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Self-control and peer groups: An empirical analysis

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ABSTRACT

We exploit the exogenous variation in peer groups generated by high school to college transitions to study the theoretical predictions of Battaglini et al.'s (2005) model of self-control in peer groups. We find evidence consistent with the two key predictions of this theory regarding the relationship between an agent's expected level of self-control and the size and composition of his or her social circles: (i) students embedded in social circles have more self-control than those who are alone and their self-control is increasing in the size of their social group; (ii) students' self-control is, however, a non-monotonic hump-shaped function of the average self-control of their friends.

1. Introduction

In the majority of the theoretical literature on peer effects, the existence of peer influences is treated as a starting point. Instead of explaining the origins of the peer effects, the literature focuses on studying their implications for individual choices.[1] An exception is Battaglini et al. (2005), who propose a theory of social influences on self-control. The key question they address in the paper is: in the presence of self-control problems, is it beneficial to be exposed to the choices made by another player? In their model, no individual's action directly enters into other agents' payoffs. Instead, agents care about other agents' actions because of their informative content, and externalities arise endogenously from inferences among peers who observe each other's behavior.

The advantage of Battaglini et al.'s (2005) approach is that it provides testable predictions on the nature of the peer effects. Two theoretical predictions emerge from the analysis. First, observing how another agent deals with impulses and

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[1] See Jackson and Zenou (2015) for a recent survey.

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temptation can be beneficial or detrimental, since this news can improve or damage the agent's ability to control his own impulses. The sign of the peer effect depends, in a predictable and endogenous way, on the expected type of the peer: observing another agent improves self-control when agents have at least a minimum level of expected self-control; it has the opposite effect when agents have a low expected level of self-control.

Second, when agents are heterogeneous in their expected levels of self-control, they generally value the "quality" of their peers non-monotonically. The ideal friend is someone with a slightly worse self-control problem than one's own: this makes one's own successes more encouraging and own failures less discouraging. Intuitively, there is little benefit from having a friend who is too self-controlled or a friend who is too impulsive. This fact is in contrast with the standard assumption that peer effects are monotonic and, indeed, linear in other players' actions.

In this paper, we use data from the National Longitudinal Survey of Adolescent to Adult Health (Add Health) to test these predictions. This panel is an ideal data set to test this theory since it provides information on self-control both for the individuals and for their friends. As a result, besides providing evidence on a specific model of social interaction, this paper contributes to the literature on peer effects by providing new evidence on the nature of peer influences in the presence of self-control problems.

The main challenge encountered in empirical studies on peer effects is the endogeneity stemming from the fact that individuals choose peers as well as actions.[2] Our analysis exploits the longitudinal nature of the Add Health panel, which follows six cohorts of individuals and their friends from adolescence to adulthood (from Grades 7–12 through ages 24–30) from the years 1994–1995. The central regression of our paper investigates whether, and to what extent, a student's ability to deal with her own impulses changes when the student's social circle is affected by the loss of an older friend who terminates the school program. The key assumption of our identification strategy is that, when a student graduates, social ties with younger schoolmates are terminated or attenuated.[3] Graduation/termination of the school program, therefore, provides an exogenous shock to the social circle of the other members in lower grades who remain enrolled. To our knowledge, this dynamic feature of Add Health has not been exploited before in this way as a source of exogenous variation to test for peer effects.

Specifically, our analysis consists of regressions looking at individual self-control as a function of a set of socioeconomic characteristics and proxies for social influences. We first investigate whether people with strong social circles have more self-control than those without ties to peers. Next, we investigate whether self-control varies with the level of self-control of peers, allowing for non-linear effects. Our results show that, consistent with the theory described above: (i) students embedded in social circles have more self-control than those who are alone, and their self-control is increasing in the number of their peers; (ii) an agent's self-control increases with the average peers' self-control if the agent's self-control is sufficiently above the peers' average self-control, but it decreases if the agent's self-control is below the peers' average self control; (iii) having similar friends can be good, but too much similarity can be bad. These results are confirmed when we exploit an exogenous variation in the composition of the peer group.

Our work fits in a recent literature empirically studying the link between self-control and peer effects following Battaglini et al.'s (2005) theoretical work. Early contributions in this literature have focused on the possibility of contagion of self-control problems through peer effects. Contagion effects in obesity and smoking problems are found by Christakis and Fowler (2007) and Christakis and Fowler (2008), respectively. These results have, however, been disputed by Cohen-Cole and Fletcher (2008) who, after controlling for endogeneity issues, find no statistically significant contagion. A different approach is used by Buechel et al. (2014), who rely on laboratory experiments to explicitly study Battaglini et al. (2005) predictions. Similar to our work, they find a positive correlation between self-control in the study habits of undergraduates at Hamburg University and the quality of their social circles.

With respect to this and previous papers, our work distinguishes itself in two ways. First, while we exclusively rely on field data, we are able to use high school graduation as a source of exogenous variation in peer groups to identify causality. Second, we are the first to find non-monotonic peer effects on the self-control problem, a key prediction in Battaglini et al. (2005).

The paper is organized as follows. In Section 2, we discuss the theoretical predictions and the data in greater detail. Section 3 contains an exploration of the correlations that emerge from our data, while in Section 4, we exploit the exogenous variation in social networks described above to identify peer effects on self-control. In Section 5, we collect additional evidence to provide further confidence in the results of our analysis. Section 6 concludes.

[2] The other critical issue is the identification of the behavioral mechanism underlying peer effects (see Liu et al., 2014). For surveys of the recent empirical literature that incorporates network analyses into studies of peer effects and behavior, see Jackson (2014) and Jackson et al. (2014).

[3] Although it is true that students may still be in contact after high school, it seems plausible to assume that the strength of social interactions is reduced. Online communication among adolescents was not as common during the years of the survey as it is now. There were just 5 and 16 internet users per 100 people in the US in 1994 and 1996, respectively, in contrast to the almost 90 per 100 we have today (World Bank, 2016). As psychologists postulate, a constant level of interaction is essential for people with self-control or addiction problems to find relief in self-help groups like Alcoholics Anonymous, Narcotics Anonymous, and similar organizations that are predicated on the mutual sharing of experiences. As a result, a shock to the intensity of social interactions would affect the transmission mechanism, even if interactions are not reduced to zero.

