From Distraction to Dedication: Commitment Against Phone Use in the Classroom*

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Abstract

Many people try to limit their phone usage, yet most struggle to do so, highlighting challenges in self-control. We present findings from a field experiment conducted at a large public university in partnership with an app designed as a commitment device to reduce phone use in the classroom. We find that app usage led to improvements in classroom focus, attendance, and overall academic satisfaction. Analysis of time spent outside the classroom suggests a potential substitution effect: students using the app allocated less time to study, particularly on campus. Overall, our evidence suggests improvements in transcript grades associated with app usage.

Keywords: Self-Commitment Device, Self-control Problem, Smartphones, Student Performance
JEL codes: C93, D12, D91, I23, L86

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1 Introduction

Smartphones have become a fixture for everyday life in the US. Smartphone usage rose 39% from 2019 to 2022[1], with the average American spending approximately two and a half hours per day on their phone, and nearly half of adult users state they cannot last longer than 24 hours without their phone.[2] An eminent concern with the growing dependency on phones is a type of self control problem, where not only are owners reflexively using their phones regularly, but they're doing so in settings which could carry harsh consequences. For instance, 81% of Americans spend time looking at their phones while dining out, despite the fact that 62% of adults have a disagreeable opinion on doing so (Eadicicco, 2015; Rainie and Perrin, 2017). In the workplace, 48% of employers report phone distractions compromising the quality of their employee's work, which subsequently leads to several other harmful consequences, such as coworkers having to pick up the slack (38%). Correspondingly, 75% of employers have made efforts to control productivity issues, including blocking Internet sites (32%) and banning cellphone use altogether (26%) (Farber, 2016). On US roads, the National Safety Council (2017) reports that one in every four car accidents is caused by texting while driving, a rate that is six times that of the accident rate of driving drunk. In turn, 94% of drivers support a ban on texting while driving, and 74% of drivers support an overall ban on hand-held cell phone use.

Another setting with a rampant amount of undesirable phone usage is the classroom. One study found that students checked their phones in the classroom over 11 times a day, on average, which accumulated into 20% of their classroom time being spent for activities unrelated to class (McCoy, 2016). Another study found that 92% of students use their phones to text during class time, and 10% admit to having texted during an exam on at least one occasion (Tindell and Bohlander, 2012). Ravizza et al. (2017) found that despite knowing they were being directly monitored during lecture, students still spent up to a third of class time surfing the web to nonacademic sites. Not surprisingly, phone usage is even a greater distraction in online learning, with 44% of students in online (vs. 37% of student in in-person classes) reporting spending more than 20% of class time on their devices (Aivez and Teodorescu, 2022). Indeed, numerous correlational studies suggest that student performance is harmed by phone use (see Amez and Baert, 2020, for a literature review). Considerable debate continues today on policies related to banning or controlling phone usage in the classroom: in 2016, nearly two thirds of public schools banned cell phones and other devices (Zhang et al., 2018). This percentage has, however, significantly dropped over time, where over 90% of public schools banned cell phones in the classroom in 2009.[3] This decreasing trend is

[1]Source: insiderintelligence. Website: https://www.insiderintelligence.com/insights/mobile-users-smartphone-usage/, retrieved October 17, 2023.

[2]Source: Zippia. Website: zippia.com/advice/us-smartphone-industry-statistics, retrieved August 24, 2023. Zippia also estimates that the average smartphone user touches their phone 2,617 times per day.

[3]Utilizing difference-in-differences designs, studies from Beland and Murphy (2016), Kessel et al. (2020), and

largely driven by growing concerns of school safety, where parents have increasingly demanded that they can reach their kids during school hours (Nielsen Insights, 2017).

Despite acknowledged concerns centered on phone habits, there remains a severe disconnect between intention and action to reduce phone usage. According to a survey conducted in 2017, 47% of US smartphone owners have made an effort to limit their phone use in the past, but only 30% have succeeded in doing so.[4] Utilizing a model of digital addiction paired with an experiment, Allcott et al. (2022) estimate that 31% of social media use can be directly attributed to self control problems. In order to help agents combat problems of self control, studies from a variety of domains, including savings (e.g. Thaler and Benartzi, 2004; Ashraf et al., 2006; Beshears et al., 2013), weight loss (e.g. Royer et al., 2015; Carrera et al., 2018, 2022), and smoking cessation (e.g. Giné et al., 2010; Cahill et al., 2015), have investigated the efficacy of providing incentives and commitment devices.

