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## **Bridging Economic and Educational Disparities in America**

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Many Americans face substantial barriers to economic opportunity. Inclusive growth has been challenging to achieve in the United States: the economy has not generated income growth for the bottom half of earners over the past half-century (Piketty, Saez, and Zucman, 2017), and upward economic mobility has declined substantially during the same span of time (Chetty et al., 2017). This dissertation examines how technology, education policy, and places have potentially perpetuated economic disparities for low-income Americans. Each chapter explores how certain policy responses—affordable broadband access, school discipline reform, and place-based jobs policies—have important implications for bridging these disparities.

### **Wired and Hired: Employment Effects of Subsidized Broadband Internet for Low-Income Americans** (Zuo 2021, *American Economic Journal: Economic Policy*)

Many Americans live without a wired broadband connection in their homes and frequently cite price as the limiting factor (Horrigan and Duggan, 2015). Prior to the COVID-19 pandemic, lack of broadband affordability had driven large income-based disparities in broadband adoption rates: in 2017, 56% of families earning less than \$40,000 annually had a broadband subscription, compared to 86% of families earning more than \$70,000.<sup>1</sup> Without the convenience of home broadband, poor families may be less equipped to navigate the labor market in the digital era. Job seekers without broadband are 21 percent less likely to use online resources for job search, and face other obstacles to employment that modern online tools may be suited to address.<sup>2</sup>

This chapter studies whether changes in broadband pricing can meaningfully close the income-broadband gap and produce downstream benefits in the labor market for economically disadvantaged Americans. I do so by analyzing Internet Essentials, a commercial broadband discount program launched in 2012 by Comcast, the nation's largest internet service provider by subscriber count. Internet Essentials offers 15 megabits-per-second (Mbps) broadband internet for \$9.95 per month to families with children eligible for free and reduced-price lunch through the National School Lunch Program (NSLP). The discounted pricing is \$20 to \$30 lower than typical,

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<sup>1</sup> Author's calculation using 1-Year Estimates from the American Community Survey (2013-17).

<sup>2</sup> Author's calculation using the 2015 Pew Survey on Gaming, Jobs, and Broadband.

non-promotional prices for equivalent speeds. The program also provides ancillary benefits such as fee waivers and instructional materials to mitigate other financial and psychic costs of connecting online from home. According to a 2018 progress report, Internet Essentials has connected over six million low-income Americans to the internet since launching in 2012, with over 90 percent of customers connecting online from home for the very first time (Comcast Corporation, 2018).

The relationship between broadband access and labor market outcomes has been a topic of growing interest for policymakers and researchers alike (Council of Economic Advisors, 2015). Broadband availability and affordability was a key issue in the federal government's \$1.2 trillion infrastructure plan; \$65 billion was ultimately allocated towards these efforts. However, evidence from economics is almost entirely comprised of studies analyzing geographic expansions of broadband infrastructure.<sup>3</sup> This paper's novel focus on broadband affordability builds on the economic literature in several important ways. First, to the best of my knowledge, this is the first paper that specifically focuses on low-income families. While expanding geographic broadband coverage remains an important policy objective, addressing the persistent income-broadband gap is arguably the more pressing and current issue. 97 percent of the U.S. population lives where 10 Mbps broadband speeds are available---enough to comfortably stream Netflix in HD---yet only 56 percent of low-income Americans actually own broadband subscriptions.<sup>4</sup> Second, studies that leverage geographic broadband expansions typically document greater broadband adoption rates in both households *and firms*, making it difficult to disentangle the labor market impacts of household versus firm broadband take-up. I analyze policy variation in broadband pricing for low-income families, which conceivably isolates the effect of increasing household take-up. Finally, the timing of the policy variation I use is the most up-to-date in the literature. This is important given that it coincides with a recent surge in mobile wireless technologies that may influence the relative importance of wired broadband connections moving forward.

To empirically estimate the employment effects of Internet Essentials, I use the fact that only eligible families living within Comcast's broadband service area after 2012 could enroll in Internet Essentials. This meant that an individual's ability to enroll in Internet Essentials was

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<sup>3</sup> See expansions from Hjort and Poulsen (2019) in Africa, Akerman, Gaarder, and Mogstad (2015) and Bhuller, Kostol, and Vigtel (2019) in Norway, Briglauer et al. (2019), Gurtzgen et al (2018), and Denzer and Schank (2018) in Germany, and Dettling (2017) and Kolko (2012) in the United States.

