Untangling the Education Effect: Moving Educational Interventions into the Experimental Frontier

Sara Chatfield[1]
Postdoctoral Fellow
Dept. of Political Science
MIT

John Henderson[2]
Assistant Professor
Dept. of Political Science
Yale University

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[1] sarachat@mit.edu, http://schatfield.com/, Department of Political Science, MIT, 77 Massachusetts Ave., Cambridge, MA 02142
[2] john.henderson@yale.edu, http://jahenderson.com/, Institution for Social and Policy Studies, Yale University, 77 Prospect Street, New Haven, CT 06511

Introduction

In the two decades since publication of *Voice and Equality* (V&E), many scholars have taken up the challenge laid out by its authors to improve our understanding of the underlying sources of political engagement. The results of this effort, however, have not resolved one of the basic questions motivating Sidney Verba, Kay Schlozman and Henry Brady's seminal book: does *education* cause greater participation in politics, and if so, how?

This is not to deny the substantial progress made on the question in the intervening years. Scholars have developed new survey techniques and utilized natural experiments to enhance the inferential quality of their findings. An important characteristic of much of this work, one certainly shared by V&E, has been a careful attention to research design in light of potential threats to empirical inference. This research is also notable for building new theory to better explain the mechanisms that may account for the robust 'education effect' on participation. Perhaps not surprising given this attention, a serious debate has arisen over whether it is appropriate to interpret the relationship between schooling and voting as fundamentally causal in nature.

In Verba, Schlozman, and Brady's (1995) civic voluntarism model, education influences participation in a variety of ways, increasing politically relevant skills, political engagement, and recruitment into politics. In contrast, recent work, especially Kam and Palmer (2008), has challenged this causal model, arguing that education is merely a proxy for earlier childhood experiences that strongly influence participation later in life. For example, early-life influences like parental education and political socialization can lead individuals to both seek out more education and to participate in politics as an adult in ways that may confound previous studies.

Untangling the precise education effect has proven to be challenging. Directly manipulating educational outcomes through experimentation is usually infeasible and unethical. And there is a serious concern that non-random pressures to seek out more education remain problematic in observational studies (e.g., Henderson and Chatfield 2011; Mayer 2011), and perhaps even those utilizing natural experiments (e.g., Henderson 2015).

Our aim in this chapter is to outline a roadmap for future research on the political returns to schooling, given the limits to experimentation in educational attainment. We think developing such a guide will be helpful for political scientists as the field moves increasingly into the experimental frontier. This is especially so given a possible future where scholars have exhausted new sources of exogenous natural variation, are unable to experimentally manipulate years of education, and yet remain skeptical of much of the observational findings about education.

In this roadmap, we argue that scholars should engage in a two-step research approach. The first step involves making the theoretical explanations for an education effect more elaborate, in particular by identifying and expanding the many individual pieces of the causal chain that link education to participation. The second step is to develop and implement a range of creative empirical tests that separately or

simultaneously assess these causal linkages. Rather than attempting to examine the education effect directly or as whole, we argue that a more profitable strategy is to (dis)confirm specific components that may drive such an effect in a more piecemeal fashion.

We envision this more elaborate testing to take a number of forms. One principal approach would involve developing natural (or controlled) experiments into the effects of education *on* intermediaries (e.g., more education on political information), and then linking these tests to controlled (or natural) experiments into the effects *of* these intermediaries on participation outcomes (e.g., randomized information on voter turnout). If the factors that education appears to influence seem likely to cause variation in participation, then this adds credence to the causal interpretation of the overall education effect. Yet oppositely, if *any* of the links in the chain appear broken, this dampens the plausibility that education in fact causes participation.

In addition to expanding on experimental designs, we also recommend developing new education measures that tap distinct dimensions of schooling, and especially those that differentiate between theories that aim to explain the education effect. Generally, scholars should be investigating the political consequences of major developments underway in education. For example, the dramatic increase in the cost of higher education or the replacement of traditional campus programs with online courses could influence the kinds of attitudes, networks or resources obtained by citizens, with potential consequences for 'voice and equality'. Significant changes are underway as well in K-12 education. While high school graduation is becoming increasingly the norm, the introduction of charter schools and novel curriculum may provide new sources of variation. We see these changes as opportunities to test different explanatory mechanisms, since these may alter certain features of education that influence participation decisions differently.

This chapter proceeds as follows. First, we consider possible mechanisms driving the education effect, including education-as-proxy, individual-level effects, and network effects. We review the literature in these three areas, and consider how attention to mechanisms can influence research design. Second, we summarize recent work that uses instrumental variable or quasi-experimental designs to examine pieces of the education effect. Finally, we present new data using novel measures of the educational experience that may highlight the particular mechanisms that explain how education influences participatory outcomes.

Untangling the Mechanisms Linking Education to Turnout

Education has long been viewed as a "universal solvent" that can reduce social and economic inequality by improving the standing of those whose parents were undereducated (Converse 1972). Political scientists have been especially interested in one consequence of this solvent, the effect that education may have encouraging people to get involved in politics (Verba, Schlozman and Brady 1995; Wolfinger and Rosenstone 1980). This question is central to the work in V&E, and other scholars of American politics. This is so largely because of the concern that the policymaking process will more closely attend to the interests of participating citizens above non-participants. In a setting where

participation is not universal, expanding education could be a way to dampen bias in representation and the legislative process (Schlozman, Verba and Brady 2012).

This view of course rests squarely on the claim that education is a causal force increasing political engagement. Otherwise, expanding education over generations could have little impact on political participation and policy (e.g., Brody 1978). Since the earliest election surveys launched over fifty years ago, scholars have consistently uncovered robust positive effects of education on turnout, voter registration and other forms of political involvement. In our survey of 45 major studies on the question since 1960, we find that an overwhelming majority (82%) of these uncover positive education effects.[3] Figure 1 summarizes this finding in a histogram of the number of studies conducted each year that find either positive (light grey) or null (dark grey) effects. Clearly from the figure, we see most of the research affirms a positive relationship between education and participation, with virtually no dissenting studies emerging prior to 2007. In the last decade, there have been some studies reporting null findings, though these still constitute the minority (33%) of research conducted since 2005.