2. Theory and data

2.1. Model and predictions

In Battaglini et al. (2005), an individual can choose to act alone or in a group. If he acts alone, he can only observe his own past actions (i.e., whether he was weak-willed or strong-willed in previous situations). The key behavioral assumption of the model is that the agent does not know certain aspects of his own preferences (notably the strength of his self-control), but can infer them from his own actions: the agent therefore uses his own past actions for self-monitoring. Intuitively, if an agent breaks a personal rule (a personal resolution, like a diet or an exercise regimen), he will reveal himself to be weak-willed.

If the agent acts in a group, he is able to observe the actions and outcomes of another agent (henceforth referred to as "the peer"). The second key assumption of the model is that the agents' types are correlated: if self-control is hard for an agent, it is also likely to be hard for the peer. The agent, therefore, finds it optimal to use both his own past actions and the peer's actions for self-monitoring. Successes by the peer are "good news" that boost the agent's belief that self-control is manageable; failures are "bad news" and have the opposite effect. What makes the analysis interesting is that the informative content of the peer's actions is endogenous. Depending on the primitives of the model, the agent's actions can be complements with positive peer effects, or substitutes with negative peer effects.

Two theoretical predictions emerge from the analysis concerning who finds it beneficial to be in a group, and how an agent in a group is affected by his or her peer. For both predictions, the key variable is the expected cost of self-control, denoted as s_i for agent i, as measured by the probability of experiencing a self-control temptation and the cost of resisting it. Regarding the first prediction, the model predicts that observing a peer has an expected positive effect on self-control only if the agents have a sufficiently low expected cost of self-control (henceforth, in short, self-control problem). The model predicts that an agent joins a group if and only if his expected self-control ability is larger than a threshold s_i^*. If we denote G_i the event in which an agent i joins a group and NG_i when the agent i is alone, we have

$$E(s_i|G_i) = \int_{s_i^*}^{\bar{S}} s_i \, \mathrm{d}F(s_i)/(1 - F(s_i^*)) > \int_{\underline{S}}^{s_i^*} s_i \, \mathrm{d}F(s_i)/F(s_i^*) = E(s_i|NG_i)$$

While the model in Battaglini et al. (2005) formally deals only with groups of two agents, the previous result motivates the following more general testable hypotheses:

H. 1. *Agents in social groups have higher expected levels of self-control, with the level of self-control increasing in the number of peers.*

The intuition of this result can be seen as follows. The expected returns for an agent of resisting his own impulse at t depends on what the other agents are going to do at $t+1$ and how informative these actions will be. If an agent has a small self-control problem, he or she will assign higher probability to the event that the other player in the group provides good news; as a result, he or she expects to receive a positive externality that (and this is the key point) increases the *expected return* of being virtuous, making it beneficial to join a group. If, instead, an agent has a high self-control problem and therefore expects the other player in the group to be weak-willed, he or she will expect to receive bad news that reduces his or her expected return of being virtuous.

Regarding the second prediction, the model suggests that the benefit from the informational externality described above is not monotonic in the quality of the peer. The positive effect on an agent's ability to resist self-control temptations increases with the peer's self-control level up to a level that is a little lower than the agent's level, and then it decreases. This implies that the ideal partner is someone with a slightly worse self-control level than one's own. This result motivates the following testable hypothesis:

H. 2a. *An agent's self-control increases with the average peers' self-control if the agent's self-control is sufficiently above the peers' average self-control; it decreases if the agent's self-control is below the peers' average self-control.*

Intuitively, a person who is too weak is likely to exhibit demoralizing behavior, while one who is too strong is one from whose likely successes there is little to be learned. Thus, there will be gains to group formation only among individuals who are not too different from one another in terms of preferences, willpower and external commitments.

It should be noted that, while increasing similarity is a good thing when agents in a group are sufficiently dissimilar, increasing similarity is not necessarily a good thing when agents are already very similar. This motivates the following additional hypothesis:

H. 2b. *Increasing similarity in expected self-control levels is good at the margin when the friends are not too similar, but too much similarity may be harmful.*

Table 1
Self-control.

Do you usually go with your "gut feeling" ?			
	Freq.	%	Cum.
Strongly agree	1,872	9.10	9.10
Agree	6,035	29.35	38.46
Neither agree nor disagree	4,308	20.95	59.41
Disagree	6,859	33.36	92.77
Strongly disagree	1,487	7.23	100.00
Total	20,561	100.00	

Source: Add Health, Wave I

Prediction *H.2b* follows from the fact that the ideal peer for agent i has a self-control level that is strictly lower than i's expected self-control. Thus, i's peer has a self-control level that is lower than i's own self-control level. However, above the "ideal level", increasing similarity is detrimental.[4]

2.2. Data

Our empirical analysis is based on data from the National Longitudinal Survey of Adolescent to Adult Health (Add Health).[5] Four features of the Add Health dataset are central to our analysis: *(i)* it provides nomination-based friendship information, which allows us to reconstruct the precise geometry of social contacts, *(ii)* it has a longitudinal dimension, which provides respondents' information over time, *(iii)* it features a rich set of variables on attitudes and preferences, including a measure of self-control, and *(iv)* it has a large sample size that allows us to find a subsample of students that conforms to the requirements of our analysis.

The Add Health survey was designed to study the impact of adolescents' social environment (i.e., friends, family, neighborhood and school) on their behavior. It contains data on American students in Grade 7–12, collected from a nationally representative sample of roughly 130 private and public schools in 1994–95 (Wave I). Every pupil attending the sampled schools on the interview day was asked to complete a questionnaire (*in-school data*) containing questions on her demographic and behavioral characteristics, education, family background, and friendship. Pupils were also asked to identify their best friends from a school roster (up to five males and five females).[6] As a result, the Add Health dataset contains detailed information on both respondents and their peers.[7] A subset of adolescents (about 20,000 individuals) was then asked to complete a longer questionnaire containing more sensitive individual and household information (*in-home data*). These students were interviewed again in 1995–96 (Wave II), 2001–02 (Wave III), and 2007–08 (Wave IV). The Wave I and Wave II in-home questionnaires contain the standard question that is used to measure self-control or willpower (see Nagin and Pogarsky, 2004; Fletcher et al., 2009): "When making decisions, you usually go with your 'gut feeling' without thinking too much about the consequences of each alternative?". The answers are coded 1 to 5, where 1 means "strongly agree" and 5 means "strongly disagree".[8] In our analysis, we follow this practice and use this variable as a measure of self-control: the higher this variable is, the higher the level of self-control. Table 1 shows the distribution of the answers for the complete sample. As shown in the table, the distribution is relatively even.

