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Nadim Elayan-Balagué

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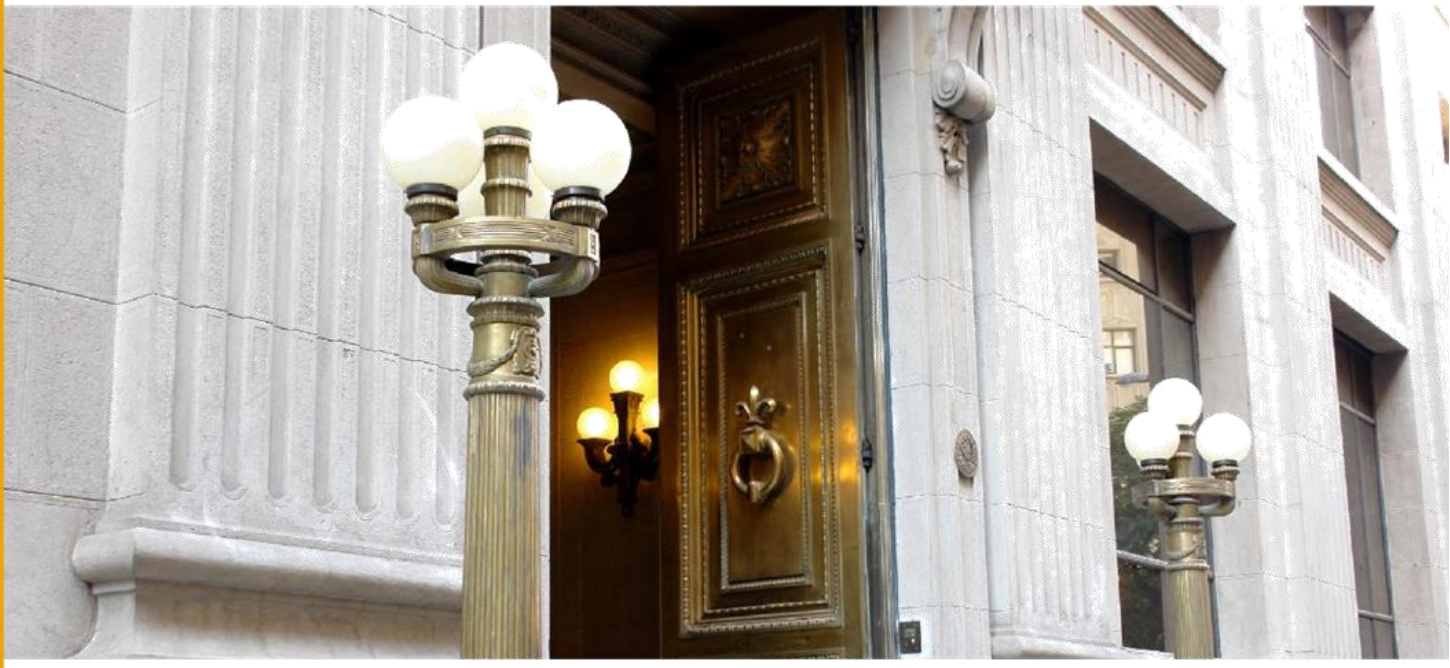

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Teléfono: (56-2) 3882475; Fax: (56-2) 38822311

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Strategic or Scarred? Disparities in College Enrollment and Dropout Response to Macroeconomic Conditions*

Nadim Elayan-Balagué†

Resumen
Las recesiones generan efectos negativos y persistentes en las carreras laborales de los jóvenes. En este paper analizo cómo las decisiones educativas amplifican o mitigan estas secuelas según el nivel de ingresos familiar. Los jóvenes de bajos ingresos enfrentan principalmente dos tipos de secuelas negativas ante una recesión: con mayor probabilidad abandonan la universidad y sufren una inserción laboral más desfavorable. Los jóvenes de ingresos altos y medios evitan estratégicamente estas secuelas retrasando su entrada al mercado laboral matriculándose a la universidad durante las recesiones económicas. Por último, cuantifico las repercusiones vitales de experimentar una recesión durante dos fases críticas (después de la graduación de secundaria y durante la asistencia a la universidad) utilizando un modelo dinámico de ciclo de vida con decisiones educativas calibradas con datos de Estados Unidos. Encuentro que las consecuencias negativas de las recesiones se concentran principalmente en el grupo de bajos ingresos.