<sup>4</sup> See Figure 3 in Tomer, Kneebone, and Shivaram (2017), and Netflix's "Internet Connection Speed Recommendations" (<https://help.netflix.com/en/node/306>)

determined by a confluence of three sources of variation: 1) geographic variation in Comcast availability, 2) temporal variation pre- and post-launch, and 3) individual variation in eligibility. I leverage this variation in a triple differences framework comparing outcomes of eligible and ineligible individuals across locations with varying Comcast broadband coverage rates before and after the launch of Internet Essentials. Identification relies on the assumption that differences in labor market outcomes between eligible and ineligible individuals are uncorrelated with Comcast coverage rates before and after 2012, but for the impact of Internet Essentials.

I also exploit the fact that program eligibility based on the NSLP is two-pronged. Individuals with children eligible for free/reduced-price lunches must have 1) family incomes beneath a specific threshold, and 2) at least one child attending K-12. In my main specification, I restrict the control group of ineligible individuals to those who meet the low-income requirement but do not have school-aged children. Ineligible individuals in this group may be more likely to access similar kinds of labor markets and job opportunities as those who are eligible, mitigating the likelihood that post-2012 differences between the two groups diverge in high- versus low-Comcast areas for reasons besides Internet Essentials. Building on this, I show that the estimated employment effects are similar when restricting the control group of ineligibles to low-income individuals who are parents but whose children are either too young or too old to attend K-12. The results also hold when restricting the entire sample to low-income parents whose children's ages vary within a narrow bandwidth above and below the cutoff for kindergarten.

The data I use come from two sources. I first use data from the National Telecommunications and Information Administration to construct estimates of local Comcast broadband coverage rates. These data include census block-level indicators of where Comcast provides broadband service in the United States. I then link these data to individuals and their outcomes in the American Community Survey (ACS) at the Public-Use Microdata Area (PUMA) level, which is the lowest level of geography identified for all respondents. The ACS data also contain information on family income and children, which I use to determine program eligibility.

The results indicate that PUMA-wide availability of Internet Essentials increases the probability that an eligible low-income individual is employed by 0.9 percentage point (off a base of 56.7 percent). This estimate is an intent-to-treat (ITT) estimate of Internet Essentials, since I do not observe actual program enrollment. The effects are robust to a variety of sensitivity tests and alternate specifications, including the addition of various controls for confounding trends that could potentially correlate with program availability. The effect appears driven both by

increases in labor force participation and decreases in the probability of being unemployed. After adjusting for nationwide program take-up rates, I calculate that the treatment-on-the-treated (TOT) employment effect of enrolling in Internet Essentials is approximately 8.1 percentage points (14.3%), with a lower bound of 2.1 percentage points (3.7%). While large, the effect size lies within the range of previous estimates on broadband and employment, and aligns with qualitative evidence on the program's outsized role in helping job seekers find work. Availability of Internet Essentials ultimately increases income by \$147 (1.3%), an effect which appears driven by earnings gains along the extensive margin of employment. I conduct a back-of-the-envelope calculation and find that the program benefit to enrolled households is approximately \$2,202. This benefit is more than four times the estimated cost to provide the service, including the monthly broadband subsidy, fee waivers, and other administrative costs.

I also conduct a simple placebo test leveraging the fact that Internet Essentials was the only low-income program of its kind among large internet service providers until 2016. This implies that post-2012 employment differences between eligible and ineligible individuals should not be associated with broadband coverage rates of other large internet service providers. I confirm that the significant effects associated with post-2012 Comcast coverage vanish when using broadband coverage rates of the next three largest internet service providers: AT&T, Charter (Time Warner), and Verizon. This test bolsters a causal interpretation of my findings.

Broadband has become a near-necessity in the digital era, yet many low-income families remain unwilling or unable to pay for a broadband subscription. The findings in this paper provide evidence that Internet Essentials, which subsidized broadband subscriptions by \$20 to \$30 per month, meaningfully increased broadband adoption, employment, and earnings for program enrollees. Even in light of the growing ubiquity of smartphones, public WiFi, and other methods of connecting online, the benefits of a home broadband subscription remain non-trivial for low-income families navigating the labor market in the digital era.