We use the nomination system to identify each agent's reference group. More precisely, a student's reference group consists of all the friends that he or she nominated.[9] In the following analysis, we study whether self-control is correlated with characteristics of the associated social network and examine how an individual's self-control changes following exogenous changes in peers' self-control.

[4] More specifically, *H.2b* follows from Proposition 6 in Battaglini et al. (2005) and can be easily seen from the right panel of Fig. 6 in their paper. This figure plots agent 2's endogenous level of self control as a function of agent 1's "self confidence hurdle" ρ_1^*. Agent i's "self confidence hurdle" ρ_i^* is a measure of agent i's expected self control problem, which depends only on the exogenous characteristics of the agent. (It is defined in (3) in Battaglini et al., 2005). The larger the value of ρ_i^*, the larger i's self control problem. As can be seen from Fig. 6, agent 2's endogenous self control function $x^2(\rho_1^*)$ reaches a peak at some level $\tilde{\rho}_1$ of ρ_1^* with $\tilde{\rho}_1 > \rho_2^*$. Let $\upsilon = \tilde{\rho}_1 - \rho_2^*$ and note that $|\rho_1^* - \rho_2^*|$ is a measure of the dissimilarity in self-control between agents 1 and 2. For $\rho_1^* > \rho_2^*$, increasing $\rho_1^* - \rho_2^*$ (i.e., the agents' dissimilarity) induces an increase in agent 2's self control when the agents are sufficiently similar (i.e., $|\rho_1^* - \rho_2^*| < \upsilon$). This implies that too much similarity may be harmful, as stated in hypothesis *H.2b*.

[5] This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (http://www.cpc.unc.edu/addhealth). No direct support was received from grant P01-HD31921 for this analysis.

[6] The limit in the number of nominations is not binding (even by gender). Only 4% of the students in our sample show a list of 10 best friends. On average, students declare having about 3 friends (with a standard deviation of roughly 2.5).

[7] Most of the existing surveys with information on social networks contain limited information on ego-networks, that is, the respondent (ego)'s self-reported information on basic characteristics (such as gender, race, education) of two/three friends.

[8] The external validity of this measure is discussed in Section 5.

[9] Unfortunately, a more precise definition of peer group, such as the one based on mutual nomination, results in insufficient sample variation when we exploit out-of-school transition among peers.

Table 2
Characteristics of students by existence of friendship relationships.

	Students w/no friends		Students w/friends		Mean difference
	Mean	SD	Mean	SD	*t*-test *p*-value
self-control	2.86	1.1	3.00	1.1	0.00***
age	9.71	1.6	9.68	1.6	0.65
female	0.41	0.5	0.51	0.5	0.00***
black	0.43	0.5	0.21	0.4	0.00***
native	0.03	0.0	0.01	0.0	0.03**
asian	0.08	0.0	0.09	0.0	0.22
other_races	0.09	0.0	0.12	0.2	0.03**
two_parents	0.47	0.5	0.66	0.5	0.00***
fam_income	25.01	34.6	41.2	50.7	0.00***
housing_quality	3.13	1.0	3.35	0.9	0.00***
religion_practice	2.50	1.3	2.70	1.2	0.00***
religion_importance	0.43	0.5	0.42	0.5	0.47
peer_group_size	0.00	0.0	3.17	0.0	0.00***
intelligence	3.61	1.2	3.86	1.1	0.00***

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 3
Self-control and peer groups.

	(1)	(2)	(3)	(4)	(5)
	self-control	*self-control*	*self-control*	*self-control*	*self-control*
alone	−0.141***	−0.113**	−0.135**	−0.113**	−0.107*
	(0.053)	(0.056)	(0.065)	(0.066)	(0.064)
Control variables					
Demographics	No	Yes	Yes	Yes	Yes
Family background	No	No	Yes	Yes	Yes
Additional controls	No	No	No	Yes	Yes
School fixed effects	No	No	No	No	Yes
Observations	19,807	19,322	15,880	15,830	15,830

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

3. Exploratory evidence

We start looking at evidence for *H.1*, the prediction that there is a positive relationship between an agent's level of self-control and the fact that he or she belongs to a social group. Our first step is to compare the characteristics of students who are in friendship relationships with those students who declare they have no friends. In our sample, the average number of best friends is three, and about 75% of our students nominate fewer than four friends. Remarkably, about 2% of the students do not nominate any friend. From Table 2, it appears that students who declare they have no friends have a lower level of self-control than students embedded in groups.[10] They are also less likely to live with both parents and to attend religious services.

There are N students ($i = 1, \ldots, N$) in S schools ($s = 1, \ldots, S$). Our next step is to investigate the association between social isolation and self-control using a regression of the form:

$$self\text{-}control_{i,s} = \alpha + \gamma alone_{i,s} + \sum_{k=1}^{K} \beta^k x_{i,s}^k + \eta_s + \varepsilon_{i,s} \quad (1)$$

where $alone_{i,s}$ is a dummy taking a value of 1 if student i in school s does not nominate any friend and zero otherwise, and $x_{i,s}^k$, with $k = 1, \ldots, K$, denotes a set of K individual characteristics. A school fixed effect, η_s, controls for correlated contextual effects. Table 3 shows the OLS estimation results of model (1) for our target variable, with increasing sets of

[10] Regarding other characteristics, students who declare they have no friends are more likely to be male, African American, and have lower socio-economic status.

Table 4
Self-control and peers' self-control.