Abstract
Recessions create enduring effects, or scars, on young individuals' careers. I investigate how educational choices amplify or mitigate these scarring effects by income. Low-income young people face dual scarring effects: an increased likelihood of dropping out of college and enduring negative labor market entry effects. High- and middle-income young people strategically evade these repercussions by delaying labor market entry through timely college enrollment during economic downturns. I quantify the lifetime repercussions of experiencing a recession during two critical phases (around high-school graduation and college attendance) using a dynamic life-cycle model with educational choices calibrated to US data. I find that the negative consequences of recessions are largely concentrated on the low-income group.

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† Monetary Policy Division, Economic Modeling Department, Banco Central de Chile, Agustinas N° 1180, Santiago de Chile, Chile. Email: nelayan@bcentral.cl. Website: nadimelayan.github.io

Macroeconomic conditions are well-known to impact young people's schooling choices (Gustman & Steinmeier, 1981; Betts & McFarland, 1995; Sakellaris & Spilimbergo, 2000; Dellas & Koubi, 2003; Hérault et al., 2012; Johnson, 2013; Boffy-Ramirez et al., 2013; Smith, 2017; Guo, 2018; Cajner et al., 2021; Blom et al., 2021; Stuart, 2022; Graves & Kuehn, 2022; Schanzenbach et al., 2024; Sadaba et al., 2024; Grenet et al., 2025). However, less is known about how these impacts differ by students' socioeconomic backgrounds. Labor force entry decisions during recessions involve difficult trade-offs for recent high school graduates and college students. On the one hand, family financial distress creates a wealth effect that raises the relative cost of staying in college. On the other hand, a weak labor market lowers the opportunity cost of being outside the labor force. This paper focuses on how the relative importance of these mechanisms correlates with family income.

I develop a model with endogenous schooling decisions that mirrors the main tradeoffs that young individuals face during a recession. The model has liquidity constraints and persistent effects of labor market entry conditions on current wages that impact college enrollment and dropout decisions heterogeneously by income levels. I calibrate this model to match key moments for the US using Current Population Survey (CPS) micro data. The model successfully replicates the following novel empirical findings. College students from low-income families—those in the bottom 35% of the income distribution—are 10% more likely to drop out during periods of high unemployment. In contrast, students from high-income families—the top 25%—are 4% more likely to persist and earn their degrees. Years after graduating high school during times of high unemployment, low-income individuals are only 3% more likely to have attended college, while their high-income peers are 7% more likely. Furthermore, low-income individuals are 24% less likely to have earned a degree, compared to a 31% higher likelihood among high-income individuals. I calibrate the model to reproduce the two main counterfactuals of the paper displaying substantial drops in lifetime consumption for the poorest subgroups within the low-income group when a recession occurs during two pivotal periods: around high school graduation and during college attendance. Finally, the model highlights the strategic role of college decisions made by middle and high-income individuals as a means to mitigate such long-term effects.

I introduce a dynamic life-cycle individual decision-making model to quantify the long-term effects of experiencing an economic recession during two critical life stages: graduating from high school and entering college. The model also explores how young individuals respond to the trade-offs posed by these recessions. It incorporates endogenous choices regarding college enrollment, college completion, as well as decisions regarding consumption and savings, all starting from different initial asset levels. Business cycles are generated by a productivity variable subject to a stochastic process. Wages depend both on the current productivity state and the productivity state at the individual's labor market entry, capturing the scarring effects resulting from unfavorable entry conditions. Additionally, the model features liquidity constraints that affect individuals' ability to borrow to pay tuition and living expenses during college enrollment.

The model illustrates that during economic recessions, high-income individuals are more likely to enroll in college or complete their degrees due to lower wages and strong incentives to delay labor market entry. These incentives are further amplified by labor market rigidities, which cause the initial conditions to have persistent effects on future wages.