### **Suspending Suspensions: The Education Production Consequences of School Suspension Policies** (with Nolan Pope, revise and resubmit at *Economic Journal*)

Managing student behavior is an integral part of education production. School discipline is tightly linked to high school dropout and adult crime (Aizer and Doyle, 2015; Bacher-Hicks, Billings, and Deming, 2019), harbingers of poor economic outcomes in adulthood. Yet historically, most disciplinary policies have been formed with little empirical evidence of their costs and benefits—a notion highlighted by the turbulent history of school suspensions in

American education. Starting in the early 1990s, many states and school districts began implementing “zero tolerance” suspension policies in response to growing concerns of violence and disorder in schools, driving national suspension rates from 3.5% to 8.4% between the mid-1970s and the turn of the century. Around this time, the prevailing view on suspensions began to shift: suspensions were gradually being seen as a policy responsible for needlessly removing students from the classroom and disproportionately harming minority students. These criticisms culminated in a joint initiative between the Department of Education and Department of Justice in 2011, leading many states and school districts to reform their disciplinary policies to be less strict and exclusionary (Lacoe and Steinberg, 2017) The reforms fueled a reversal in national suspension policy, leading to a 40 percent reduction in suspensions over the past decade. Still, approximately 3.5 million students are suspended each year, amounting to nearly 18 million days of lost instruction (Losen et al., 2015).

Despite the wide variety of policies accompanying the rise and decline of suspensions over the last 40 years, there remains relatively little empirical evidence on the causal impact of suspension policies on student performance and teacher turnover. In this paper, we model and estimate the effects of a large and persistent decline in suspension rates in the Los Angeles Unified School District (LAUSD), where suspension rates drastically fell from eight percent in 2003 to less than one percent in 2015. The decline was largely driven by a districtwide push for schools to revise their respective disciplinary policies to rely less on suspensions. Individual schools were required to both design and resource their revamped disciplinary policies. We use LAUSD administrative student-level data to estimate the effect of changes in school suspension rates on math and English test scores, GPAs, absences, and teacher turnover.

Estimating the causal impact of changes in school suspension rates is complicated by the fact that school suspension rates are likely endogenous to changes in school quality and student composition. Our empirical approach instruments for each school's suspension rate using year-to-year changes in the districtwide suspension rate interacted with school-specific suspension rates fixed to an initial pre-period. The instrument, which shares some similarities to the classical shift-share IV, relies on year-to-year changes in districtwide suspension rates being exogenous to school-specific determinants of student performance. Initial suspension rates scale each school's exposure to these districtwide changes.

We find that a 10 percentage point decrease in school suspension rates decreases concurrent math and English test scores by 0.040 and 0.065 standard deviations, respectively.

These effects, while modest, are equivalent to reducing teacher quality by 0.29 and 0.65 standard deviations for math and English (Chetty, Friedman, and Rockoff, 2014). Suspension rates also impact students beyond test scores. A 10 percentage point decline in suspension rates decreases GPAs by 0.07 standard deviations and increases the fraction of days absent (excluding suspension days) by 1.1 percentage points (15.1%). This implies that declining suspension rates in Los Angeles during our sample period were detrimental to the average student across a variety of outcomes. Our findings are supported by a falsification test that shows little correlation between future values of the instrument and current achievement, suggesting that the results are unlikely driven by correlations in the trajectory of schools with high initial suspension rates and districtwide suspension rate growth. The estimates are also robust to a variety of specifications which probe the sensitivity of the estimates to bias from serial correlation and the endogeneity of initial suspension rates.

Declining suspension rates may also affect teachers' well-being. When limited in their capacity to suspend students, teachers may face more misbehavior and find the teaching environment to be more difficult and unpleasant. We quantify this by estimating the impact of school suspension rates on teacher turnover. We find that a 10 percentage point decrease in suspension rates increases teacher turnover by 2 percentage points (9.9%). The effect is particularly concentrated on inexperienced teachers. Teachers with less than three years of experience are more than three times as likely to leave their school in response to declining suspension rates. A back-of-the-envelope calculation suggests that inexperienced teachers would need to be paid \$2,967 more per year to offset a 10 percentage point decrease in suspension rates (Clotfelter et al., 2008). In addition, we find that attrition rates among high school teachers—with older students whose misbehavior may be more difficult to manage—are most responsive to declines in suspension rates.