<Figure 1 about here>

From our survey of the literature, we also find positive results across a wide range of research settings. The education effect has been recovered in a variety of populations including national election surveys, multi-generational panel socialization studies, and large-sample current population data (Campbell et al. 1960; Converse 1972; Jennings and Niemi 1981; Leighley and Nagler 1992a; Wolfinger and Rosenstone 1980). Similarly positive findings are reported using different education measures, including years of schooling, discrete education levels, curriculum type, and college attendance or graduation (Leighley and Nagler 1992b; Nie Junn and Stehlik-Barry 1996; Pacheco and Plutzer 2008; Verba and Nie 1972). More recently, natural and field experiments in education have replicated the positive results from the earlier body of observational analyses (Milligan, Moretti and Oreopoulos 2004; Sondheimer and Green 2010). In no small measure, the consistency of this positive association has led some scholars to conclude that the *education effect* is one of the major contributions of political science to our knowledge of social and political life (Schlozman 2002).

Individual Factors

Given robust positive findings, much scholarly effort has been devoted to explain the education-participation link. This work typically begins with a basic model of participation: people get engaged if the benefits outweigh the costs. Early on, this account took a rudimentary form, examining the connection between socioeconomics (SES) and participation, under the logic that SES factors (i.e., income, education, occupation) enable some people to better afford the costs of participating compared to others. In subsequent

[3] See Appendix Table A for more details on the 45 studies, and the features we included in our survey.

years, influenced in part by V&E, this model has been greatly elaborated to include a much more precise accounting of benefits, costs and resources.

V&E's civic volunteerism model focuses much attention on the costs side of the participation calculus. The model connects SES factors to resources that may influence particular forms of engagement, like voting, donating money or volunteering. Education mainly plays a role in cultivating civic skills (e.g., cognitive ability, creative thinking, research and writing) and a general interest in politics that helps people overcome certain participation costs.[4] These civic skills and interests make it easier for citizens to collect and digest information about candidates, navigate voter registration hurdles, and understand how elections and governments work (Delli Carpini and Keeter 1996; Verba, Schlozman and Brady 1995). Notably in V&E, education is *not* seen as a key driver of donating or volunteering – income or occupation are more critical to amounting resources in money and time that encourage those activities. However, through its influence on civic skills and interests, education *is* a major force behind registering and voting.

The civic voluntarism model significantly (though not exclusively) features the balance of resources and costs to model participation. This is not the only way scholars have approached the question. High rates of voting after all are paradoxical focusing solely on costs, given that voting is always costly, but the policy (or material) benefits of doing so virtually nil. Other researchers have emphasized the (largely immaterial) benefits afforded to those who participate. Wolfinger and Rosenstone (1980), for example, argue that education inculcates civic values and norms that may elicit psychological rewards for participating later in life. Benefits may also accrue from experience. While in school, students may get early exposure to politics through campus activities or elections, which can increase the enjoyment had from voting by cultivating taste or habit (Gerber, Green and Shachar 2003). Finally, Wolfinger and Rosenstone (1980) and Verba, Schlozman and Brady (1995) agree about one important benefit: political interest. Accordingly, the more interested in national or political affairs, the more likely a person is to participate, since they may receive some enjoyment from the voting experience. Education, and in particular college, has long been expected to spark interests in politics, not only through coursework on political affairs, but also through the vast array of political opportunities that abound in university life.

Network Linkages

The above accounts are mostly about individual-level changes flowing from education that create new participants or encourage additional modes of participation. An alternative way scholars link education to participation is through its influence on people's social networks (Jackson 1996; Nie, Junn and Stehlik-Barry 1996; Rolfe 2012; Rosenstone and Hansen 1993). Generally, this work emphasizes the ways social and political networks mobilize individuals to be engaged by connecting them to other

[4] We emphasize the implications of the civic volunteerism model for the costs side of the participation calculus, though civic skills and political interest could easily be placed on the benefits ledger as Verba, Schlozman and Brady (1995) note.

engaged citizens. Central to the account is that educational attainment connects similar individuals together in particular social networks, which can increase the chances of their being asked or expected to participate. In such models, education does not necessarily change who you are, but can encourage civic engagement in changing who you know.[5]

A classic work in this vein, Rosenstone and Hanson (1993), argues that educated individuals are more likely to be mobilized by politicians and interest groups through their social networks. Political leaders may so mobilize because they believe educated individuals have higher civic skills, or simply because they are part of the same social circles and thus are easier to target. In the parlance of V&E, people may participate because someone asked them to do so, with the more educated being more frequently asked (Verba, Schlozman and Brady 1995). Indirectly, educated individuals also may be encouraged to participate given their position in a social network, since these connections may help transmit important political information, lessening the cost of gathering that information independently. Finally, network linkages can also have reinforcing influences on participatory behavior through social monitoring, pressure or norm transmission (Gerber, Green and Larimer 2008). Denser networks inhabited by other participants may increase pressure to vote by adding more opportunities for non-voters to encounter social friction. By influencing the costs and benefits of participation, the more politically active social circles that highly educated individuals have access to thus can influence their rates of participation as well.[6]

Meredith Rolfe (2012) expands upon this network account, contrasting the individual costs-and-benefits model with a socially-driven model. She argues that rather than focusing on Verba, Schlozman and Brady's (1995) civic voluntarism model in which individuals make participation decisions that are more or less costly depending upon a variety of factors, including education, researchers should instead think about voting in terms of the relationships and networks among citizens. Higher levels of educational attainment are highly correlated with being a part of social networks that are larger and denser, and Rolfe argues that it is these social networks that are crucial to spurring higher

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[5] Network accounts are somewhat ambiguous as to whether a *causal* relationship exists between education and participation. Often such accounts see education as a sort of signal that others use when mobilizing voters, so that education is merely a proxy for the bundle of civic goods that elites aim to utilize. Networks could still facilitate a kind of education 'effect', yet one in which education has no individual-level causal influence. We think a part of the ambiguity here is the view that causes generally should be seen operating on an individual, as opposed to on their social context. Setting aside how elites might alter mobilization strategies, if policymakers exogenously altered people's education levels *and* this increases their likelihood of participating by altering their network membership, we see this as consistent with a causal education effect, *even if* education does not otherwise alter an individual in any way. Thus, we see networks (i.e., social context) as analogous to other mechanisms (e.g., individual civic skills) that potentially mediate the causal link between education and political engagement.