In this study, we present results from a field experiment conducted in partnership with the phone app Pocket Points. Pocket Points effectively acts as a soft commitment device and provides incentives for students to stay off of their phones. In particular, Pocket Points rewards students "points" for staying off their phones during class: Students open the app, lock their phone, and start accumulating points, all while the app verifies through GPS coordinates that the student is indeed in class.[5] These points can then be used to get discounts at participating local and online businesses. First launched in 2014, Pocket Points quickly grew in popularity, reaching over 100 universities and 200,000 downloads within its first year of inception.[6]

In the fall semester of 2017, we conducted an encouragement design field experiment with Pocket Points at Texas A&M University (TAMU). During the beginning weeks of the semester, 1,000 subjects from the population of undergraduate TAMU student were recruited to participate in the study, and after the deadline to add or drop classes, approximately half were instructed to download the Pocket Points app and create an account using their university email address. Students were informed that upon downloading the app, they could do anything they wanted, including immediately deleting the app.[7] The purpose of this treatment was to "nudge" or "encourage" stu-

Beneito and Vicente-Chirivella (2022) have found mixed results on the efficacy of cell phone bans on student outcomes. Chadi et al. (2022) find overall positive effects on worker (telephone surveyor) productivity in response to a smartphone ban.

[4]Source: Statista. Website: https://www.statista.com/chart/12403/smartphone-addiction/, retrieved August 25, 2023.

[5]Today, students can earn points for staying off their phones in other contexts as well, such as while driving their car. Teachers can also opt into the app to further verify that students were staying off their phones during class time. During the time frame of our field experiment, the only feature available to students was to use the app while they were in an academic building on a university campus.

[6]Source: USA Today. Website: https://www.usatoday.com/story/college/2015/09/23/pocket-points-app-rewards-students-for-staying-off-their-phones-in-class/37406563/, retrieved August 25, 2023.

[7]Prior to the launch of the experiment, Pocket Points had a sizable userbase within TAMU, and so numerous local

dents to use the Pocket Points app, and thus generate a plausible instrumental variable for Pocket Points usage. At the end of the semester, students (both control and the nudged) completed a survey, and student transcripts for all participants were provided directly from the TAMU registrar's office.

We first estimate significant demand for the app: Treatment led to an over 19 percentage point increase in the likelihood of using the app during the semester. Then, to identify which types of students demanded the app, we compare average characteristics of app users vs. non-users, conditional on receiving treatment (since this assures that the entire sample was aware of the app). We find that female students, students who were enrolled in more credits for the semester, and more patient students were more likely to download and use the app.

We then find that usage of the app improved student outcomes. Reduced form estimates of the impacts of treatment on self-reported outcomes suggest that students felt less distracted by their phones in class and were more satisfied with their academic performance for the semester. IV estimates imply that usage of the app for more than once a week led to an about one standard deviation decrease in feeling distracted in class and an about one standard deviation increase in academic satisfaction. Though less precisely estimated, we additionally find that treatment students were more likely to attend all of their classes during the semester.

Interestingly, we find that these positive classroom effects are associated with reductions in time spent on other human capital related activities. For example, we see (imprecisely estimated) decreases in time spent on campus and time spent studying overall, with a significant decrease in time spent studying on campus. Thus, it appears that the gains made in the classroom (in terms of attendance and focus) led to substitutions away from time invested outside the classroom.

To estimate the net effect of these behavioral changes, we utilize data directly obtained from student transcripts. We find that on average, treatment students outperformed control students by between 0.05 to 0.07 grade point units (scale 0 to 4). Our IV models suggest using the app more than once a week led to an increase in GPA by nearly 0.50 grade point units. These estimates, however, are somewhat noisily estimated. Still, the evidence suggests an overall positive effect of improved student outcomes as a result of the app usage.

Our study presents the first example of a market-based self-commitment device (Pocket Points) effectively helping agents (students) in addressing self-control challenges to enhance (academic) outcomes. Unlike previous research, which predominantly involved researchers creating commitment devices for participants, our approach showcases the success of an app in a real-world setting. Furthermore, our study breaks new ground by explicitly addressing self-control issues in an edu-

vendors were already offering rewards to students in exchange for their points. Naturally, some of the 1,000 subjects were already Pocket Points users, so randomization was stratified by whether the student already had a Pocket Points account.

cational context. Previous literature has predominantly focused on self-control challenges related to health and financial savings.[8]

Beyond its negative impact in the classroom, cellphone use and addiction has been linked to a wide range of detrimental consequences, including lower worker productivity (Chadi et al., 2022), unsafe driving, fertility issues, depression, poor sleep quality, and relationship conflicts.[9] Therefore, another significant advantage of the Pocket Points app is its ability to address cellphone addiction, a self-control problem that likely affects a much larger population beyond the confines of the classroom.

Finally, our study relates to a literature investigating a wide array of benefits and consequences from the expansion of mobile technology via phone apps. For instance, Dills and Mulholland (2018) find that the introduction of Uber across US counties resulted in fewer DUIs and road fatalities.[10] Work from Al-Bahrani et al. (2018) and Faccio and McConnell (2020) evaluate the Pokemon GO app (a popular augmented reality game) to identify its (positive) impacts in the classroom and (negative) impacts on the road, respectively. French et al. (2021a) and French et al. (2021b) demonstrate how personal finance phone apps can improve financial knowledge and skills. Though the evidence is mixed, mindfulness apps have also been linked to positive outcomes such as reduced stress and improved sleep (see O'Daffer et al. (2022) for a review).[11] Our study contributes to this growing literature by partnering with a novel app and identifying the (causal) effects of utilizing the app on user outcomes - to do so, our study is also the first to conduct a field experiment with the app, whereas the previous literature relied on either small-scale RCTs or natural (difference-in-differences) variation in the introduction of the app.