	(1)	(2)	(3)	(4)	(5)	(6)
	self-control	*self-control*	*self-control*	*self-control*	*self-control*	*self-control*
self-control_peers	0.208***	0.218***	0.222***	0.222***	0.240***	0.208***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.018)
self-control_peers * d_1	0.978***	0.986***	0.982***	0.956***	0.944***	0.554***
	(0.021)	(0.019)	(0.020)	(0.020)	(0.021)	0.014)
self-control_peers * d_2	−0.432***	−0.426***	−0.428***	−0.424***	−0.422***	−0.470***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.011)
Control variables						
Demographics	No	Yes	Yes	Yes	Yes	Yes
Family background	No	No	Yes	Yes	Yes	Yes
Additional controls	No	No	No	Yes	Yes	Yes
Estimation method	OLS	OLS	OLS	OLS	OLS	IV
School fixed effects	No	No	No	No	Yes	Yes
Observations	14,581	14,385	11,954	11,927	11,927	11,927

OLS/IV estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

controls. Column (1) shows the raw correlation, whereas in column (2) we include basic individual characteristics (age, gender and race). In column (3) we add family income,[11] an indicator of residential living arrangements and an indicator of the social structure of the family, which may be important for developing a child's self-control. In column (4) we include indicators of the respondent's religiosity, intelligence and peer group size.[12] Finally, column (5) controls for school fixed effects. Table 3 reveals that adolescents with no friends have, on average, less self-control ability.[13] This result is in line with the expectations. Although, as mentioned in Section 2.1, Battaglini et al. (2005) deal only with groups of two agents, it is interesting to see what is the relationship between an agent's self-control and his number of friends. We address this question in Section 4, when we use an exogenous variation in the peer group size.

Let us now turn our attention on *H.2a*, that is the prediction of the model regarding the relationship between an agent's self-control and the self-control of his or her peers. To this goal, we use the regression model (2):

$$self\text{-}control_{i,s} = \alpha + \delta_0 self\text{-}control\_peers_{i,s} + \delta_1 self\text{-}control\_peers_{i,s} * d1_{i,s} + \delta_2 self\text{-}control\_peers_{i,s} * d2_{i,s} + \sum_{k=1}^{K} \beta^k x_{i,s}^k + \eta_s + \varepsilon_{i,s} \quad (2)$$

where $self\text{-}control\_peers_{i,s}$ indicates the average self-control of individual i's peers, and $d1_{i,s}$ and $d2_{i,s}$ are two dummies taking value one if the individual self-control is above or below the average self-control of the peers by a given threshold, respectively, and zero otherwise. The model predicts a positive estimate of $\delta_0 + \delta_1$ and a negative estimate of $\delta_0 + \delta_2$. That is, the individual's own self-control increases with the peers' self-control for those students whose self-control is sufficiently above the peers' self-control, whereas it decreases for those students whose self-control is sufficiently below the peers' self-control. We define "sufficiently" by using, as a threshold, one standard deviation of the empirical distribution of the self-control variable. Observe that while a positive relationship between individual and peers' self-control requests that the two levels have to be far enough, the negative relationship is always satisfied as long as the individual level of self-control is below the one of the peers. Table 4 collects the estimation results.[14,15]

The first five columns report the OLS results with increasing sets of controls, whereas the last column shows the IV results that account for the simultaneity which is endemic in the estimation of spatial autoregressive (SAR) models, such as model (2). The common strategy to estimate SAR models with network data is to use the characteristics of peers of peers as

[11] The reduction of the number of observations in columns (3) and (4) of Table 3 is due to missing values in family income.
[12] A description of the variables used in this study, as well as descriptive statistics on our sample, is provided in Table A.1 of the Appendix to this paper. We include religious practice because it can shape self-control ability. We include peer group size to control for a differential individual response to peer inputs in small and large groups. We use as a proxy for intelligence the response to the question: "Compared with other people your age, how intelligent are you?". The responses are coded 1 to 6, where 1 means the student considers his intelligence "moderately below average" relative to people of his age, whereas 6 means the student considers his intelligence "extremely above average" relative to people of his age.
[13] The estimates for the entire set of controls are shown in the Online Appendix, Table A.2.
[14] The qualitative results remain unchanged when we slightly move the threshold value, and when we set the threshold equal to zero for those below the average of their peers.
[15] The estimates for the entire set of controls are shown in the Online Appendix, Table A.3.

Table 5
Self-control and peer similarity.

	(1)	(2)	(3)	(4)	(5)
	self-control	*self-control*	*self-control*	*self-control*	*self-control*
similar	0.177***	0.164***	0.175***	0.175***	0.169***
	(0.024)	(0.024)	(0.026)	(0.026)	(0.035)
Control variables					
Demographics	No	Yes	Yes	Yes	Yes
Family background	No	No	Yes	Yes	Yes
Additional controls	No	No	No	Yes	Yes
School fixed effects	No	No	No	No	Yes
Observations	14,581	14,385	11,954	11,927	11,927

OLS estimation results and standard errors (in parentheses) are reported.
* $p<0.1$.
** $p<0.05$.
*** $p<0.01$.
Control variables are described in the Appendix, Table A.1.

instruments for the average activity of the peers (see, e.g., Bramoullé et al., 2009, and Calvó-Armengol et al., 2009). Intuitively, the validity of this IV strategy is grounded on the observation that the characteristics of peers of peers affect the individual's activity only through the activity of the peers. In our context, this IV strategy (Table 4, column (6)) leaves our qualitative evidence unchanged. The estimated coefficients $\hat{\delta}_0$, $\hat{\delta}_1$ and $\hat{\delta}_2$ are statistically significant and in line with the predictions of Battaglini et al.'s (2005) model.

Finally, we examine *H.2b*, that is whether there is evidence that self-control problems are reduced when interacting with peers with similar impulses. Model (1) becomes:

$$self\text{-}control_{i,s} = \alpha + \delta similar_{i,s} + \sum_{k=1}^{K} \beta^k x_{i,s}^k + \eta_s + \varepsilon_{i,s} \tag{3}$$

where $similar_{i,s}$ denotes the percentage of peers of student i giving the same answer to the self-control question.[16] Table 5 shows the OLS estimation results of model (3) for our target variables.[17] The estimated coefficient on *similar* is statistically significant and positive: those teenagers with a higher percentage of similar friends appear to be better in terms of self-control abilities.[18]

Observe that the fraction of peers with the same level of self-control is a non-linear (and dyadic) transformation of the dependent variable that breaks the linear correlation with the error term, which is endemic in SAR models. Nevertheless, a threat to the use of OLS in estimating model (3) is the possible presence of individual unobserved characteristics correlated with self-control and with the fraction of peers with the same level of self-control. We investigate the likelihood of this scenario by regressing the fraction of similar peers on the individual's observed characteristics. Table 6 shows the results. There appears to be no systematic variation in this variable across students' observable characteristics. Altonji et al. (2005) suggest that the degree of selection on observables can provide a good indicator of the degree of selection on unobservables. In light of this argument, the absence of marked correlations with observed variables increases our confidence in the assumption of no correlation with unobservables (i.e., with the error term), and thus in the OLS estimation results.