[6] Social networks form in a variety of ways, including on college campuses. We might expect that individuals who spend time on a traditional, physical college campus form stronger social networks of the type that encourage political participation, as compared to those completing college coursework online and potentially disconnected from their student peers. We explore this idea further below.

levels of participation. Rolfe finds that once social networks are accounted for, individual-level educational attainment has no independent effect on voting rates. Thus, as with Rosenstone and Hanson's research, Rolfe's work points to the need to consider which aspects of education are likely to create the type of social networks – large, dense, and full of other highly educated individuals – that encourage political participation.[7]

The Education-as-Proxy Alternative

More recently, scholars have offered a very different account for the education effect, suggesting education merely *proxies* rather than causes factors that elicit greater participation. Kam and Palmer (2008) articulate this view most clearly, arguing that pre-adult forces in social stratification and socialization drive both educational attainment and political engagement behaviors. For example, a person's family background, parental income or education, personality, core values, and even natural or developed abilities, can lead them to be more participatory, regardless of any exposure to education. Yet, since those same factors also drive people to seek out more schooling, especially higher education, the correlation between education and participation could simply be spurious. In other words, educational experiences themselves do not confer any additional resources to individuals or make them more likely to participate later in life, but simply proxy the variety of participation-relevant, pre-adult experiences and characteristics that do generate such resources or benefits (Kam and Palmer 2008).

Naturally, such a view deeply questions the causal nature of the relationship between education and participation. In doing so, Kam and Palmer's findings constitute a significant departure from previous work on education. Perhaps most importantly, this work has re-centered the debate rightly on the kinds of quality data and research design needed to evidence a causal effect. In their original piece (Kam and Palmer 2008), and in a later rejoinder (Kam and Palmer 2011), the authors use a matching design in two education panel studies to control for important pre-education *observable* factors before estimating the education effect.[8] In both studies, the authors recover null findings.

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[7] Nie, Junn, and Stehlik-Barry (1996) offer an alternative network-like account of the education effect. Here education plays an important role as a sorting mechanism, promoting some people towards the center of social and economic networks. This placement leads people to be asked to participate at higher rates, but only to the degree that education, relative to other participation factors, remains scarce. An important implication is that it is not just the number of years of education that matters, but also the quality and type of education that is obtained. As more people attend college, the scarce resource of political network centrality may be allocated increasingly by factors such as the prestige of an individual's university. Thus, as we argue below, it is important that researchers move beyond simply measuring the number of years of education and consider more qualitative aspects of education that may be important for network formation.

[8] Matching here is used to find those people who did *not attend* (or graduate) college, who are as similar as possible on the available covariates as each person who did obtain (or complete) college education. Notably, only observed factors can be 'balanced' or made similar through matching, and the key assumption is that no other *unobserved* factors are imbalanced after matching that correlate with both college and participation.

One of the major strengths of this research is the use of a large number and wide array of relevant variables, which by definition are pre-treatment given the panel structure of the data. However, the original study in 2008 was shown independently by Henderson and Chatfield (2011) and Mayer (2011) to suffer serious methodological and data shortcomings, some of which very likely arise in many other observational studies of the education effect. Foremost among these problems is that those who obtain more education appear to be very different from those who do not on the *observed* variables included as controls (e.g., parent's income and education, high school GPA, prior political interest or knowledge). At least in the case of college attendance in the 1970s, matching methods are unable to eliminate these differences, which is likely to seriously bias comparisons of participation rates across different levels of education (Henderson and Chatfield 2011).

This problem is usually denoted as a lack of 'common overlap' in the data, and though is quite apparent in the debate surrounding the matching analysis in Kam and Palmer (2008), it is by no means exclusive to that method or result.[9] Other studies, most notably Tenn (2007), use alternative OLS regression approaches to estimate the influence of each marginal year of schooling on participation. Tenn (2007), in particular, restricts the analysis so that people are only compared to those with one additional (or one fewer) year of education, controlling for other standard socio-demographic variables. The author also recovers null estimates, yet acknowledges a similar issues in lacking common overlap even when comparing people who differ by just one year of education.

In addition to this issue, the main assumption underlying such observational analyses, that no additional *unobserved* factors need be included as controls once all the observable factors are included (and balanced), is both strong and untestable. And this assumption may be especially strong in studying education, since the serious lack of overlap in the available data suggests a very strong unobserved process of educational sorting is afoot. Despite these concerns, it is likely the case that at least some portion of the 'education effect' previously uncovered is explained by pre-adult experiences, since individuals do not select into attending college at random. Thus, it remains an open question for political science researchers whether education provides substantial participatory returns, and if so through what particular mechanisms it does so.[10]

The Experimental Turn

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[9] A way to think about this problem in a typical OLS setup is when there are a great many empty cells in the cross-tabs of the *X* variables that correlate with levels of education. For example, if a particular survey sample contains no low-income, Latina woman with a BA, then an OLS estimate essentially assumes these citizens participate at a rate of $\propto +\delta$. Here $\propto$ is the rate of participation amongst low-income, Latina woman *without* a BA, and δ is the average (weighted) marginal increase in participation going from no-BA to BA for all the other individuals sampled. This δ is (roughly) the additional rate of participation associated with moving from no-BA to BA that is not explained by sex, ethnicity and income. Less overlap (more missing cross-tabs) implies OLS is making more of these strong (and untestable) extrapolation assumptions on the basis of less data.

[10] We include in Appendix Table B a summary of the various mechanisms usually proposed as explanations of the education effect.

Precisely for the reasons above, a few scholars have turned to experimental approaches to study the education effect. In the ideal, such designs can exploit interventions in education that are uncorrelated (either by nature or through controlled randomization) with the underlying sorting pressures that drive people to obtain more schooling. In doing so, these would permit causal estimates.

Such studies are quite rare, likely due to the difficulty in experimentally manipulating levels or years of education. In Figure 2, we present a histogram of the 45 studies we surveyed over time distinguished by whether they utilized some kind of experiment, either in the field (dashed line) or from nature (dark grey), or are observational (light grey). We find that only 9 of the 45 studies use any experimental approach, and only one of these leverages researcher-randomized interventions. The remaining experimental studies exploit a range of instrumental variables (e.g., compulsory education laws, distance to college, public health interventions) that encourage greater schooling as ways of potentially identifying causal effects.

The rarity of experimentation makes sense for direct interventions in education, or those that may discourage educational advancement. Yet, surprisingly few scholars make use of encouragement designs, or interventions in the quality or type of education received. Sondheimer and Green (2010), who use three 'found' experiments in early-education, are the sole exception. They show that randomized preschool exposure, tutoring and mentoring resources, and smaller class sizes encourage students to stay in school longer and graduate high school at higher rates. Assuming these interventions had no alternative influence on participation outside of their positive impact on education, using them as instruments, the authors show that high school graduation causes higher rates of vote participation. While only one study, we think this finding should carry some additional weight given the randomized nature of the education interventions, certainly relative to non-experimental studies. Nevertheless there is clearly a need for replication and room for growth in the experimental study of education. We outline below some possible paths such growth could take.