2 The Self-Commitment App

This paper centers on a field experiment conducted with Pocket Points, a mobile app that was first developed in 2014. The app provides a foundation for students to (soft) commit to staying off of their phones, and subsequently "rewards" students if they succeed in keeping their phones locked. To participate in Pocket Points, the student first opens the app. The app then uses geo-fence technology to verify whether the student is in an academic building on a school campus. The student can then lock their phone and start accumulating "points" at a linear rate (per minute off

[8] While not directly centered on commitment devices and self-control issues, Clark et al. (2020) conduct an experiment to see how goal-setting among college students can positively impact academic outcomes.

[9] See https://www.psychguides.com/behavioral-disorders/cell-phone-addiction/signs-and-symptoms/ and citations therein. Retrieved August 25, 2023.

[10] Barreto et al. (2021) similarly estimate a reduction in traffic hospitializations and fatalities in response to Uber's introduction in Brazil.

[11] Though not looking explicitly at phone apps, Ball et al. (2006) look at how the introduction of technology in the classroom improved learning in principle economics courses.

the phone). Students may also enter a "commitment length" of time (minimum of 10 minutes), in which they receive a larger, lump sum of points only if they keep their phone locked during the entirety of the commitment period. Students are free to break their "soft commitment" at any point by unlocking their phone.

Points cannot be earned at non-academic buildings, including dorm rooms and school gyms. Though the app is advertised for use in the classroom, students can still use the commitment device and earn points so long as they are in an academic building on campus. Today, Pocket Points includes several non-campus features that allow users to accumulate points through other means; during the time frame of our field experiment, points could only be earned on university campuses. Points can then be used for coupons and discounts at participating local and online retailers. See Figure A1 for screenshots from the Pocket Points app provided on `pocketpoints.com`.

3 Experimental design and econometric specifications

3.1 Experimental design

All undergraduate students at Texas A&M University (TAMU) were invited to participate in the study, which can be decomposed into three stages. Students who successfully completed all three stages were entered into a drawing for a chance to be one of the twelve recipients of $100. First, an online sign-up sheet was circulated at the beginning of the Fall 2017 semester using a university-wide email. In this sign-up sheet, we collected some basic information on the students, as well as provided information about the study. Students were told that as part of the study, they would potentially be asked to download and create an account with a phone app; they were additionally told that if they were selected, that they would not have to utilize the app beyond creating an account. The specific phone app (Pocket Points) was not disclosed at this stage. Students who completed the sign-up sheet signed a FERPA waiver letting the university release transcript-related information directly to the researchers.[12]

The second stage of the study began after sign-ups closed, which involved randomly assigning approximately half of the participants into the "treatment" group. This randomization was carried out after the last day students could add or drop their courses, and was stratified by whether the student had indicated on the sign-up sheet (among a long list of phone apps) whether they had used Pocket Points prior to the experiment. All treatment students were then asked to download the Pocket Points app and create an account using their TAMU email address. The idea behind this "encouragement" treatment was to generate an instrumental variable for Pocket Points usage

[12] A total of 1154 students (including 142 graduate students) completed the sign-up sheet. Since the study was open to undergraduate students only, we exclude the 142 graduate students. Additionally, we were not able to obtain data from the registrar's office for 12 students which we also exclude from the data.

(Banerjee and Duflo, 2017). While students in the treatment group may not comply with downloading Pocket Points, and while some control students may use Pocket Points regardless, the goal of the encouragement design is to generate a strong, exogenous predictor for using the app.

The third stage of the experiment came at the end of the semester, where we asked participants to complete an end-of-semester survey. This survey collected a series of self-reported outcomes, including focus in the classroom, academic satisfaction, and course attendance. The full list of survey questions can be found in the online appendix. Though we were guaranteed reception of university transcripts for all participants, not all participants completed this third stage survey (724 of 1,000 participants). In later analysis, we consider whether there were differential survey completion rates by regressing an indicator for survey completion on treatment assignment and a vector of student controls. We find no statistically significant difference in post-experiment survey completion rate between the treatment and control group (see column 2 of Table 2), and so future analyses using the survey sample and/or responses are unlikely to suffer from an attrition bias.

3.2 Summary statistics and tests for random assignment

In this section, we test for whether there are any statistically significant differences in observable characteristics between the treatment and control groups in order to address any potential concerns of unobservables that correlate with assignment and student outcomes. All covariates in this analysis come from student answers to the sign-up sheet survey, which were collected prior to treatment assignment.

The first three columns of Table 1 present our tests for balance, where we display average student characteristics by group and calculate whether the difference between the treatment and control group is statistically significant for each characteristic. The only variable that correlates with treatment is the indicator for whether the student had difficulty committing to goals - Treatment students were 6.9 percentage points more likely to have difficulty with goal commitment. At the bottom of the third column of Table 1, the F-statistic and p-value are reported from a test for whether the coefficients are jointly equal to zero from a regression of an indicator for treatment on the set of student survey responses, credits taken during the semester, and pre-treatment Pocket Points usage. With a p-value of 0.721, we fail to reject the null hypothesis that the coefficients are jointly equal to zero and conclude that the randomization is well balanced. In other words, the sole significant indicator (difficulty with goal commitment) can likely be attributed to natural variation stemming from the randomization.