We then investigate the presence of non-linear effects using the model:

$$self\text{-}control_{i,s} = \alpha + \delta_1 similar_{i,s} + \delta_2 similar_{i,s}^2 + \sum_{k=1}^{K} \beta^k x_{i,s}^k + \eta_s + \varepsilon_{i,s} \tag{4}$$

The OLS estimation results for the target variables are collected in Table 7.[19] It appears that self-control skills increase with the percentage of similar friends, until we reach a point (approx. 80%) at which higher levels of similarity are associated with lower self-control ability.[20]

[16] Note that both hypotheses, 2a and 2b, concern the nonlinearity of the relationship between self-control of an agent and the self-control of his or her peers (a relationship that is predicted by the model to be hump-shaped). In model (3), however, we use a different measurement of "similarity" (namely, the percentage of student i's peers who give the same answer as i to the self-control question). In contrast, in model (2) we measured "similar" by the difference between i's self-control and the average self-control of his peers. The fact that model (3) also generates results that are consistent with the theory can, therefore, be seen as a robustness check on (2).
[17] The estimates for the entire set of controls are shown in the Online Appendix, Table A.4.
[18] The reduction in the number of observations is due to the fact that some students name friends that cannot be tracked in the school rosters, mainly because of imprecise information.
[19] The estimates for the entire set of controls are shown in the Online Appendix, Table A.5.
[20] The ordered probit results for models (2) and (4) are shown in the Online Appendix, Tables A.6 and A.7, respectively.

Table 6
Peer similarity in self-control and individual characteristics.

	(1) *similar*	(2) *similar*
age	−0.014	0.008
	(0.026)	(0.030)
female	0.009	0.008
	(0.007)	(0.007)
black	−0.007	0.001
	(0.010)	(0.012)
native	−0.004	−0.004
	(0.019)	(0.020)
asian	0.010	−0.001
	(0.014)	(0.016)
other_races	0.025*	0.028*
	(0.013)	(0.016)
two_parents	0.003	0.002
	(0.008)	(0.008)
fam_income	0.000	0.000
	(0.000)	(0.000)
housing_quality	0.005	0.003
	(0.004)	(0.004)
religion_practice	−0.004	−0.006
	(0.003)	(0.004)
religion_importance	0.008	0.014
	(0.008)	(0.009)
peer_group_size	−0.001	−0.001
	(0.001)	(0.001)
intelligence	0.001	−0.000
	(0.003)	(0.003)
School fixed effects	No	Yes
Observations	11,927	11,927

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Intercept included in the regression models.
Control variables are described in the Appendix, Table A.1.

Table 7
Self-control and peer similarity – non-linear effects.

	(1)	(2)	(3)	(4)	(5)
	self-control	*self-control*	*self-control*	*self-control*	*self-control*
similar	0.409***	0.389***	0.348***	0.359***	0.382***
	(0.085)	(0.085)	(0.093)	(0.103)	(0.118)
$similar^2$	−0.251***	−0.244***	−0.187**	−0.200*	−0.232**
	(0.087)	(0.086)	(0.094)	(0.106)	(0.113)
Control variables					
Demographics	No	Yes	Yes	Yes	Yes
Family background	No	No	Yes	Yes	Yes
Additional controls	No	No	No	Yes	Yes
School fixed effects	No	No	No	No	Yes
Observations	14,581	14,385	11,954	11,927	11,927

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

4. Out-of-school transitions among peers as exogenous shocks

As a whole, the analysis thus far shows novel and interesting correlations. Causality claims, however, are more difficult to make, as there may be unobservable factors driving both peer choice and self-control. In this section, we exploit the richness of our dataset to select a sub-sample of students for whom variations in the peer group's self-control may be reasonably taken as random. We single out the Wave I students who (*i*) nominate at least one friend in Grade 12, and (*ii*) nominate no new friends in Wave II. When the Grade 12 friend ends the school year, these students experience variations in the (average)

Table 8
Self-control of forgone peers.

Do you usually go with your "gut feeling"?			
	Freq.	%	Cum.
Strongly agree	202	7.63	7.63
Agree	706	26.66	34.29
Neither agree nor disagree	521	19.68	53.97
Disagree	1,013	38.26	92.22
Strongly disagree	206	7.78	100.00
Total	2,648	100.00	

Source: Add Health, Wave I

Table 9
Self-control and peer groups – exogenous peer group variations.

	(1)	(2)	(3)
	Δ*self-control*	Δ*self-control*	Δ*self-control*
Δ*alone*	−0.171*	−0.223*	−0.319*
	(0.083)	(0.128)	(0.181)
Control variables	No	Yes	Yes
School effects	No	No	Yes
Observations	895	362	362

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

self-control of the peers which are reasonably exogenous with respect to each student's self-control. Indeed, schooling terminates at Grade 12 irrespective of the level of self-control.[21] In fact, Table 8 shows a relatively even distribution in terms of self-control among Grade 12 students who left the school in Wave II.

Therefore, if *changes* in individual self-control are associated with *changes* in peers' self-control between Wave I and Wave II, then we could give a causal interpretation of the results of the previous section.

Because most students nominate friends in the same grade, the requirement of having a friend in Grade 12 at Wave I significantly reduces our sample size. We further restrict our analysis to individuals who are interviewed at Waves I and II, provide no new nominations in Wave II and have no missing values for personal or friends' characteristics. As a result, our final sample consists of roughly 360 observations.[22]

To the extent possible, we now replicate the analysis in the previous section and exploit this mechanism of randomly allocating peer groups.[23] We start from *H.1*. The model that corresponds to model (1) and to the theoretical prediction *H.1* is:

$$\Delta self\text{-}control_{i,s} = \alpha + \gamma \Delta alone_{i,s} + \sum_{k=1}^{K} \beta^k \Delta x_{i,s}^k + \eta_s + \varepsilon_{i,s} \tag{5}$$

where Δ denotes variations in variables between Wave I and Wave II,[24] and $\Delta alone_{i,s}$ is a dummy equal to 1 if the respondent lost 50% or more of his or her friends between Wave I and Wave II.[25] Table 9 shows the results.[26]

It appears that an important decrease in the number of friends is associated with a decrease in the ability to resist temptations, in line with the evidence in Table 3. In terms of magnitude, since the average level of self-control is 3.0 and the estimated coefficient of $\Delta alone_{i,s}$ is −0.319, adolescents that lose 50% or more of their friends are expected to experience, on average, a decrease in the level of self-control of 11% relative to the sample mean.