<Figure 2 about here>

As a result of the limitations on direct manipulation, most experimental work has utilized natural interventions that may exogenously 'nudge' educational attainment, pushing some people onto different schooling paths than they otherwise would have taken. In doing so, these interventions may open up avenues to estimating causal inferences through an instrumental variables approach. The results of these natural experimental analyses, however, have been somewhat more mixed, with only about 63% of these uncovering positive education effects.[11]

[11] Chevalier and Doyle (2012) show positive education effects in the U.S., but largely null results for most of the other countries in their study. Thus, we include this study as a positive finding here. Also, this percentage excludes Sondheimer and Green (2010), which if included would shift this figure to 67% of experimental studies with positive results. Note, for observational studies the percentage of positive findings is higher at 83%.

Dee (2004) and Milligan, Moretti, and Oreopoulos (2004) use distance to junior college and compulsory schooling laws, respectively, as instruments for education since these lower the costs to obtaining more schooling. Both studies recover positive estimates of education on turnout in the U.S. In something of a contrast, Chevalier and Doyle (2012) look at variation in compulsory schooling laws across 38 European countries to assess the education effect in comparative context. Interestingly, this study finds no effect of education on voting, except for in the U.S., where such an effect persists. Looking backwards in time, Henderson (2015) uses a public health intervention in eradicating hookworm in the American South as an instrument for expanded schooling, and also finds a positive education effect. However, other work using natural experiments has recovered null findings. For example, Berinsky and Lenz (2011) exploit Vietnam draft-eligibility as an instrument for men's college attainment, and find no effects of additional education on voting. Solis (2013) uses a discontinuity in college loan eligibility as an instrument, finding null results amongst Chilean citizens. And Borgonovi, d'Hombres and Hoskins (2010) also uses comparative compulsory schooling, and finds zero education effects in 18 European nations.[12]

Again, one challenge in interpreting this work as a whole is its relative novelty, which is especially striking in the lack of controlled randomized studies. We think more experimental analysis is needed before it is possible ultimately to take stock of the education effect in light of the turn to experimentation. Another challenge is that natural experiments using instrumental variables may suffer certain inferential shortcomings that are difficult to test. In being determined by 'nature', there is no guarantee that the interventions are distributed independently of important pre-education confounders. Additionally, these analyses must make other untestable assumptions, for example that the instruments have no influence on participation outside of their effect on education.[13]

Another limitation is that virtually all of these experimental studies aim to estimate the *direct* effect of education (i.e., years or levels of schooling) on participation. One exception to this is Lasson (2004) who utilizes a natural experiment in a voter education campaign to see if civic information increases turnout in municipal elections in Denmark. The author finds that receiving civic and election information does increase voting rates, confirming one link in the education causal chain. Given this, as we describe below, we think there is ample room to expand the scope of experimentation in a variety of ways in order to better pin down the effects of education on political engagement.

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[12] Notably, the pattern of results here seems to be different in U.S. versus non-U.S. contexts. It is possible that this is because data of differing quality is available for different locations, but it also may be because the mechanisms linking education and political participation differ between the political systems under study. For example, the United States may have more difficult voter registration procedures or different patterns of party mobilization, among other differences.

[13] Adding to the complexity, natural experimental estimates are only relevant for the specific subset of citizens who would obtain more schooling if they received the instrumental intervention. For example, some students would graduate high school regardless of whether their state requires students to attend school through age 17. Compulsory schooling laws cannot tell us anything about whether more education increases participation for these particular students.

Linking Research Design to Education Mechanisms

Given the above challenges in observational and experimental research, we make three broad recommendations for future work on education. First, we suggest scholars should invest greater effort in outlining and investigating intermediate outcomes (or mechanisms) that are expected to translate educational experiences into participatory behaviors. Second, we argue for innovation in educational measurement, in particular developing more fine-grained measures that capture additional facets of the educational experience. Finally, we recommend greater use of natural and controlled interventions wherever possible, alongside careful observational analyses, to assess the above elaborate set of hypotheses about the political, behavioral, information and social effects of education. In the next section, we outline and implement such an approach following some of these recommendations through preliminary survey data.

In recommending elaborate theory testing, we take some inspiration from the basic research approach developed in V&E. Verba, Schlozman, and Brady (1995) elaborate a number of intermediate tests that point to specific educational mechanisms in resources and networks. For example, the authors include a vocabulary measure in their models, a correlate of cognitive ability that may be improved through education. They also study a range of civic engagement outcomes such as political knowledge, efficacy, interest and recruitment through workplace or organizational networks. Though the results they present are correlational, we see their approach as embedded in a larger mode of triangulation, characterized by assessing various pieces of the causal chain between education and participation.

Much (though certainly not all) of the research published since V&E, particularly those leveraging experimental designs, has focused on a direct frontal attack on the education question, with an emphasis on main or direct effects. We suggest that indirect tests focusing on mechanisms may be a more fruitful path going forward. That is, if we preclude many of the parts in the causal chain or find that the mechanisms linking education and participation do not seem to hold up to statistical scrutiny, this may reduce our confidence in the education effect. In contrast, attention to the entire causal chain and specific mechanisms may open up additional research designs that could provide more confidence for main effects. Elaborating the mechanisms behind the education effect is also important for policy recommendations. If it is the case that the participatory effects of college education are mainly attributable to pre-adult proxies, this suggests the need for very different policy interventions (i.e., those aimed at pre-adult experiences) than a world in which political engagement is bolstered by the development of cognitive, social, and organization skills that are best developed on college campuses.

Beyond elaborating theory, we think scholars should expand their focus to new education interventions and measures. This will be especially important as the educational environment changes dramatically over the next few decades, but also can offer scholars ways of leveraging data to evaluate competing theories of the education effect. As of 2013, one-in-eight U.S. college students was enrolled in an online degree program, and about a quarter took a mix of online and in-person classes (Integrated Postsecondary Education Data System). Further, this expansion in online education does not appear to be slowing down. As Suzanne Mettler reports, students are increasingly

enrolling at for-profit institutions, often with dramatically different outcomes in terms of graduation rates, unemployment, and student debt burden (Mettler 2014). Meanwhile, student loan burdens across institutions have risen dramatically in recent years. Finally, liberal arts and humanities instruction is on the decline, both in high school and university.