Using CPS micro data I document these trade-offs presented in the model. I find that low-income individuals are disproportionately scarred by economic recessions during two pivotal time periods. While attending college, an increase in the unemployment rate in a US state equivalent to the rise experienced during the Great Recession of 2009 correlates with an increase in the probability of dropping out of college without earning a degree by 10%. In addition, around high school graduation, the same rise in unemployment rate is correlated with only a 3% rise in the probability of enrolling in college and a 24% reduction in their probability of earning a college degree.

By contrast, high-income individuals strategically evade these scarring effects. When periods of high unemployment coincide with college attendance, they are 4% more likely to complete their college degree, and when such economic downturns coincide with their high school graduation, they are 7% more likely to enroll in college and 31% more likely to graduate.

The substantial increase in college enrollment among high-income individuals after a rise in the unemployment rate in the respondent's state around their high school graduation does not fully translate into the same magnitude rise in future college degree holders within this income bracket. This spike in college enrollment is followed by an increase in college dropouts among high-income individuals as economic conditions rebound post-recession. The model explores the following mechanism: for the high-income group, the diminished opportunity cost incentivizes even individuals who might be *a priori* less academically suited for college. Once they realize their unsuitability for college and the labor market has recovered they might choose to drop out of college. I find that this type of college dropout more prevalent among the male population. The model successfully replicates this.

I use this same dataset to estimate the following key parameters of the model—the variance of the business cycle, the influence of labor market entry conditions on current wages, and tuition fees—with key moments of the data. Experiencing a rise in the unemployment rate in a state similar to the rise experienced in the 2009 recession, either while attending college or around the time of high school graduation, significantly reduces the lifetime consumption of individuals from low-income backgrounds, while having a negligible effect on those from high-income groups. I conduct three experiments to assess policy relevance. Among low-income individuals, those with a high probability of college success are most affected by recessions occurring around high school graduation, while among high-income individuals, the least likely to succeed are most impacted since recession incentivizes individuals with high probabilities of dropping out of college to enroll. Additionally, tightening liquidity constraints and increasing labor market rigidities disproportionately harm low-income groups.

This paper contributes to two branches of the literature.

First, it follows the recent empirical literature regarding the negative and persistent effects of entering the labor market during economic crises. I contribute to this branch of the literature by allowing individuals in the model to endogenously choose their labor force entry timing via schooling decisions. I contribute to the empirical literature that finds negative and persistent effects of starting a career during periods of high unemployment rates. Kahn (2010), Speer (2016) and Schwandt & Von Wachter (2019) find that entering the labor market during a time of high unemployment impacts negatively entrants' wages significantly for more than a decade. Stevens (2008) documents these negative and (less) persistent effects in Germany. This finding is consistent with Beaudry & DiNardo (1991)'s contract model in which macroeconomic conditions at the time of the labor contract better predict the evolution of wages than current macroeconomic conditions. These effects are also well-documented for other countries besides the US, such as for Germany (Bachmann et al., 2010), Japan (Genda et al., 2010), Canada (Oreopoulos et al., 2012), Austria (Brunner & Kuhn, 2014), Spain (Fernández-Kranz & Rodríguez-Planas, 2018; Escalonilla et al., 2021) or the Netherlands (Van den Berge, 2018). Oyer (2006) documents these persistent entry effects for Ph.D. graduates who enter the job market during a recession. Kondo (2015) focuses on the heterogeneity in these effects across gender and race. Choi et al. (2020) shows the same entry effects for South Korean college graduates who entered the labor market during the Asian financial crisis. This paper contributes to this branch of the literature by replicating this empirical fact using CPS data. I show that economic downturns around high school graduation dates matter only for people who do not go to college, and therefore, actually enter the labor market. In the model I allow the labor market entry decision to be endogenous for an individual that can use college enrollment to postpone it and to strategically avoid these negative entry effects. I find empirical evidence of such behavior coming from middle and high-income groups and it is economically significant.