3.3 Econometric specifications

In this paper, we investigate how usage of a soft commitment app against phone use in class (i.e. Pocket Points) influences student outcomes. Thus, we are interested in the following specification:

$$Y_i = \alpha + \beta \mathsf{AppUse}_i + \delta \mathsf{X}_i + \epsilon_i \tag{1}$$

where Y_i is a student i's outcome (focus in the classroom, class attendance, academic satisfaction, GPA), AppUse_i[13] is an indicator for utilizing the Pocket Points app for student i, and X_i is a vector of other student characteristics that might influence their outcomes. The coefficient of interest is β, which reflects the predicted increase in Y_i for students who use Pocket Points relative to students who don't use Pocket Points. If one were to use naturally occurring data to identify this equation, then estimates for β would likely be biased due to omitted variables in ϵ_i that correlate with AppUse_i and Y_i. For instance, it may be that students with a higher propensity to study are more likely to a) use Pocket Points and b) receive better scores, and so absent controls for studying behavior, an estimate for β would be positively biased.

Given our experimental setting, we can instrument for AppUse_i with an indicator for whether the student was assigned into the encouragement treatment (T_i). Adopting a two stage least squares approach, we can first estimate whether treatment influenced Pocket Points usage:

$$\mathsf{AppUse}_i = \alpha + \gamma T_i + \delta \mathsf{X}_i + \epsilon_i. \tag{2}$$

The estimated coefficient γ reports the predicted increase in likelihood of using Pocket Points in response to our randomly assigned treatment. For the second stage, we estimate:

$$Y_i = \alpha + \beta \widehat{\mathsf{AppUse}}_i + \delta \mathsf{X}_i + \epsilon_i \tag{3}$$

where $\widehat{\mathsf{AppUse}}_i$ holds the predicted values generated from the first stage. Our estimate for β can then be interpreted as the causal effect of using Pocket Points on student outcomes. For completeness, we also consider the reduced form equation:

$$Y_i = \alpha + \phi T_i + \delta \mathsf{X}_i + \epsilon_i \tag{4}$$

where ϕ reports the impact of receiving the encouragement treatment on student outcomes. That is, our estimate for ϕ is the conditional predicted difference in an outcome between treatment

[13] We use two main indicators for Pocket Points utilization. The first one is "Used app at least once" which is an indicator variable takes the value of 1 if the student used the app at least once during the course of the treatment semester. This data is obtained from the Pocket Points company. The second one is "Used app $>$ once a week" which is an indicator variable that takes the value of 1 if the student used the app more than once a week. This self-reported data comes from the final survey.

and control students in response to receiving the nudge to use Pocket Points.

Our student-level controls for X_i, which are collected as part of the end-of-semester survey, include the number of classes the student was enrolled in, the number of units enrolled in (for a letter grade) for the semester, indicators for gender, class year (e.g. Freshman), how often the student checked their phones during a typical class, approximately what percentage of the class time they spend checking their phones, number of lectures missed in a typical week, being distracted by phone in class, having issues with procrastination, having issues with committing to goals, frequency of pulling an "all-nighter", having present bias preferences, and whether they were a Pocket Points user prior to the experiment.

4 Results

4.1 Selection into the Self-Commitment App

First, we investigate whether our encouragement treatment led to increases in Pocket Points usage. In Table 2, we estimate equation (2) for several different measurements of AppUse_i, including indicators for whether they downloaded the app, whether they used the app at least once, and (self-reported) whether they used the app more than once a week during the semester. For the first two measures, we also separately consider the full sample (those who signed up for the study at the beginning of the semester) and the survey subsample (those who completed the final survey at the end of the semester). Across all dependent variables and samples, we find large and statistically significant first-stage effects. As presented in Table 2, for our survey sample, we find that treatment students were about 25 percentage points more likely to download the app (column 3) and over 31 percentage points more likely to use the app (column 5) than control students. Additionally, treatment students were 13 percentage points more likely to use the app more than once a week (column 6).

Next, we investigate what types of students were interested in using the app. To do so, we observe the averages of student characteristics across those who used the app at least once versus those who did not, conditional on being assigned into the treatment group, and test for any statistically significant differences across these averages. By focusing strictly on the treatment group, we can assume that observed disuse of Pocket Points cannot be attributed to a lack of awareness of the app itself. These results are presented in the last three columns of Table 1.

Conditional on receiving the encouragement email, we first find that students who used the app were enrolled in more credits for the term than those who did not use the app. This is perhaps unsurprising since, all else equal, students who are enrolled in more credits have more lectures to attend, and thus could potentially reap more reward from utilizing the app. Next, we find that

students who were prior Pocket Points users were significantly more likely to be a user for the treatment semester. Again, this is unsurprising, as those who were a previous user were already familiar with the app and/or were already using the app for the semester prior to being assigned the treatment. Third, we see that female students were significantly more likely to use the app compared to others. The fourth and final significant predictor of demand is impatience: Those who were flagged as being more impatient were less likely to demand the app. Interestingly, we find no evidence that those who self-state as having issues with being distracted by their phone during class or while studying were more likely to use the app.