[21] None of the students in our sample repeated Grade 12.
[22] This sample increases to 895 observations when we estimate model (5) with a limited set of controls (Table 9, column (1)). The reduction in the sample size is mostly due to missing values in peers' answers to the self-control question in Wave II. The representativeness of the sample, however, appears to be largely preserved. In Table A.8 in the Online Appendix, we provide summary statistics of the entire and restricted samples. Although a rigorous comparison of means cannot be easily done because these are nested samples, it appears that the original sample and the restricted samples are similar.
[23] School fixed effects are added after differencing the variables. Therefore, they help control for school-specific trends.
[24] For example, Δ*self-control* is *self-control* in Wave II minus *self-control* in Wave I.
[25] The precise counterpart of the variable *alone* in model (1) would be a dummy taking value 1 for the individuals that lost *all* their friends in Wave II. Unfortunately, those agents constitute less than 2% of the sample.
[26] The complete list of estimation results can be found in the Online Appendix, Table A.9.

Table 10
Self-control and peer group size – exogenous peer group variations.

	(1)	(2)	(3)
	Δ*self-control*	Δ*self-control*	Δ*self-control*
Δ*peer_group_size*	−0.300**	−0.346**	−0.480**
	(0.147)	(0.151)	(0.201)
Control variables	No	Yes	Yes
School effects	No	No	Yes
Observations	895	362	362

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

Table 11
Self-control and peers' self-control – exogenous peer group variations.

	(1)	(2)	(3)	(4)
	Δ*self-control*	Δ*self-control*	Δ*self-control*	Δ*self-control*
Δ*self-control_peers*	−0.276***	−0.381***	−0.366***	−0.500***
	(0.091)	(0.106)	(0.137)	(0.167)
Δ*self-control_peers* * d_3	0.278**	0.322***	0.429***	0.545***
	(0.117)	(0.105)	(0.141)	(0.205)
Estimantion method	OLS	OLS	OLS	IV
Control variables	No	Yes	Yes	Yes
School effects	No	No	Yes	Yes
Observations	347	347	347	347

OLS/IV estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$,
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

When the number of nominated friends, *peer_group_size*, replaces the dummy *alone*, the variable Δ*peer_group_size* captures the change in the number of friends. It is higher, the higher is the number of friends that are lost between Wave I and Wave II. Table 10 collects the results. The evidence remains unchanged: the higher the number of friends who are lost, the lower the ability to resist temptations.[27]

We now turn to *H.2a*. We revisit our finding about the relationship between individual and peers' self-control by estimating the model:

$$\Delta self\text{-}control_{i,s} = \alpha + \lambda_0 \Delta self\text{-}control\_peers_{i,s} + \lambda_1 \Delta self\text{-}control\_peers_{i,s} * d3_{i,s} + \sum_{k=1}^{K} \beta^k \Delta x^k_{i,s} + \eta_s + \varepsilon_{i,s} \quad (6)$$

where $d3_{i,s}$ is defined as $d1_{i,s}$ in model (2), but with the threshold set to zero to preserve the number of observations. Importantly, we control for variations in the self-control of the old friends by including the difference in the average self-control of the peers who are still in school in Wave II ($\Delta self\text{-}control\_peers\_old_{i,s}$) among the control variables.[28] A negative and statistically significant estimate of λ_0 would reveal that students who are below the average of their peers are less likely to control their impulses when facing an exogenous increase in the self-control of peers, as predicted by Battaglini et al.'s (2005) model. Table 11 collects the results.[29]

The evidence echoes the results in Table 4, thus remaining fully in line with the theoretical predictions.

Finally, we turn our attention to *H.2b*, i.e., the model's prediction in terms of peer similarity. Table 5 shows that self-control problems appear to be mitigated when interacting with peers with similar impulses. However, according to the evidence in Table 7 (and the model by Battaglini et al., 2005), the relationship between individual and peers' (average) self-control is non-monotonic.

[27] See the Online Appendix, Table A.10, for a complete version of these estimation results.
[28] The estimation results which are obtained when this variable is excluded are however qualitatively unchanged.
[29] The estimates for the entire set of controls are shown in the Online Appendix, Table A.11.

Table 12
Self-control and peer similarity – exogenous peer group variations.

	(1)	(2)	(3)
	Δ*self-control*	Δ*self-control*	Δ*self-control*
Δ*similar*	0.340***	0.270*	0.262*
	(0.129)	(0.162)	(0.157)
Δ*similar* threshold*	−0.851**	−0.829**	−1.142**
	(0.404)	(0.416)	(0.572)
threshold	−0.394	−0.424	−0.765
	(0.259)	(0.272)	(0.493)
Control variables	No	Yes	Yes
School effects	No	No	Yes
Observations	362	362	362

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

In order to give to this evidence a causal interpretation, we estimate regressions of the form:

$$\Delta self\text{-}control_{i,s} = \delta \Delta similar_{i,s} + \theta threshold_{i,s} + \phi \Delta similar_{i,s} * threshold_{i,s} + \sum_{k=1}^{K} \beta^k \Delta x^k_{i,s} + \eta_s + \varepsilon_{i,s} \quad (7)$$

where Δ again denotes variations of variables between Wave II and Wave I, and $threshold_{i,s}$ is a dummy equal to 1 if the percentage of individual *i*'s similar friends ($similar_{i,s}$) is greater or equal to 82% at Wave I, and 0 otherwise. Similarly to model (6), we control for variations in self-control of the peers who are still in school in Wave II by including the difference in the percentage of similar friends among those peers ($\Delta similar\_old_{i,s}$), among the control variables.

Table 12 displays the estimation results.[30] Although the sample size is smaller, it appears that there is sufficient variation to identify the claimed non-linear effects. Indeed, Table 12 confirms that the interactions with peers that have similar impulses is important to increase individual self-control. This is true, however, up to a certain percentage of similar peers, after which the social influence turns negative. The estimates reveal that for adolescents with a percentage of similar peers below 82%, a 10% increase in the similarity of peers translates, on average, into a 0.9% increase in self-control. For adolescents with a percentage of similar peers above 82%, a 10% increase in the similarity of peers translates instead into a 2.9% reduction in self-control.

