spectrum with possible values of low, medium, and high, two raters may vary in their scores but are in closer agreement if both scores are low (e.g. 2 and 3) than if one rater scores low and one rater scores high (e.g. 2 and 6). In reality, however, the difference was minimal between the unweighted kappa (0.927, $p<0.001$) and the weighted kappa (0.957, $p<0.001$) which combined can be interpreted as a high level of interrater reliability.

Appendix B: Frontline workers measured as caseloads

To empirically model caseloads, the *CounselorFTE*$_j$ variable is replaced with the counselor-to-student ratio for school *j* (*CounselorCASELOAD*$_j$) at Level 2 of the model:

$$\begin{aligned}\beta_{0j} = \ & \gamma_{00} + \gamma_{01}(\mathrm{ENROLL}_j) + \gamma_{02}(\overline{\mathrm{FRPL}_j}) + \gamma_{03}(\mathrm{DIST}_j) + \\ & \gamma_{04}(\mathrm{CounselorCASELOAD}_j) + \\ & \gamma_{05}(\mathrm{CounselorCASELOAD}_j \times \mathrm{URM}_i) + \\ & \gamma_{06}(\mathrm{CounselorCASELOAD}_j \times \mathrm{FRPL}_i) + r_{0j}\end{aligned} \qquad \text{[Eq. 2.2]}$$

The counselor caseload variable is interpreted in a manner similar to other studies that have hypothesized that all else equal, lower caseloads increase the frontline worker's effectiveness (Hill 2006) and higher caseload levels present a barrier between client and frontline staff (Brintnall 1981; Garrow and Grusky 2012; Jewell and Glaser 2006; Rice 2012; Weissert 1994).

The interpretation of the counselor caseload odds ratio merits special attention since the nature of a caseload is such that a *lower* caseload is hypothesized to ease the barriers a frontline worker faces in service delivery (Brintnall 1981; Heinrich 2002; Riccio, Bloom, and Hill 2000; Rice 2013; Woods and Domina 2014). The interpretation of the caseload variable also warrants an explanation since this variable is a ratio; following Woods and Domina (2014), the caseload variable is standardized and interpreted as the effect of a *lighter* counselor caseload on the baseline odds of application submission. Beginning with Table 1B, the odds ratio for the counselor caseload is 0.908, which means a one-unit increase in the caseload decreases the odds of application submission by 9.2% (1 - 0.908 = 0.092). But the interpretation of the caseload's effect on the baseline odds can also be considered as a one-unit *decrease* in the counselor caseload. In other words, a frontline worker's decreased caseload by one standard deviation (i.e. from an average of

340 students down to 237 students to every one counselor) is associated with a 9.2% *increase* in the odds of application submission to the flagship university.

TABLE 1B: APPLICATION SUBMISSION TO FLAGSHIP UNIVERSITY, BASELINE MODEL

	Student-Level Model		Student-Level Model with Counselor = CASELOAD	
	Est. (s.e.)	Odds Ratio (95% CI)	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-3.310 (0.035)	0.017 (0.014 - 0.020)	-4.086 (0.085)	0.017 (0.014 - 0.020)
GPA	1.239*** (0.021)	3.451 (3.307 - 3.603)	1.719*** (0.029)	5.576 (5.269 – 5.902)
Number of AP classes (log)	0.755*** (0.018)	2.129 (2.052 - 2.209)	0.743*** (0.027)	2.103 (1.996 – 2.212)
Ever took calculus	0.443*** (0.038)	1.558 (1.445 - 1.679)	0.420*** (0.043)	1.521 (1.398 - 1.656)
Free/Reduced Price Lunch (FRPL)	-0.309*** (0.045)	0.734 (0.671 - 0.802)	-0.032 (0.043)	0.968 (0.875 - 1.071)
Underrepresented Minority (URM)	0.184*** (0.055)	1.203 (1.078 - 1.340)	0.302*** (0.061)	1.353 (1.200 - 1.525)
Male	0.307*** (0.030)	1.359 (1.280 - 1.443)	0.374*** (0.033)	1.453 (1.362 - 1.550)
FRPL x URM	0.056 (0.102)	1.058 (0.865 - 1.292)	0.142 (0.111)	1.153 (0.927 - 1.434)
FRPL x URM x Male	-0.421** (0.129)	0.656 (0.508 - 0.843)	-0.454*** (0.136)	0.635 (0.486 - 0.828)
Counselor CASELOAD			-0.096* (0.051)	0.908 (0.822 - 1.003)
AIC	27,864.5		27,574.4	
BIC	27,917.7		27,680.9	

This caseload effect on the odds of application submission is indistinguishable from zero when the full model is considered for the odds of application submission to the state's flagship university (Table 2B).