4.2 Effectiveness of the Self-Commitment App

Next, we study the impact of the app use on students' academic performances. Table 3 presents our main results for student self-reported outcomes via the post-experiment survey. Each cell considers a separate regression. Each panel considers a separate outcome variable of interest: the frequency of the student feeling distracted by their phone when in class (reported on a scale from 1 to 5, standardized to a N(0,1) distribution), whether the student attended all of their classes during the semester, and the degree of satisfaction the student felt with their academic performance (reported on a scale from 1 to 5, standardized to a N(0,1) distribution). Column (1) considers our "reduced form" specification from equation (4) which estimates the direct impact of the encouragement treatment on student outcomes. The next two columns report estimated β's from specification (3), the second stage of our IV estimation, using two different measurements for AppUse_i: whether the student used the app at least once, and whether the student used the app more than once a week.

From the first panel, we observe large and statistically significant decreases in phone distraction rates in the classroom. From column (1), we predict a 0.13 standard deviation decrease in phone distraction rate for students who were encouraged to use the Pocket Points app; from column (2), we estimate that Pocket Points usage is associated with a 0.42 standard deviation reduction in phone distraction rate in the classroom. When we turn to attendance, our estimates become statistically insignificant, but nevertheless suggest increases in class-going; from column (2), we estimate about a 15 percentage point increase in the likelihood the student missed zero classes in response to using the Pocket Points app at least once. In the final panel, we observe increases in student satisfaction with their academic performance for the semester: Students who used the app more than once a week experienced an over one standard deviation increase in satisfaction (column 3). Overall, results from the post-experimental survey suggest that Pocket Points positively influences students' outcomes.

Given that students were less likely to miss their classes, and that they felt less distracted during their classes, a natural question arises as to whether time spent elsewhere was affected.

For example, a better experience in the classroom could motivate students to exert greater effort outside the classroom in the event of learning complementarities. On the other hand, students could substitute away from studying outside the classroom due to their increased learning in the classroom.

To consider these possibilities, our survey asked students how many hours per week they spent on campus, how many hours per week they spent studying, and how many hours per week they spent studying on campus. From the first two panels of Table 4, we see that treated students spent fewer hours on campus and fewer hours per week studying overall, though these estimates are noisy. Then, in the third panel, we estimate significant decreases in time spent studying on campus. Thus, it appears that the increased learning and attendance in the classroom came with a reduction in time spent studying outside the classroom on campus.[14]

Thus far, our findings indicate that the use of the self-commitment app Pocket Points is associated with reduced classroom distractions, a lower likelihood of missing classes, and increased academic satisfaction among students. However, it appears that treated students are reallocating their time away from independent study outside the classroom, potentially because they find their in-class learning experiences more beneficial. To assess the overall impact of these shifts in student behavior resulting from app usage, we next examine transcript grades to determine whether they have led to improved grades.

We present results for GPA outcomes in Table 5. The first two columns consider our reduced form specification (4), while the latter three columns consider our IV approach. Results are also split by the full sample of sign-ups (n=1,000) versus the sample that completed post-experimental survey (n=724). In the first panel, we find that treatment was associated with a 0.05 to 0.07 GPA increase on average for treatment students. From our IV estimates, students who used the app more than once a week experienced a 0.50 unit increase in GPA. These estimates, however, are all marginally insignificant. Still, the evidence suggests that despite the substitution away from hours spent studying on campus, overall grades were improved.

5 Conclusion and Discussion

Many phone users suffer from a self-control problem (Allcott et al., 2022). Researches and policymakers alike have expressed serious concern over the consequences of cell phone addiction among youth, and in particular, how such issues affect learning in the classroom. Indeed, numerous correlational studies have linked cell phone usage to reduced student outcomes (Amez and Baert,

[14]These results relate to Pop-Eleches and Urquiola (2013), who find that parents of high school students spent less effort on their children when their children attended a better school. The authors also find a net positive effect of attending a better school on student test scores.

2020). Studies from contexts outside of education have illustrated how commitment devices and incentives could be utilized to help agents battle issues of self control (e.g. Giné et al., 2010; Royer et al., 2015; Carrera et al., 2022).

We run a field experiment at a large public university in partnership with Pocket Points, an app designed as a commitment device to reduce phone use in the classroom. Our data yields several noteworthy findings regarding the impact of Pocket Points on students' academic performance. We find that the app use is associated with reduced classroom distractions, a lower likelihood of missing classes, increased academic satisfaction among students, and higher grades during the semester. The substantial reduction in classroom distractions, along with improved academic satisfaction and performance, underscore the potential of self-commitment apps like Pocket Points to enhance the educational experiences and outcomes.