The changing landscape of higher education has important implications for the education-participation relationship. For example, depending on the correct theoretical mechanisms, many of these changes might weaken the education effect by dampening those features that elicit civic benefits or skills, in exchange for other sorts of skills unrelated to political engagement. We also argue that expanding measurement can provide new opportunities to explore educational mechanisms. For example, students taking classes in person may form very different types of social networks than those who take classes online. To the extent that different educational interventions influence intermediaries or resources differentially, we should exploit these differences to test portions of the causal chain. We discuss some of these mechanisms below, and recommend that future work also leverage these important changes in higher education.

Attention to more fine-grained educational interventions may also be more amenable to natural or controlled experimentation, in comparison to an absolute count of years of schooling where these designs are more problematic. For instance, Hillygus (2005) finds that taking a social science-focused curriculum in college is correlated with later political engagement. While randomizing college admissions would be ethically and practically problematic, it would be more feasible to randomize enrollment in a required first-year seminar that focused on either a social science or STEM topic. Such an approach also aligns with studying years of education in an encouragement design, similar to Sondheimer and Green (2010), where early schooling experiences that randomly or quasi-randomly influence educational attainment are used as instrumental variables.

Finally, we recommend that researchers consider designs that exploit natural and controlled interventions that test both direct and indirect effects, as well as careful observational analysis. There are clearly limits to direct experimentation on number of years of education, and natural experiments may become less feasible in a period of near-universal education. That said, designs that can leverage randomness in interventions can be quite promising, and may be most feasible when they focus on indirect effects or more specific educational measures (i.e., beyond number of years of schooling). We argue that researchers should significantly shift their efforts to studying indirect effects that may help differentiate between mechanisms.

Data and Results: New Measures of Education

We argue above that it is necessary to take a more fine-grained look at educational attainment, moving beyond a simple count of the number of years of education or a dummy variable for college attendance. While these broader measures can tell us that a correlation between education and political participation exists, they tell us less about the mechanisms at work in explaining this correlation. To this end, we suggest a number of new measures here that capture aspects of the educational experience, with a focus on

college education. Although the survey data described below is exploratory and suggestive, we hope to draw attention to these types of measures for future researchers as important sources of variation in the educational experience.

We conducted two surveys on Mechanical Turk, between February 9 and February 17, 2015. We split our sample into two groups, in order to oversample younger individuals who would be more likely to have taken online courses, one of our variables of interest. Ultimately, we collected 1,011 responses, with about half between ages 18 and 35, and half older than 35. Although Mechanical Turk samples are not as representative of the general population as nationally representative samples, they fare fairly well in comparison to other internet-based survey methods and do not tend to display extreme biases (see Berinsky et al. 2012). We also created weights to correct for the imbalances that did exist in the survey responses.[14] Finally, we imputed missing data for non-education outcomes and control variables.[15]

Our survey focused on two participation outcomes, voter registration and voting in the 2012 general election.[16] We also asked respondents about three types of intermediate outcomes – that is, outcomes that might be influenced by educational attainment that then later go on to influence participation. These were political knowledge (i.e., three factual questions about politics), political news (i.e., a question asking which news sources respondents had utilized to access political news during the past 24 hours), and political efficacy (i.e., trust in government and a sense that government listens to "people like you."). Each of these intermediate outcomes were combined into additive scales, indicating how many knowledge questions were answered correctly, how many different sources of political news were accessed, and how many efficacy questions were answered in the positive.

We examine three explanatory variables, in addition to educational attainment, that aim to capture different aspects of the educational experience. First, we asked respondents with at least some college experience where they took their coursework: on a physical college campus, online, or a mix of the two. Xu and Jaggars (2014) find that, at least at the community college level, students performed more poorly in online courses, both when comparing across students and across courses taken by the same student. Thus, we might expect that students whose educational experiences are entirely or almost entirely online would have different participatory outcomes than those whose experiences take place on a traditional college campus. In addition to the academic performance gaps that may exist between these students, online students may miss out on socialization experiences on college campus, as well as participatory gains from networks that may form on college campus.

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[14] We created rake weights in R using education, age, income, and race population moments from the 2012 Cooperative Congressional Election Study (CCES). See Appendix Figure A for a comparison of the (weighted) distribution of education levels in our survey and in the CCES. We utilized the 'survey' package in R to create the weights (Lumley 2010).

[15] We imputed items using Bayesian multiple chained equations (MICE) with the 'mice' package in R (van Buuren and Groothuis-Oudshoorn 2011).

[16] We leave it to future research to investigate a broader range of participatory outcomes, such as donations to political campaigns, volunteering, and letter-writing.

Following Hillygus (2005), we next asked respondents about their major in college (e.g., arts, science, social science, business or other), or in what area they took the most courses while attending school. Taking social science or politics courses might increase an interest in or knowledge of political affairs in ways that could encourage greater civic engagement. Comparatively, science courses may increase cognitive ability, but will probably not influence civic interests or benefits. Thus, observing participation differences between science and social science majors could provide some insight into the curriculum sources of the education effect, if any.

Finally, we asked students about educational debt. As student debt has skyrocketed in recent years, we might think that this debt could influence political participation. According to V&E, one of the pathways through which education influences participation is through the higher income that often results from having higher educational attainment. But, if a significant chunk of that higher income is going to service student loan debt, the actual financial resources available to an individual will be lower. We ask respondents to give the total amount borrowed to finance a college or post-graduate degree.

<Figure 3 about here>

Figure 3 presents histogram summaries of the three education measures. Figure 3(a) shows the (weighted) proportion of respondents by major, as well as the proportion of people taking courses predominantly on campus or online. Most of our respondents majored in either the sciences or in business. Interestingly, social science was the least popular course area, being edged out even by the arts and humanities. These proportions are roughly comparable to those recovered by Hillygus (2005), and provide variation that might provide a partial account for the participation differences exhibited amongst college attenders. Next, not surprisingly, a large majority of people took courses in a traditional campus environment. Yet, nearly 20% of the respondents took some significant number of their courses online, perhaps foreshadowing major changes in education delivery on the horizon.

Figure 3(b) displays the proportion of respondents with various degrees of student debt. While most respondents had no or low debt amounts, at least 33% of our sample owed $20k or more in education loans, and an additional 10% owed $80k or more. By all accounts student loan burdens are on the rise as college becomes more expensive. This development may dramatically change the way college cultivates civic resources by altering the value of particular kinds of knowledge, and thus how much schools or students invest in them. Rising student loan debt may also dampen the participatory value of civic and material resources as greater amounts of future earnings are devoted to servicing school debt.