The theoretical reasons behind these persistent effects of entering the labor market during a crisis have been recently explored using macroeconomic directed search models. Guo (2018) builds a dynamic directed search model to show the effect of experiencing a recession while young on lifetime welfare. Acabbi et al. (2022) propose a model where on-the-job human capital accumulation is affected by the business cycle and the quality of the firm workers get matched with. Another similar branch of the literature focused on trying to explain theoretical reasons behind the *scarring effects* of job losses, that is, the persistent negative effects of being unemployed. Jarosch (2023) shows that the main reason for the observed negative persistent scarring effects generated by unemployment is the interaction of human capital and job security loss. Huckfeldt (2022) also finds that these scarring effects are explained by the directed search of relatively skilled workers who focus their search into less skilled submarkets during recessions in order to increase their likelihood of matching with a firm.

Second, it shows the counter-cyclicality of college enrollment, with a novel finding regarding the distinct elasticities across income levels. Another relevant contribution is the distinction between people who finish the degree and those who drop out from college. One branch particularly focuses on how negative shocks disrupt the potential of enrolling to college for some students (Gregg & Tominey, 2005; Coelli, 2011; Ost et al., 2018; Huttunen & Riukula, 2024). While the other finds that recessions lower the opportunity cost of education and actually rise school enrollment

(Gustman & Steinmeier, 1981; Betts & McFarland, 1995; Sakellaris & Spilimbergo, 2000; Dellas & Koubi, 2003; Johnson, 2013; Boffy-Ramirez et al., 2013; Guo, 2018; Cajner et al., 2021; Stuart, 2022; Schanzenbach et al., 2024; Sadaba et al., 2024). This paper contributes to this branch of the literature in two main ways. First, I show that the cyclicality in college enrollment varies by income level. Second, I distinguish individuals who graduate and earn their college degrees from those who drop out from college.

This paper is structured as follows: in Section 1, I introduce a dynamic individual decision-making model designed to capture the dynamics of college decisions as a response to macroeconomic conditions. In Section 2, I describe the data set and I present preliminary statistics. In Section 3, I show the two main empirical findings of the paper as well as some robustness checks and a discussion of the central identifying assumptions underpinning the empirical section of the paper. I calibrate the model to match key moments in the US data in Section 4 and I present the main results of the model with a comparison to the empirical findings in Section 5. In Section 6, I present the two main counterfactuals of the paper. Finally, Section 7 concludes.

1 Model

I build a dynamic life-cycle individual decision-making model to quantify the lifetime impact of experiencing a rise in the unemployment rate in a state similar to the one experienced in the 2009 recession at two critical points in time for young individuals-high school graduation and college enrollment-across different income levels.

The model incorporates an exogenous productivity process that induces business cycles, differential initial asset levels leading to initial inequalities, liquidity constraints and the endogenous decision to enroll in college and to whether complete or drop out. The model presents trade-offs. In expansions individuals are incentivized to enter the labor market to earn high wages. This effect is amplified by labor market rigidities, which cause initial entry conditions to have persistent impacts on future earnings. Conversely, during recessions individuals with sufficient liquidity have strong incentives to enroll in or complete their college education.

Environment

Time (t) is discrete and finite ($t = 0, 1, ...T$). There is no production. Individuals derive utility (U) from consumption (c):

$$U = \mathbb{E}_0 \sum_{t=0}^{T} \beta^t u(c_t). \tag{1}$$

Agents know their initial level of assets (a_0), their ex-ante probability of being a good fit for college (p) and the aggregate productivity state of the economy (z_t). Agents choose enrolling ($e = 1$ means to enroll and $e = 0$ means not to enroll) and dropout decisions ($d = 1$ means to drop out and $d = 0$ means not to drop out) which will determine their schooling level (X_t). While enrolled, they will also face an exogenous revelation of their own type. They also choose their consumption (c_t) and next period asset level (a_{t+1}). The budget constraint that individuals face is the following:

$$(1+r)a_t + y_t(X_t, z_t, \tilde{z}) + g(z_t) = a_{t+1} + c_t + f_t(X_t), \tag{2}$$