Another natural consideration is whether administrators and policy-makers should consider cell phone bans, rather than relying on commitment devices such as Pocket Points. Evidence from Beland and Murphy (2016) found improved high school student test scores in response to a cell phone ban, but later evidence from Kessel et al. (2020) partly replicates Beland and Murphy (2016) and significantly expands their sample size to precisely estimate no effect of a cell phone ban. A cell phone ban may be attractive relative to other contexts with self control issues (like banning cigarettes to curb smoking cessation) since such a ban would impact a significantly larger share of agents.

In practice, however, phone usage has become increasingly ingrained into everyday life. Subsequently, schools and universities have reacted by reducing the use of cell phone ban policies. Moreover, a blanket policy such as a phone ban in school or class does not target the actual self control problem inflicting students. This is important because it is possible that access to a phone produces some positive outcomes for students, depending on the context, particularly given nearly half of all web traffic is done via phones. Thus, arguably the ideal intervention would involve the students themselves identifying when they have a self-control problem, and when to use the commitment device to tackle the self control problem. Finally, the success of Pocket Points further demonstrates that demand for commitment could arise through market-based mechanisms, which under traditional assumptions of information and incentives, necessarily implies that commitment devices can be welfare improving.

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Main Tables and Figures

Table 1: Summary statistics, balance test, and demand for the app

	Randomly assigned into treatment group?			Demand - Among treated, downloaded & used app?		
	Yes	No	Difference	Yes	No	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Semester credits (for a grade)	12.505	12.843	-0.338	13.033	11.901	1.131
	(0.158)	(0.134)	(0.207)	(0.169)	(0.274)	(0.313)
Prior Pocket Points user	0.414	0.418	-0.003	0.528	0.284	0.244
	(0.022)	(0.022)	(0.031)	(0.031)	(0.030)	(0.043)
Pre-treatment survey questions:						
Female	0.620	0.610	0.010	0.707	0.450	0.258
	(0.022)	(0.022)	(0.31)	(0.028)	(0.033)	(0.043)
Years at TAMU	2.115	2.127	-0.013	2.053	2.185	-0.133
	(0.051)	(0.051)	(0.072)	(0.070)	(0.073)	(0.101)
Distracted by Phone During Class or Studying	0.618	0.598	0.019	0.615	0.621	-0.006
	(0.022)	(0.022)	(0.031)	(0.030)	(0.032)	(0.044)
Percent of Class Time Spent on Phone (6%+)	0.229	0.222	0.007	0.223	0.221	-0.002
	(0.019)	(0.019)	(0.027)	(0.026)	(0.027)	(0.038)
Issues with Procrastination	0.795	0.765	0.030	0.774	0.819	-0.045
	(0.018)	(0.019)	(0.026)	(0.026)	(0.025)	(0.036)
Issues with Committing to Goals	0.479	0.410	0.069	0.468	0.491	-0.023
	(0.022)	(0.022)	(0.031)	(0.030)	(0.033)	(0.045)
Pulled an All-nighter in previous semester	0.126	0.122	0.004	0.141	0.102	-0.039
	(0.018)	(0.018)	(0.026)	(0.027)	(0.024)	(0.037)
Impatience	0.135	0.155	-0.020	0.106	0.168	-0.062
	(0.015)	(0.016)	(0.022)	(0.019)	(0.025)	(0.031)
Present Bias Preferences	0.068	0.082	-0.013	0.053	0.086	-0.033
	(0.011)	(0.012)	(0.017)	(0.014)	(0.018)	(0.027)
Total observations	497	503	1,000	265	232	497
F-statistic [p-value]			0.72			7.91
			[0.721]			[0.000]

Notes: Standard errors presented in parentheses. F-statistics and p-values for joint significance of all individual covariates included. "Pulled an All-nighter" variable drops freshmen since this was their first semester. All variables (except "Years at TAMU" and "Semester Credits") are dummy variables. See Appendix A.2 for a complete list of survey questions.

Table 2: Impacts of encouragement on app usage and post-experiment survey completion

	Completed survey	Downloaded app		Used app at least once		Used app > once a week
	(1)	(2)	(3)	(4)	(5)	(6)
Encouragement treatment	0.044	0.196	0.247	0.251	0.311	0.130
	(0.028)	(0.025)	(0.029)	(0.028)	(0.033)	(0.031)
Observations	1000	1000	724	1000	724	724
Sample	Full	Full	Survey	Full	Survey	Survey

Notes: Standard errors presented in parentheses. Each cell corresponds to a single regression. Each outcome is a dummy variable, presented in the column header. Observations are unique at the student level. See text for description of full set of control variables. "Full" sample includes all participants who signed up for the experiment. "Survey" sample includes all participants who completed the survey at the end of the semester.