In addition to these education measures, we also collected data on a number of control variables, including parent's highest educational attainment, parent's occupation, age, race, and gender. We selected these covariates both because they plausibly might influence both education and participatory outcomes, and because they are all pre-treatment, allowing us to avoid post-treatment bias in our analysis. We also collected data on party identification, which we treat here as pre-treatment. Although in theory

party identification could be influenced by college experiences, our comparisons are *among* individuals with college experience of some type, rather than between those with some college and those who never attended college. Additionally, there is little evidence that college education (or beyond) has much systematic influence on party identification in practice, given its durability as a social identity (Green, Palmquist and Schickler 2002), though additional schooling years might influence attitudes towards redistribution policies (Bullock 2014).

We used these variables to model the relationship between online versus traditional education, student loans, type of major and a variety of participatory outcomes. In an OLS regression, we included dummy variables for educational attainment (some college, 2-year degree, 4-year degree, or advanced degree). Because our independent variables of interest (location of coursework and college loans) are only applicable to those who attended college at some point, individuals who never attended are not included in our analysis.[17] We also controlled for parent's educational attainment, parent's occupation, age, race, gender, and the absolute value of party identification (i.e. strong partisans of either party are grouped together). These results are presented in Table 1.

Turning first to online versus traditional education, the major participatory differences pop out for those who attended college entirely or primarily online. Individuals who took a mix of online and in-person courses look very similar to those who attended in traditional campus environments in terms of their registration and voting participation. In contrast, individuals who attended college in an online setting are significantly less likely to be registered to vote, and also less likely to show up at the polls. Interestingly, this difference does not seem to be mediated by any of the intermediary variables that we examined. Online students are no less likely to feel politically efficacious or to seek out political news, and while they do score more poorly on political knowledge, the gap here is of a similar size as that exhibited by mixed online-physical campus students, and amounts to answering less than one political knowledge question incorrectly as compared to students on traditional campuses. Future research should explore alternative explanations for the participatory gap between online students and other college students. Specifically, we think that questions that ask about social networks and their relationship to political outcomes will be an important avenue for future work.

Next, we examined the relationship between student loan burden and political participation. Interestingly, higher student loan debt is associated with slightly higher rates of voter registration (about 2% for a $20,000 increase in student loan debt), even controlling for degree type and curriculum. However, this difference in registration rates does not translate into higher rates of voting participation. Higher levels of student loan debt are associated with slightly less attention to political news and slightly lower scores

[17] Because of the nature of this design, we do not directly test in this model the effect of college education as compared to those with less than a college education. That said, when we run the same models without the college-specific variables (i.e. without including measures of online education and loan debt), the college-educated are significantly more likely to register and turn out to vote.

on political knowledge questions, but these differences are substantively very small. Ultimately, we do not find substantively meaningful differences based on the total amount of student loan debt. That said, because of the strong influence of income on political participation, we hope that future studies will examine student loan burdens in more fine-grained ways, perhaps asking respondents about their monthly loan payments rather than the total amount borrowed. Finally, contra Hillygus (2005), we find little evidence of any participation differences across college majors, and so we omit these results here.

Ultimately, while this data is very preliminary, we believe it does show the promise of utilizing new education measures that may capture different facets of the higher education experience. We hope that future work will expand on these and other more fine-grained measures that aim to capture the ways in which "years of education" does not tell the full story.

Conclusion

Our aim in this chapter is to stimulate thinking about new research designs and approaches to studying the education effect. In spite of decades of attention, we think there is still great need (and considerable room) to think creatively and expansively about the kinds of education interventions to study. We expect future work to go beyond a focus on levels or years of education, and to think critically about the variety of schooling experiences that may alter participation. We also anticipate that such an effort will increasingly use experimental designs in tandem with more elaborate theory to provide much stronger evidence of much clearer relationships between educational factors and civic behaviors. Furthermore, the piecemeal approach we outline in this chapter can help shed light on some or many competing mechanisms, and may preclude some explanations all together, clarifying the precise link that exists between education and participation.

Elaborating measurement and design will be especially important as both K-12 and higher education undergo significant changes in content and mode of instruction. Certain facets of education are increasingly becoming universalized, while others remain or are becoming increasingly selective. Better quality or status, for example, may make attending certain colleges much more important in differentiating citizens in their networks or resources that elicit political involvement. Ultimately, it is important for political scientists to adapt their measures and research designs to capture the core features of what education means today and how it will change in the coming years. This is particularly so as these new and ongoing changes alter who participates, thereby bending the policymaking process towards certain interests over others, and perhaps more seriously dampening the voice and equality of those excluded from the benefits of educational innovation and expansion.

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Table 1: Effects of Different Dimensions of College Education on Participation and Intermediary Outcomes

	Voter Registration	2012 Vote Participation	Efficacy and Trust	Attention to Politics	Political Knowledge
Some Online Courses	0.05 (.03)	0.03 (.05)	-0.01 (.09)	0.43 (.12)*	-0.33 (.08)*
All Online Courses	-0.14 (.05)*	-0.15 (.08)*	0.02 (.14)	-0.21 (.19)	-0.34 (.12)*
Student Loan Debt	0.02 (.01)*	-0.01 (.01)	0.00 (.02)	-0.07 (.03)*	-0.12 (.02)*
2-year Degree	0.10 (.03)*	0.16 (.03)*	0.37 (.08)*	-0.18 (.11)†	-0.19 (.07)*
4-year Degree	0.01 (.03)	0.23 (.04)*	0.17 (.07)*	0.36 (.09)*	0.29 (.06)*
Post-Graduate	0.04 (.03)	0.12 (.04)*	0.32 (.09)*	0.47 (.12)*	0.20 (.08)*
Female	0.02 (.02)	0.04 (.03)	-0.03 (.05)	-0.18 (.07)*	-0.00 (.05)
Age	0.04 (.01)*	0.04 (.01)*	-0.10 (.02)*	0.06 (.03)*	0.04 (.02)*
Black	-0.03 (.03)	-0.01 (.03)	0.17 (.08)*	0.07 (.11)	-0.26 (.07)*
Hispanic	-0.02 (.05)	-0.13 (.07)†	-0.05 (.13)	-0.27 (.18)	-0.30 (.11)*
Asian	-0.12 (.05)*	-0.24 (.07) *	0.24 (.13)†	-0.21 (.19)	-0.12 (.12)
PID (abs)	0.03 (.01)*	0.12 (.01)*	0.24 (.03)*	0.14 (.04)*	0.09 (.02)*