TABLE 2B: APPLICATION SUBMISSION TO FLAGSHIP UNIVERSITY, FULL MODEL

	Full Multilevel Model with Counselor = CASELOAD	
	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-3.783***	0.022
	(0.073)	(0.020 – 0.026)
GPA	1.718***	5.576
	(0.029)	(5.266 - 5.904)
Number of AP classes (log)	0.722***	2.059
	(0.027)	(1.953 - 2.171)
Ever took calculus	0.439***	1.551
	(0.044)	(1.423 - 1.689)
Free/Reduced Price Lunch (FRPL)	-0.031	0.969
	(0.052)	(0.875 - 1.073)
Underrepresented Minority (URM)	0.294***	1.341
	(0.137)	(1.188 - 1.515)
Male	0.368***	1.444
	(0.035)	(1.353 - 1.542)
FRPL x URM	0.126	1.134
	(0.113)	(0.909 - 1.415)
FRPL x URM x Male	-0.417***	0.659
	(0.137)	(0.503 - 0.862)
High school enrollment	0.188***	1.207
	(0.052)	(1.090 - 1.337)
Proportion of FRPL in school	-0.098*	1.103
	(0.052)	(0.996 - 1.222)
Distance between school and college	-0.542***	0.582
	(0.064)	(0.513 - 0.659)
District-level per-student expenditures	0.235***	1.265
	(0.048)	(1.151 – 1.389)
Counselors	-0.102	0.903
	(0.082)	(0.769 - 1.060)
Counselors x FRPL	0.035	1.036
	(0.065)	(0.912 - 1.176)
Counselors x URM	0.004	1.004
	(0.055)	(0.901 - 1.118)
AIC		26,782.4
BIC		26,941.7

A similar patterns appears with the state's land grant university; the baseline model (Table 3B) reveals a positive relationship between a smaller caseload and a greater odds of application submission, but the effect is not present in the fully specified model (Table 4B)

TABLE 3B: APPLICATION SUBMISSION TO LAND GRANT UNIVERSITY, BASELINE MODEL

	Student-Level Model		Student-Level Model with Counselor = CASELOAD	
	Est. (s.e.)	Odds Ratio (95% CI)	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-2.571 (0.046)	0.076 (0.070 - 0.084)	-2.567 (0.046)	0.077 (0.070 - 0.084)
GPA	0.729*** (0.021)	2.074 (1.990 - 2.161)	0.729*** (0.021)	2.072 (1.990 - 2.161)
Number of AP classes (log)	0.275*** (0.025)	1.316 (1.254 - 1.381)	0.273*** (0.025)	1.314 (1.252 – 1.379)
Ever took calculus	-0.001 (0.045)	0.999 (0.916 - 1.090)	-0.001 (0.045)	0.999 (0.916 - 1.090)
Free/Reduced Price Lunch (FRPL)	-0.507*** (0.050)	0.602 (0.546 - 0.665)	-0.504*** (0.050)	0.604 (0.547 - 0.666)
Underrepresented Minority (URM)	0.094* (0.055)	1.098 (0.985 - 1.224)	0.095* (0.055)	1.100 (0.987 - 1.226)
Male	0.135*** (0.110)	1.145 (1.078 - 1.216)	0.135*** (0.031)	1.145 (1.078 - 1.216)
FRPL x URM	0.409*** (0.102)	1.506 (1.234 - 1.838)	0.408*** (0.102)	1.505 (1.232 - 1.836)
FRPL x URM x Male	0.016 (0.110)	1.016 (0.819 - 1.262)	0.018 (0.110)	1.017 (0.820 - 1.264)
Counselor CASELOAD			-0.049** (0.021)	0.952 (0.914 - 0.992)
AIC	33,279.2		33,278.6	
BIC	33,376.8		33,385.1	