5. Robustness checks

In this section, we discuss additional evidence as a robustness check on the previous analysis. We begin by showing that our measure of self-control is consistent with other measures of impulse control that are available in Add Health. First, following Nagin and Pogarsky (2004), we use the question: "If you wanted to use birth control, how sure are you that you could stop yourself and use birth control once you were highly aroused or turned on?" The answers are recoded 1 to 5, where 1 means "very unsure" and 5 means "very sure". The main results of our analysis, which are obtained when using this alternative measure of self-control, are collected in Tables 13 and 14.[31,32,33] They strongly resemble the results in Tables 11 and 12.

Second, we consider other items related to self-control in the Add Health questionnaire and show that the students' answers to these questions are consistent with what they report for the direct question on self-control. The Add-Health questionnaire asks students how often they had trouble keeping their mind on what they were doing, getting their homework done, paying attention in school, and getting along with the teachers, since school started in the current year. A higher frequency of these problems may reveal low self-control.[34]

Fig. 1 plots the average values of the answers to each of these questions (rescaled between 0 and 1) by the categories of our measure of self-control. There appears to be a consistent downward sloping curve. It shows that, for

[30] The complete list of estimation results can be found in the Online Appendix, Table A.12.
[31] See the Online Appendix, Tables A.13 and A.14, for a complete version of these estimation results.
[32] In this case, $threshold\_bc_{i,s}$ is equal to 1 if the percentage of similar friends is greater than or equal to 84% at Wave I.
[33] Unfortunately, due to the decrease in sample size associated to the use of this alternative variable, the dummy Δ*alone* does not show enough variation, failing to obtain a statistically significant effect (as in Table 9). The sign of the estimated effect, however, is negative, as predicted by the theory.
[34] Perrone et al. (2004) use these questions for similar purposes. They also consider the question about whether students feel like they were doing everything just about right. The interpretation of this question as a proxy for self-control, however, is more controversial and, in fact, the answers are not in accordance with the other battery of items. We thank Dina Perrone for sharing the results of their principal component analysis with us.

Table 13
Self-control and peers' self-control – exogenous peer group variations.

	(1)	(2)	(3)	(4)
	$\Delta birth\_control$	$\Delta birth\_control$	$\Delta birth\_control$	$\Delta birth\_control$
$\Delta birth\_control\_peers$	−0.214**	−0.228**	−0.329**	−0.519**
	(0.103)	(0.104)	(0.130)	(0.231)
$\Delta birth\_control\_peers * d_{3\_b\,c}$	0.226*	0.235*	0.318*	0.575**
	(0.136)	(0.138)	(0.170)	(0.280)
Estimation method	OLS	OLS	OLS	IV
Control variables	No	Yes	Yes	Yes
School effects	No	No	Yes	Yes
Observations	310	310	310	310

OLS/IV estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

Table 14
Self-control ability and peer similarity – exogenous peer group variations.

	(1)	(2)	(3)
	$\Delta birth\_control$	$\Delta birth\_control$	$\Delta birth\_control$
$\Delta similar\_bc$	0.909***	0.942***	1.041***
	(0.145)	(0.149)	(0.211)
$\Delta similar\_bc * threshold\_bc$	−0.419*	−0.470**	−0.740*
	(0.251)	(0.183)	(0.438)
$threshold\_bc$	0.203	0.238*	0.254
	(0.126)	(0.125)	(0.200)
Control variables	No	Yes	Yes
School effects	No	No	Yes
Observations	310	310	310

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

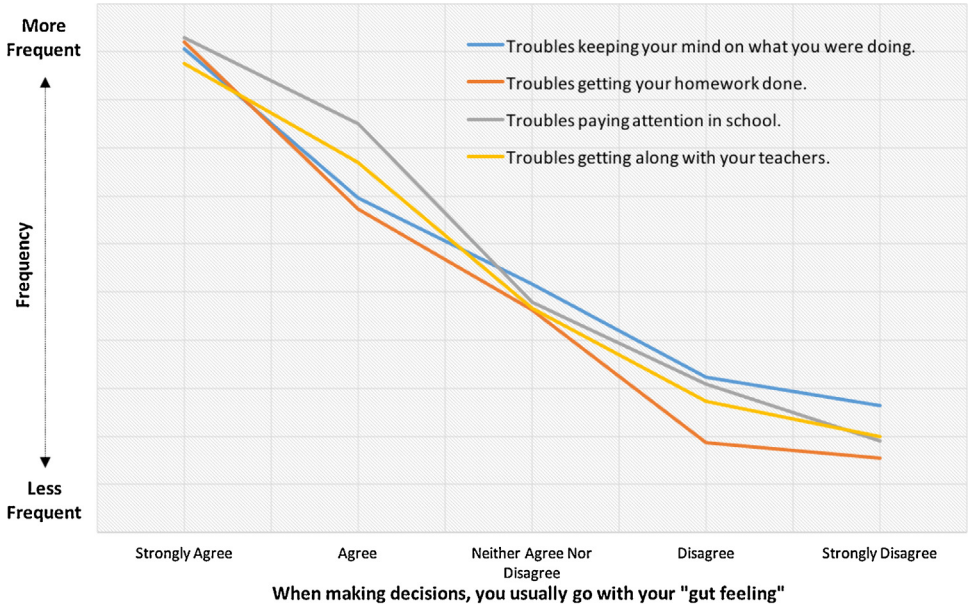

Fig. 1. Comparison of Add Health self-control variables.

Table 15
Self-control and peer similarity – exogenous peer group variations.

	(1)	(2)	(3)
	Δ*self-control*	Δ*self-control*	Δ*self-control*
Δ*almost_similar*	0.357***	0.349***	0.340**
	(0.120)	(0.135)	(0.140)
Δ*almost_similar* threshold*	−0.747**	−0.706*	−0.867*
	(0.333)	(0.359)	(0.479)
threshold	−0.443**	−0.424*	−0.514
	(0.220)	(0.250)	(0.403)
Control variables	No	Yes	Yes
School effects	No	No	Yes
Observations	362	362	362

OLS estimation results and standard errors (in parentheses) are reported.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.
Control variables are described in the Appendix, Table A.1.

example, students that strongly agree to the statement "when making decisions, you usually go with your gut feeling" have lots of troubles with the items listed before. The troubles decrease as the reported level of self-control increases, and they are at a minimal level when students disagree that they follow their gut feeling when making decisions.