Omitted Categories: For coursework location, traditional campus courses; for education, some college; for race, white/Caucasian. Also controlled for: Parent Education and Parent Occupation

* $p < 0.05$, † $p < 0.1$

Appendix Table A: Description and Findings of Studies of the Education Effect on Turnout and Participation

Citation	Method	Education Measure	Outcome	Results
1. Ashenfelter and Kelley (1975)	Observational	Schooling years	Turnout, additional participation	+
2. Bachner (2010)	Observational	Curriculum or other	Turnout	+
3. Berinsky and Lenz (2010)	Natural experiment	College attendance	Turnout	0
4. Borgonovi, d'Hombres and Hoskins (2010)	Natural experiment	Schooling years	Turnout, information	0
5. Brady, Verba and Schlozman (1995)	Observational	Education levels	Turnout, donations, volunteering	+
6. Burden (2009)	Observational	Education levels	Turnout	+
7. Campbell (2009)	Observational	Education levels	Turnout, additional participation	+
8. Campbell et al. (1960)	Observational	Education levels	Turnout, additional participation	+
9. Chevalier and Doyle (2012)	Natural experiment	Schooling years	Turnout	0
10. Dee (2004)	Natural experiment	College attendance	Turnout, registration, volunteering	+

Appendix Table A (continued)

Citation	Method	Education Measure	Outcome	Results
11. Delli Carpini and Keeter (1996)	Observational	Education levels	Information	+
12. Gallego (2010)	Observational	Schooling years	Turnout, additional participation	+
13. Henderson (2015)	Natural experiment	Education levels	Turnout	+
14. Henderson and Chatfield (2011)	Observational	College attendance	Turnout, additional participation	+
15. Highton (2009)	Observational	Education levels	Knowledge, sophistication	0
16. Hillygus (2005)	Observational	Curriculum or other	Turnout, additional participation	+
17. Jackson (1993)	Observational	Education levels	Turnout	+
18. Jackson (1995)	Observational	Education levels	Turnout, registration, additional participation	+
19. Jackson (1996)	Observational	Education levels	Turnout, registration	+
20. Jennings and Niemi (1981)	Observational	Education levels	Turnout, additional participation	+
21. Jennings and Stoker (2008)	Observational	High school graduation, college attendance, college graduation	Turnout, additional participation	+

Appendix Table A (continued)

Citation	Method	Education Measure	Outcome	Results
22. Kam and Palmer (2008)	Observational	College attendance, college graduation	Turnout, additional participation	0
23. Kam and Palmer (2011)	Observational	College graduation	Turnout	0
24. Lassen (2004)	Natural experiment	Curriculum or other	Turnout	+
25. Leighley and Nagler (1992a)	Observational	Education levels	Turnout	+
26. Leighley and Nagler (1992b)	Observational	College attendance	Turnout	+
27. Lewis-Beck et. al (2008)	Observational	Education levels	Turnout, additional participation	+
28. Mayer (2011)	Observational	College attendance	Turnout, additional participation	+
29. Miller and Shanks (1996)	Observational	Education levels	Turnout	+
30. Milligan, Moretti and Oreopoulos (2004)	Natural experiment	Education levels	Turnout, registration, additional participation	+
31. Nagler (1991)	Observational	Education levels	Turnout	+
32. Nie Junn and Stehlik-Barry (1996)	Observational	Schooling years	Turnout, additional participation	+
33. Pacheco and Plutzer (2008)	Observational	Curriculum or other	Turnout	+

Appendix Table A (continued)

Citation	Method	Education Measure	Outcome	Results
34. Persson (2012)	Observational	Curriculum or other	Turnout	0
35. Persson (2013)	Observational	College graduation	Turnout, additional participation	0
36. Rosenstone and Hansen (1993)	Observational	Education levels	Turnout, additional participation	+
37. Shields and Goidel (1997)	Observational	Education levels	Turnout	+
38. Smets and van Ham (2013)	Observational	Education levels	Turnout	+
39. Solis (2013)	Natural experiment	College attendance	Registration, additional participation	0
40. Sondheimer and Green (2010)	Field experiment	High school graduation	Turnout	+
41. Tenn (2005)	Observational	Education levels	Turnout	+
42. Tenn (2007)	Observational	Schooling years	Turnout, registration	0
43. Timpone (1998)	Observational	Education levels	Turnout, registration	+
44. Verba and Nie (1972)	Observational	Education levels	Turnout, additional participation	+
45. Wolfinger and Rosenstone (1980)	Observational	Schooling years	Turnout, registration	+

Appendix Table B: Summarizing the Causal Pathway Between Education and Participation

In synthesizing the views of the *education effect*, education could be linked to voting and participation through the following mechanisms:

Individual

1. Knowledge, information or civic skills
2. Civic values or norms to participating
3. Resources in time, income and cognitive ability
4. Expertise in politics or bureaucracies through practice
5. Tastes or habits in participating

Social

6. Networks for mobilization or information transmission
7. Social influence, monitoring, pressure through networks
8. Norms transmission across network links

Proxy

9. Selection process of prior social stratification and socialization

Each of these suggests intermediary factors that may mediate the effect education has on participation, in ways that may permit ancillary tests of the education effect.

Figure 1: Histogram of 45 Major Studies Finding Positive or Null Effects of Education on Political Participation

Figure 2: Histogram of 45 Major Studies Using Experimental or Observational Research Designs to Estimate the Education Effect

Figure 3: Histograms of Course Curriculum, Online or Offline Courses and Student Loan Debt in the MTurk Sample

Appendix Figure A: Comparison of the (Weighted) Distribution of Education Levels in the MTurk Sample and the 2012 Cooperative Congressional Election

Figure 1: Histogram of 45 Major Studies Finding Positive or Null Effects of Education on Political Participation