Table 3: Main results for classroom outcomes

	Reduced form	IV w/ encouragement treatment	
	(1)	(2)	(3)
Outcome: Phone distraction in class (z-score)			
Encouragement treatment	-0.131		
	(0.064)		
Used app at least once		-0.421	
		(0.205)	
Used app > once a week			-1.011
			(0.537)
Outcome: Attended all classes			
Encouragement treatment	0.045		
	(0.030)		
Used app at least once		0.145	
		(0.096)	
Used app > once a week			0.348
			(0.243)
Outcome: Satisfied w/ performance (z-score)			
Encouragement treatment	0.138		
	(0.072)		
Used app at least once		0.444	
		(0.232)	
Used app > once a week			1.065
			(0.589)
Observations	724	724	724

Notes: Standard errors presented in parentheses. Each cell corresponds to a single regression. Observations are unique at the student level. See text for description of full set of control variables. "Attended all classes" is an indicator variable for whether the student attended all of their classes during the semester. The exact wording for the "Phone Distraction in class" question was "(For the semester) On a scale from 1 (not very often) to 5 (very often), how often did you get distracted by your phone or laptop when in lectures, discussion sections, and labs?" The exact wording for the "Satisfied w/ performance" question was "On a scale from 1 (not very satisfied) to 5 (very satisfied), how satisfied are you with your performance in your classes this past semester?" "Phone Distraction in class" and "Satisfied w/ performance" variables are standardized to a N(0,1) distribution.

Table 4: Substitution in hours spent on campus and studying

	Reduced form	IV w/ encouragement treatment	
	(1)	(2)	(3)
Outcome: Hours/week spent on campus			
Encouragement treatment	-0.731		
	(1.743)		
Used app at least once		-2.349	
		(5.483)	
Used app > once a week			-5.635
			(13.201)
Outcome: Hours/week studying			
Encouragement treatment	-1.540		
	(1.129)		
Used app at least once		-4.949	
		(3.575)	
Used app > once a week			-11.871
			(9.014)
Outcome: Hours/week studying on campus			
Encouragement treatment	-2.110		
	(1.049)		
Used app at least once		-6.782	
		(3.353)	
Used app > once a week			-16.268
			(8.881)
Observations	724	724	724

Notes: Standard errors presented in parentheses. Each cell corresponds to a single regression. Observations are unique at the student level. See text for description of full set of control variables.

Table 5: Main results for transcript grades

	Reduced form		IV w/ encouragement treatment		
	(1)	(2)	(3)	(4)	(5)
Outcome: Grade point average					
Encouragement treatment	0.049	0.065			
	(0.040)	(0.046)			
Used app at least once			0.195	0.208	
			(0.161)	(0.148)	
Used app > once a week					0.500
					(0.374)
Observations	1000	724	1000	724	724
Sample	Full	Survey	Full	Survey	Survey

Notes: Standard errors presented in parentheses. Each cell corresponds to a single regression. Observations are unique at the student level. See text for description of full set of control variables. "GPA in credit-accumulated course" is calculated using courses for which students (ex post) received transcript credit for the course (i.e. drops "unsatisfactory" courses and failed courses). "Full" sample includes all participants who signed up for the experiment. "Survey" sample includes all participants who completed the survey at the end of the semester.

Online Appendix

Appendix A.1 - Additional Figures

Figure A1: Screenshots from Pocket Points app

Source: pocketpoints.com, retrieved August 27, 2023. *Note*: Actual user interface differed during time frame of experiment.

Appendix A.2 - Experimental Materials

Sign-up Sheet

Howdy Texas A&M Students,
A team of researchers are excited to offer you an opportunity to participate in "Project Smartphones and Smarter Aggies", which is an online study where you can enter a drawing to be one of the 12 recipients of $100 by completing the following three simple steps. Participating in "Project Smartphones and Smarter Aggies" is very easy, and in total, will take about 15 minutes of your time. Here is how the study works:
1. Sign up for the study by completing the sign-up sheet. This should take only about five minutes. You have until September 10 to sign up. Hurry and sign up today!
2. Shortly after September 10, you will receive an email from billuraksoy@tamu.edu. We may ask you to download and create an account for an app on your phone. The app will be completely free, and you will not be required to use the app at all. In fact, after creating an account, you may simply delete the app from your phone, if you desire. However, you may find the app to be useful.
3. At the end of the semester, look out for another email from billuraksoy@tamu.edu that will include a link to a short survey which will take about 10 minutes.
That's all it takes to be eligible to enter the drawing and to have the chance to be one of the 12 recipients of $100. The drawing will be conducted at the end of the semester, and if you are selected as one of the recipients, we will get in touch with you to make a payment using your most preferred method (cash, Venmo, PayPal, and so on).
All undergraduate students and Texas A&M University are invited to participate, regardless of discipline.
If you have any questions, feel free to email us at billuraksoy@tamu.edu. We look forward to seeing you participate in this easy yet amazing opportunity!
Best regards,
Billur Aksoy
PhD candidate, Department of Economics, TAMU
E-mail: billuraksoy@tamu.edu

Survey questions:

- What is your email address?
- What is your first name?
- What is your last name?