TABLE 4B: APPLICATION SUBMISSION TO LAND GRANT UNIVERSITY, FULL MODEL

	Full Multilevel Model with Counselor = CASELOAD	
	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-2.483***	0.083
	(0.049)	(0.076 - 0.092)
GPA	0.722***	2.059
	(0.021)	(1.975 - 2.147)
Number of AP classes (log)	0.252***	1.287
	(0.025)	(1.224 - 1.353)
Ever took calculus	-0.013	0.987
	(0.045)	(0.903 - 1.079)
Free/Reduced Price Lunch (FRPL)	-0.494***	0.610
	(0.051)	(0.552 - 0.675)
Underrepresented Minority (URM)	0.119**	1.126
	(0.056)	(1.009 - 1.257)
Male	0.120***	1.128
	(0.031)	(1.061 - 1.199)
FRPL x URM	0.403***	1.496
	(0.103)	(1.222 - 1.831)
FRPL x URM x Male	0.028	1.028
	(0.112)	(0.826 - 1.280)
High school enrollment	0.134***	1.144
	(0.037)	(1.063 - 1.230)
Proportion of FRPL in school	-0.045	0.956
	(0.037)	(0.890 - 1.028)
Distance between school and college	-0.152***	0.859
	(0.037)	(0.799 - 0.924)
District-level per-student expenditures	0.048	1.050
	(0.033)	(0.984 - 1.120)
Counselors	-0.013	0.987
	(0.036)	(0.919 - 1.059)
Counselors x FRPL	-0.002	0.998
	(0.048)	(0.911 - 1.092)
Counselors x URM	0.022	1.022
	(0.048)	(0.930 - 1.123)
AIC		32,050.6
BIC		32,209.6

A slightly more nuanced picture arises with the odds of application submission to the state's comprehensive universities. For the odds of application submission to the state's comprehensive universities, the positive effect of a lower counselor caseload is observable both in the baseline model (Table 5B) and the fully specified model (Table 6B).

TABLE 5B: APPLICATION SUBMISSION TO COMPREHENSIVE UNIVERSITIES, BASELINE MODEL

	Student-Level Model		Student-Level Model with Counselor = CASELOAD	
	Est. (s.e.)	Odds Ratio (95% CI)	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-1.789***	0.186	-1.783***	0.168
	(0.043)	(0.178 - 0.194)	(0.043)	(0.154 - 0.183)
GPA	0.698***	2.041	0.697***	2.009
	(0.017)	(1.977 - 2.108)	(0.017)	(1.943 - 2.077)
Number of AP classes (log)	0.345***	1.366	0.345***	1.411
	(0.021)	(1.321 - 1.413)	(0.021)	(1.354 - 1.471)
Ever took calculus	-0.393***	0.726	-0.393***	0.675
	(0.040)	(0.673 - 0.782)	(0.040)	(0.624 - 0.730)
Free/Reduced Price Lunch (FRPL)	-0.530***	0.559	-0.529***	0.589
	(0.040)	(0.519 - 0.604)	(0.040)	(0.545 - 0.638)
Underrepresented Minority (URM)	-0.029	0.971	-0.028	0.973
	(0.047)	(0.888 - 1.062)	(0.047)	(0.887 - 1.067)
Male	-0.091***	0.924	-0.091***	0.913
	(0.026)	(0.879 - 0.971)	(0.026)	(0.868 - 0.960)
FRPL x URM	0.441***	1.629	0.440***	1.553
	(0.082)	(1.393 - 1.904)	(0.082)	(1.322 - 1.825)
FRPL x URM x Male	-0.041	0.931	-0.040	0.961
	(0.092)	(0.778 - 1.114)	(0.092)	(0.802 - 1.151)
Counselor CASELOAD			-0.049*	0.952
			(0.028)	(0.901 - 1.006)
AIC	44,114.4		44,114.4	
BIC	44,212.1		44,220.8	