Our estimates also show that the suspension rate decline in LA had very different impacts across the distribution of suspension propensity. We find that low-risk students in the lowest quintile of suspension risk experienced little to no impact on their achievement. By contrast, students in the middle three quintiles all experienced large decreases in achievement. Finally, students in the top quintile experienced a moderate *increase* in achievement. Alongside the fact that suspension rates only steeply increase between the fourth and fifth quintiles, these results suggest that direct effects are likely only meaningful for the highest-risk students. Our estimates imply that suspension policies entail a difficult tradeoff between efficiency

(achievement falling for a majority of students) versus equity (achievement increasing for the highest-risk students).

This chapter provides four important contributions to the limited literature on causal effects of suspension policies (Deming, Bacher-Hicks, and Billings, 2019; Craig and Martin, 2021; Lacoë and Steinberg, 2018a,b). First, we provide a model for how direct and indirect effects can lead to different impacts across the distribution of students, and we quantify the tradeoffs that suspension policies produce. Second, our IV strategy is novel to this literature and provides a way to address the endogeneity of suspension rates and separate the correlation with other school characteristics. Third, we quantify how suspension rates not only impact students, but teachers as well. Finally, the dramatic decline in LAUSD suspension rates is novel to a literature which has primarily focused on smaller shocks such as suspension bans for low-level offenses. Our findings ultimately provide educators and administrators with a framework for assessing the tradeoffs associated with suspension policy changes.

The findings have important implications for discipline in education more broadly as well as a rich peer effects literature on negative behavior spillovers (Carrell, Hoekstra and Kuka, 2018; Imberman, Kugler and Sacerdote, 2012; Sacerdote, 2011). Researchers have also linked suspensions to future incarceration (a phenomenon known as the “school-to-prison pipeline”), which could lead to outsized negative economic and social effects for youth (Aizer and Doyle, 2015; Deming, Bacher-Hicks, Billings, 2019; Wald and Losen, 2003). Additionally, school districts must also contend with implicit racial bias in the implementation of suspension policies (Barrett et al., 2017). Given the tradeoffs that school suspensions entail, schools must ultimately make a decision on the strictness of their disciplinary policies. These choices are difficult given the lack of causal evidence surrounding suspension policies, as well as ongoing changes in public opinion surrounding school discipline. Our findings help quantify these tradeoffs and provide schools with evidence and a framework for understanding how students and teachers are affected by different suspension policies. While the short-term academic outcomes we study are not necessarily the sole objective for administrators, they provide a useful baseline for understanding the costs and benefits of changing school suspension policies.

### **Getting Beneath the Hood of Effective Place Based Policies: Evidence from the Community Development Block Grant**

The United States is in the midst of a “Great Divergence” characterized by large and growing spatial disparities (Moretti, 2012). In many places, decades of stagnating or declining

employment have led to the emergence of serious social problems—drug and alcohol abuse, disability, incarceration, and early mortality (Austin, Glaeser, and Summers, 2018). The uneven geographic distribution of economic decline has also become the backdrop to deep-seated political divisions across the country (Autor et al., 2017). In hopes of bringing jobs to economically distressed places, federal, state, and local governments have spent roughly \$60 billion annually on a variety of spatially-targeted place-based jobs policies such as firm incentives, infrastructure, and commercial/industrial development (Bartik, 2020). The COVID-19 pandemic greatly increased the prevalence of these policies; much of the \$1.2 trillion federal infrastructure plan in response to the pandemic provided state and local governments with funds to stimulate local economic development. However, the playbook on effective place-based policymaking remains underdeveloped. While some place-based investments may have the potential to reverse the fortunes of distressed places, many others—at great cost—have done little to promote lasting economic development.

Roughly three quarters of all spending on place-based jobs policies occurs through state and local business incentives: large tax incentives and subsidies used to attract firms (often in manufacturing, technology, and high-skilled service industries) to locate or expand facilities in specific places (Bartik, 2020). Local governments often “swing for the fences” in hopes that the jobs from these deals would reignite local economic growth through spillovers and economic multipliers. Recent work by Slattery and Zidar (2020) examines numerous successful bids for these facilities and finds that the average subsidy amounts to \$178M for 1,500 promised jobs—roughly \$120,000 per job. Successful bids did appear to deliver the promised number of jobs but had no discernible effect on broader economic growth beyond the jobs tied to the facility. The status quo approach to place-based jobs policies clearly leaves much to be desired in terms of cost-effectiveness. Fortunately, the playbook on place-based jobs policies is a diverse one: numerous other strategies exist to bring jobs to ailing places (Bartik 2020; Bartik 2022). The primary challenge to studying these local policies is that different approaches will yield different impacts in different places. Existing research still leaves numerous questions about *what* policies work, *where* they work, and *who* they work for.