Our second exercise relates to the definition of peer similarity. In Section 3, we identified peers as "similar" in terms of self-control when they give exactly the same answer to the "gut feeling" question. We now test the robustness of our results when this definition is slightly changed. We define as "similar peers" the friends giving answers not only in the same category, but also in the one above or below. We name this variable "almost similar" and show the main result of our analysis in Table 15.[35] As one can see, the evidence remains qualitatively unchanged.

6. Conclusions

In this paper, we have made a first attempt to test the predictions of the model of self-control in peer groups by Battaglini et al. (2005). To gain insight into the effect of peers on individual self-control, we have exploited the longitudinal nature of the Add Health panel, which follows cohorts of students and their friends from adolescence to adulthood. As a source of exogenous variation, we have used the changes in peer groups resulting from the transition of older friends out of high school.

We find evidence consistent with the two key predictions of this theory regarding the relationship between an agent's expected self-control and the size and composition of his or her social circles: (i) students embedded in social circles have more self-control than those who are alone, and their self-control is increasing in the size of their social group; (ii) students' self-control is, however, a non-monotonic hump-shaped function of the average self-control of their friends. These findings suggest that peer groups may play an important role in affecting self-control problems; but the effect of the "quality of peers" (in terms of their self-control) is non-monotonic.

Naturally, our paper is only a first step in characterizing the relationship between individual and peers' abilities to control their own impulses. Nevertheless, our analysis uncovers non-linearities in peer influence that have thus far been neglected by the large literature on peer effects.

Appendix A.

Table A.1

[35] See the Online Appendix, Table A.15, for a complete version of these estimation results.

Table A.1
Data description.

		Mean	SD	Min	Max
Target variables					
self-control	Indicates how much the respondent agrees with the statement "when making decisions, you usually go with your *gut feeling* without thinking too much about the consequences of each alternative", ranging from 1 to 5, where 1 means "strongly agree" and 5 means "strongly disagree"	3.00	1.1	1	5
self-control_peers	Indicates how much the peers, on average, agree with the statement "when making decisions, you usually go with your *gut feeling* without thinking too much about the consequences of each alternative", ranging from 1 to 5, where 1 means "strongly agree" and 5 means "strongly disagree".	2.97	0.9	1	5
birth_control	Indicates the respondent's answer to the following question: "if you wanted to use birth control, how sure are you that you could stop yourself and use birth control once you were highly aroused or turned on?", ranging from 1 to 5, where 1 means "very unsure" and 5 means "very sure".	4.05	1.2	1	5
birth_control_peers	Indicates the average peers' answer to the following question: "if you wanted to use birth control, how sure are you that you could stop yourself and use birth control once you were highly aroused or turned on?", ranging from 1 to 5, where 1 means "very unsure" and 5 means "very sure".	3.87	0.9	1	5
alone	Dummy equal to 1 if the respondent nominates no friends. This variable is used in most of the models as an additional control.	0.02	0.0	0	1
similar	Percentage of peers with the same answer to the self-control question as the respondent.	0.27	0.4	0	1
similar_bc	Percentage of peers with the same answer to the birth control question as the respondent.	0.34	0.4	0	1
almost_similar	Percentage of peers with the same answer to the self-control question, or in one category above or below with respect to the respondent.	0.64	0.4	0	1
Demographics					
age	Student grade, used as a proxy for age.	9.67	1.6	7	12
female	Dummy equal to 1 if the respondent is a female.	0.51	0.5	0	1
black	Dummy equal to 1 if the respondent is African American.	0.22	0.4	0	1
native	Dummy equal to 1 if the respondent is Native American.	0.03	0.2	0	1
asian	Dummy equal to 1 if the respondent is Asian.	0.08	0.3	0	1
other_races	Dummy equal to 1 if the individual is from a different race/ethnic group (with white being the reference category).	0.09	0.3	0	1
Family background					
two_parents	Dummy equal to 1 if the individual resides with both parents.	0.66	0.5	0	1
fam_income	Total family income before taxes (in thousands of USD).	40.72	50.8	0	999
fam_income_refused	Dummy equal to 1 if family income is refused.	0.11	0.3	0	1
housing_quality	Indicates how well kept is the building where the respondent lives, ranging from 1 (i.e., "very poorly kept, needs major repairs") to 4 (i.e., "very well kept").	3.34	0.9	1	4
Additional controls					
religion_practice	Indicates how often the respondent attends religious services, ranging from 1 (i.e., "never") to 4 (i.e., "once a week or more").	2.70	1.2	1	4
religion_importance	Dummy equal to 1 if the individual considers religion very important to her.	0.42	0.5	0	1
peer_group_size	Number of friends nominated by the respondent.	3.09	2.5	0	10
intelligence	Indicates the answer to the following question: "compared with other people your age, how intelligent are you?"; responses are coded 1 to 6, where 1 means "moderately below average", whereas 6 means "extremely above average".	3.85	1.1	1	6
self-control_peers_old	Indicates how much the peers who are still in school during Wave II, on average, agree with the statement "when making decisions, you usually go with your *gut feeling* without thinking too much about the consequences of each alternative", ranging from 1 to 5, where 1 means "strongly agree" and 5 means "strongly disagree".	2.97	0.9	1	5
birth_control_peers_old	Indicates the average peers' answer to the following question: "if you wanted to use birth control, how sure are you that you could stop yourself and use birth control once you were highly aroused or turned on?", ranging from 1 to 5, where 1 means "very unsure" and 5 means "very sure", including only the peers that are still in school during Wave II.	4.08	1.0	1	5
similar_old	Percentage of peers, who are still in school during Wave II, with the same answer to the self-control question as the respondent.	0.28	0.4	0	1
similar_bc_old	Percentage of peers, who are still in school during Wave II, with the same answer to the birth control question as the respondent.	0.34	0.4	0	1
almost_similar_old	Percentage of peers, who are still in school during Wave II, with the same answer to the self-control question, or in one category above or below with respect to the respondent.	0.64	0.5	0	1

Source: Add Health, Wave I

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jebo.2016.12.018.

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