TABLE 6B: APPLICATION SUBMISSION TO LAND GRANT UNIVERSITY, FULL MODEL

	Full Multilevel Model with Counselor = CASELOAD	
	Est. (s.e.)	Odds Ratio (95% CI)
Intercept	-1.710***	0.181
	(0.048)	(0.165 - 0.199)
GPA	0.701***	2.015
	(0.017)	(1.948 - 2.084)
Number of AP classes (log)	0.343***	1.409
	(0.022)	(1.351 - 1.470)
Ever took calculus	-0.382***	0.683
	(0.040)	(0.631 - 0.739)
Free/Reduced Price Lunch (FRPL)	-0.522***	0.594
	(0.041)	(0.548 - 0.643)
Underrepresented Minority (URM)	-0.041	0.960
	(0.048)	(0.873 - 1.055)
Male	-0.092***	0.912
	(0.026)	(0.867 - 0.960)
FRPL x URM	0.469***	1.598
	(0.083)	(1.356 - 1.883)
FRPL x URM x Male	-0.038	0.963
	(0.094)	(0.802 - 1.157)
High school enrollment	0.062	1.064
	(0.034)	(0.913 - 1.241)
Proportion of FRPL in school	-0.023	0.977
	(0.033)	(0.917 - 1.041)
District-level per-student expenditures	0.084***	1.088
	(0.031)	(1.025 - 1.153)
Counselors	-0.110**	0.896
	(0.037)	(0.833 - 0.963)
Counselors x FRPL	0.015	1.015
	(0.033)	(0.951 - 1.086)
Counselors x URM	-0.007	0.993
	(0.022)	(0.951 - 1.037)
AIC		42,696.7
BIC		42,846.9

The evidence for Hypothesis 1 is therefore nuanced by the fact that the FTE measurement of frontline workers is associated with an increased odds of application submission in certain cases while in other circumstances, the caseload measurement of counselors the variable which bears a statistically-significant relationship to the odds of application submission. In fact, specific to the full multilevel models, there are no modeled odds of application submission where both the counselor FTE *and* the counselor caseload variable are statistically significant.

The extant frontline worker literature on caseloads helps make sense of this apparent inconsistency between the FTE and caseload measurements of frontline staff. Hill (2006) notes that often a count of organizational staff (such as FTE) is a more straightforward measure of frontline workers compared to the "caseload size variable" because organizational "aspect[s] operate *through* the caseload variable" (p. 279, emphasis added).[20] These organizational aspects include such factors as an organization's efficiency or capacity. In other words, certain organizations may have an inherent culture, a particular manager, or a relevant technology that allows frontline workers to better cope with larger caseloads. For this reason, Hill (2006) posits that a caseload variable, specifically in a multilevel model, represents a broad level of resources available to the organization.

On the other hand, Weissert (1994) suggests that a caseload variable may be susceptible to "measurement error" because the "caseload variable might *not* be an accurate portrayal of [an organization] … since it does *not* take into account differences in efficiency and style" (p. 239, emphasis added). Weissert's point appears to oppose Hill's (2006) opinion of the caseload variable because Weissert argues that a caseload variable is assumed to incorporate efficiency and style but

[20] Hill (2006) is careful to note, however, that a count of frontline staff is also be open to interpretative meaning in that a higher number of frontline staff in and of itself may represent an organization's "structural complexity" that is unobservable with a variable that simply counts frontline staff (Scott, 1998, as cited in Hill, 2006, p. 274).

may not accurately capture variation in such organizational characteristics. Put succinctly, Hill (2006) sees the caseload variable as more than just a ratio of clients to frontline workers; Weissert (1994) observes that measurement error may arise by attributing too much meaning to the caseload variable.

These perspectives on modeling frontline staff demonstrate that an FTE count variable and a caseload variable are perhaps best considered two sides of the same coin. Weissert (1994) contends that the caseload variable has merit but cautions against its over-interpretation; Hill (2006) acknowledges the caseload variable's merit plus she interprets the variable's meaning in a broader organizational context. This study errs on the side of Weissert and assume a lower caseload, holding all else equal, improves a frontline worker's ability to deliver services. The fact that a higher count of counselors is associated with an increased odds of application submission in some cases while in other cases, a lower counselor caseload increases the odds application submission is therefore not problematic because these findings represent two distinct ways to empirically specify the contribution of frontline workers. Since for both variables the direction of the odds ratio is consistent (i.e. a higher number of counselors or a lower counselor caseload increases the odds of application submission) evidence from both variables is used to support Hypothesis 1.

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