This chapter sheds new insights on a wide variety of place-based policies to bring jobs to ailing communities through the lens of the Community Development Block Grant (CDBG). The CDBG is a federal program which has funded thousands of place-based investments to support firms in low-income neighborhoods across the country. While the CDBG's \$3-4 billion in annual funding comes from the federal government, the program decentralizes the actual

policymaking process to local governments through annual block grants—lump-sum funds which local governments are entitled to and can be used to flexibly invest in low-income neighborhoods. Importantly, local governments are restricted from using the CDBG to fund local business incentives. The CDBG approaches federal place-based policymaking through fiscal federalism, combining the scale of federal programs with the benefits (and pitfalls) of decentralization and tailoring policies to local needs. The breadth of the CDBG also presents a unique opportunity to analyze and compare a variety of place-based policies across many different locations, all within the same empirical and administrative framework.

I begin by estimating the impact of CDBG funding on local job counts by leveraging an exogenous change in CDBG funding which occurred in 2012. Each locality's annual CDBG allocation is determined by formula inputs which use local population counts, population growth rates, poverty rates, and the age and availability of local housing. From 2003 to 2012, these formula inputs were sourced from the 2000 Decennial Census. Year-to-year changes in CDBG allocations were smooth and variation came primarily from fluctuations in the total CDBG budget. The formula inputs became sourced from the American Community Survey beginning in 2012. This caused a discontinuous, persistent change in formula allocations for many localities. I leverage this exogenous shift using synthetic differences-in-differences as a generalization of standard differences-in-differences (Arkhangelsky et al., 2021) to compare localities which experienced large, positive CDBG shocks to synthetic localities with near-identical pre-treatment job trajectories but comprised of a weighted combination of localities which experienced large, negative shocks. I document that a persistent 30% increase in CDBG funding over the course of eight post-treatment years led to an average 5% increase in local job counts over the same time period, driven by jobs held by individuals living in higher-poverty areas.

I then ask: what kinds of place-based investments are most impactful, and in what places are they most effective? The CDBG is an ideal context for exploring these questions because of the quantity and variety of place-based investments that were funded in labor markets across the country. I begin by estimating how job counts respond in census tracts where CDBG investments in economic development ("treatments") are made. Investment size, mix, location, and timing not only differ from treatment to treatment, but are all potentially endogenous to tract characteristics and local government preferences. To handle the case-by-case endogeneity of these investments, I again use synthetic differences-in-differences—this time as a generalization of the synthetic control method. I construct a counterfactual synthetic tract for each treated tract which is comprised of observably similar untreated tracts.

Counterfactual tracts are constructed in a way to mirror the trajectory of pre-treatment jobs as closely as possible.

I find that a variety of investments are associated with positive job impacts. Among these investment types, the most impactful categories involve financial and technical assistance to local businesses, as well as subsidizing construction for commercial and industrial construction. Infrastructure appears to produce relatively little impact on jobs despite being the most costly activity on a per-investment basis. These findings suggest that investments which directly support local firms tend to generate the largest impacts. The national scope of the CDBG also provides a useful setting to study characteristics of locations where place-based policies are likely to be effective. Among low-income tracts targeted by the CDBG, job impacts generally appear larger when investments are made in *less-disadvantaged* neighborhoods. Places with better amenities may be more conducive to commercial and industrial activity, and residents in these neighborhoods may be more responsive to changes in labor demand. I also show that CDBG investments produce positive benefits regardless of whether the tract had been on a positive or negative trajectory prior to treatment; however, the effects are notably larger in tracts on the rise. Finally, I analyze characteristics the effectiveness of the CDBG across different local labor market characteristics. CDBG investments tend to perform better in more disadvantaged and less densely populated commuting zones.

Taken together, the findings in this chapter 1) highlight the effectiveness of delegating place-based policymaking to local governments through block grants, and 2) expand the playbook on effective place-based policymaking beyond traditional local business incentives. These results shed light on how the block grant structure can be used as a bridge between the scale of federal programs and the diverse, individual needs of localities across the nation. Federal funding for place-based policies may also be particularly valuable to local governments in distressed and financially constrained jurisdictions. As spatial economic disparities continue to grow in severity, effective place-based policy making will no doubt be needed to bolster economic opportunities for disadvantaged Americans, wherever they live.

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