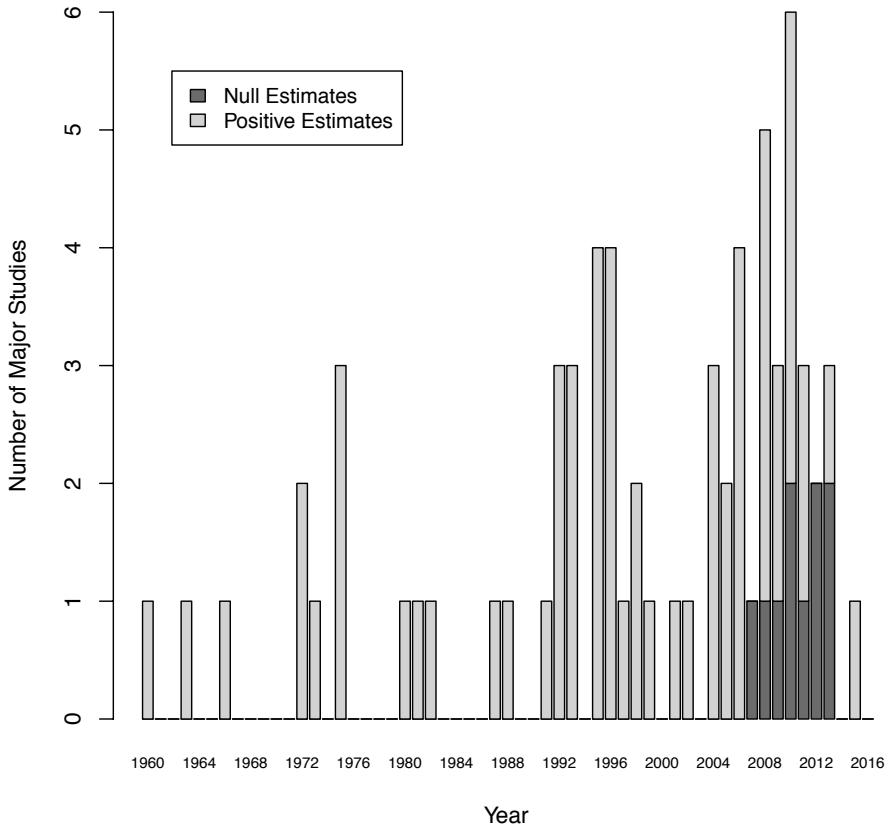


Figure 2: Histogram of 45 Major Studies Using Experimental or Observational Research Designs to Estimate the Education Effect

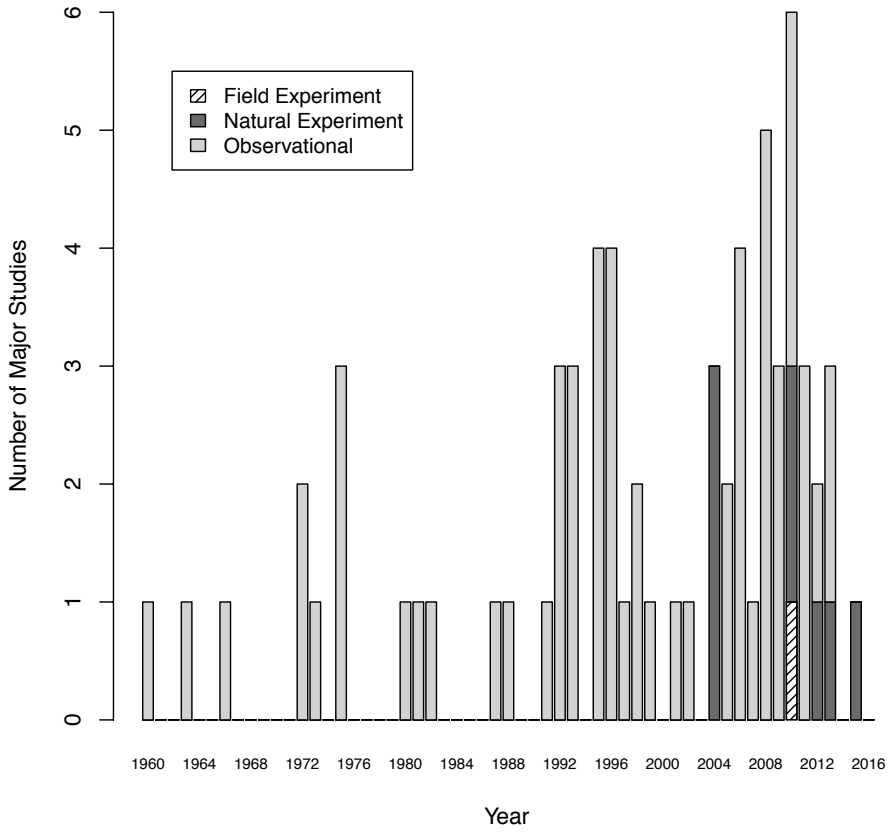
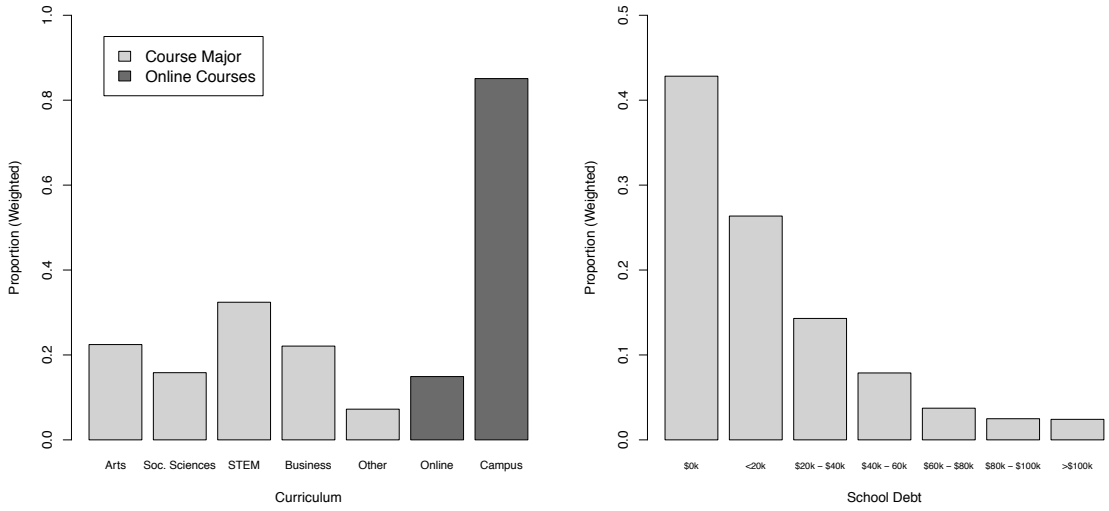


Figure 3: Histograms of Course Curriculum, Online or Offline Courses and Student Loan Debt in MTurk Sample



(a) Online and Major Curriculum

(b) Student Loan Debt

Appendix Figure A: Comparison of the (Weighted) Distribution of Education Levels in the MTurk Sample and the 2012 Cooperative Congressional Election