- What is your UIN? (9-digit number on your student ID)
- What is your UIN? Please type in again.
- When is your birthday?
- What gender do you identify as? [Male, Female, Prefer not to say, Other]
- What year are you? [Freshman, Sophomore, Junior, Senior, Graduate]
- Approximately how many times during a typical class do you check your smartphone? [This is my first semester at Texas A&M, 0-1 times, 2-4 times, 5+ times, I do not own a smartphone]
- Approximately what percentage of class time do you spend checking your smartphone? [0%, 1-5%, 6-20% ,21+%, I do not own a smartphone]
- Approximately how many lectures/labs do you miss or skip every week? [This is my first semester at Texas A&M, 0-1, 2-4, 5+]
- To what extent do you agree or disagree with this statement: "I often get distracted by my cellphone when studying or sitting in class." [Very much agree, Slightly agree, Slightly disagree, Very much disagree]
- To what extent do you agree or disagree with this statement: "I have issues with procrastination when studying or completing assignments." [Very much agree, Slightly agree, Slightly disagree, Very much disagree]
- To what extent do you agree or disagree with this statement: "I have issues with committing to my goals (e.g. exercising, smoking cessation, achieving academically)." [Very much agree, Slightly agree, Slightly disagree, Very much disagree]
- How many times in the last semester have you pulled an "all-nighter" (i.e. gone a whole night and morning without sleeping) for school-related purposes? [This is my first semester at Texas A&M, 0 times, 1-3 times, 4-7 times, 8+ times]
- Which of the following would you rather have? [$100 transferred to your bank account instantaneously, $105 transferred to your bank account in 7 days,]
- Which of the following would you rather have? [$100 transferred to your bank account in 365 days, $105 transferred to your bank account in 372 days]

- Which of the following apps do you currently have downloaded on your phone? [Facebook, YouTube, DropBox, WhatsApp, Pocket Points, Line, Yelp, CNN, Spotify, Pandora, Snapchat, Skype, Skyscanner, Instagram, Venmo, PayPal, Groupon, AirBnB, Etsy, Flixter, ESPN, Twitter, Starbucks, Audible, Finish, I do not own a smartphone, I do not have any of the above apps on my smartphone]

[CONSENT FORM]

I read the above statement and I give my consent to participate in this study.

End-of-semester Survey

Dear participants,

Congratulations! You have reached the final stage of Project Smartphones and Smarter Aggies. You signed up to be a part of our study at the beginning of the Fall 2017 semester, and upon completion of the following survey which should take no longer than five minutes, you will enter a drawing to be one of the twelve recipients of $100. You have until Friday 12/22/2017 to complete this short survey. It takes only 5 minutes, go ahead and complete now. To complete your participation in this study, please click the link below. Please notice that this study is open to TAMU students only thus you will have to be logged into google with your TAMU email.

[insert link]

Thank you for your participation and we hope you enjoy your winter break! If you have any questions, please feel free to email me back here.

Best Regards,

Billur Aksoy
PhD Candidate, Department of Economics, TAMU
E-mail: billuraksoy@tamu.edu

IRB Number: IRB2017-0473D
IRB APPROVAL DATE: 07/26/2017
IRB EXPIRATION DATE: 7/25/2018

Survey questions:

- What is your UIN? (9-digit number on your student ID)
- What is your first name?
- What is your last name?

- Compared to your previous semesters, how difficult were your courses this past semester? [Less than average difficulty, average difficulty, more than average difficulty, N/A (first semester at TAMU)]
- How many final examinations did you have this past semester?
- Approximately how many hours did you spend on campus every week this past semester for academic-related purposes (e.g. class attendance, visiting office hours, studying)?
- Approximately how many hours did you spend studying every week this past semester?
- Approximately how many hours did you spend studying on campus every week this past semester?
- Approximately how many hours did you spend studying at home every week this past semester?
- Approximately many hours of lectures, discussion sections, and labs did you MISS/SKIP this past semester?
- On a scale from 1 (not very often) to 5 (very often), how often did you get distracted by your phone or laptop when trying to study or do school work?
- On a scale from 1 (not very often) to 5 (very often), how often did you get distracted by your phone or laptop when in lectures, discussion sections, and labs?
- Agree or disagree: "On average, I found myself using my cellphone more than once a week during lectures, discussion sections, and labs this past semester, to do things such as check my email, go on Facebook, and browse the web."
- Agree or disagree: "This past semester, I feel like social media distracted me from studying as much as I wanted to."
- On a scale from 1 (not very satisfied) to 5 (very satisfied), how satisfied are you with your performance in your classes this past semester?
- Which of the following apps did you use at least once during this past semester? [Facebook, YouTube, DropBox, WhatsApp, Pocket Points, Line, Yelp, CNN, Spotify, Pandora, Snapchat, Skype, Skyscanner, Instagram, Venmo, PayPal, Groupon, AirBnB, Etsy, Flixter, ESPN, Twitter, Starbucks, Audible, Finish, I do not own a smartphone, I do not have any of the above apps on my smartphone]

- Which of the following apps did you use approximately more than once a week during this past semester? [Facebook, YouTube, DropBox, WhatsApp, Pocket Points, Line, Yelp, CNN, Spotify, Pandora, Snapchat, Skype, Skyscanner, Instagram, Venmo, PayPal, Groupon, AirBnB, Etsy, Flixter, ESPN, Twitter, Starbucks, Audible, Finish, I do not own a smartphone, I do not have any of the above apps on my smartphone]