where

$$a_{t+1} \geq \xi. \tag{3}$$

The left-hand side of the budget constraint represents all the income sources available to the individual. a_t is the asset level at period t, and r is the exogenous rate of return. a_0 can be interpreted as the initial asset holdings of a young individual, mirroring the parental transfers received or at their disposal. Labor income, denoted as y_t, depends on the schooling level X_t, current productivity state z_t, and the productivity state at labor market entry, denoted by $\tilde{z}$. Additionally, the function $g(z_t)$ represents the other type of parental transfers received by the individual that only depend on the current productivity state.[1] This is to ensure that enrolled students remain susceptible to current economic conditions. For example, a negative shock on parental transfers might emulate parental job loss, exerting some financial pressure on the student. The right-hand side shows the various expenditures. a_{t+1} represents the asset level in the next period, while c_t is the consumption level. f_t denotes tuition costs, which depend on the schooling level. The asset level for the next period (a_{t+1}) must not fall below the threshold parameter ξ, embodying liquidity constraints.

The stochastic element z_t corresponds to a productivity shock, and its evolution follows a Markov process $\Pi = [\pi_{ij}]$, where $\pi_{ij} = Pr(z_{t+1} = z_j | z_t = z_i)$. The productivity process follows an AR(1) process:

$$z_t = \mu + \rho z_{t-1} + \epsilon_t, \tag{4}$$

where ρ is the persistence parameter and ϵ_t is distributed normally with mean 0 and variance σ^2.

Schooling levels will be determined by schooling levels in the previous period and by enrollment and dropping out decisions such that:

$$X_{t+1} = \Psi(X_t, e, d), \tag{5}$$

[1] We can think of this as the portion of parental transfers that only depend on the business cycle and maybe initial assets a_0 as the rest of the transfers that depend on the family characteristics besides the cycle. An easy extension of the model could be to make the parental transfers function depend on the interaction between the business cycle and parental assets.

Timing ane Income Structure

The world starts in $t = 0$ and the individual realizes the following: her ex-ante probability of being a good fit for college (p), her initial asset level (a_0), and the current economic state (z_0). She also knows that productivity follows a Markov process and the transition probabilities. The individual confronts pivotal decisions regarding schooling, consumption, and savings. During enrollment, the individual does not receive any labor income but she has to pay tuition costs. It takes two periods to complete college. After finishing the first period of enrollment, the individual realizes her aptitude for college, for example, by observing her own grades. The individual only earns the college wage premium if she graduates from college after having observed she is a good fit for it; conversely, an unfavorable fit leaves her with a smaller premium, the college dropout wage premium, even upon successful completion. Subsequently, the individual must opt to either persist in college for the senior year or exit to the labor force in the ensuing period. Once an individual drops out of college she cannot enroll again.

In period $t = 0$, the agent must choose whether to enroll in college. If she decides not to enroll, she will be in state $X_0 = N$ and will reconsider her enrollment decision (e) in $t = 1$. If the individual enrolls, she will be in state $X_0 = E^+$ or $X_0 = E^-$, depending on the exogenous realization of her suitability for college, such as observing her own grades. The agent knows her probability of being a good fit for college (p). While enrolled (E^+ or E^-), the individual must decide whether to drop out of college (d). Regardless of her type, if she decides to drop out, she will enter state $X_1 = D$ and remain there permanently. If she decides to stay in college, she will enter state $X_1 = S$, which represents the senior year of college. Being a senior in $t = 1$ means that the agent will automatically become a college degree holder in $t = 2$ when she enters the labor market ($X_2 = C$). However, the individual will only enjoy the college wage premium ($\theta(X_t) = \theta(C)$) if she graduates and also receives a favorable realization about her type (E^+). In case of observing a negative type (E^-) she would receive the college dropout wage premium ($\theta(X_t) = \theta(D)$ where $\theta(N) < \theta(D) < \theta(C)$) regardless of her decision to complete the degree. I summarize this dynamic evolution of schooling decisions in Figure A.1.

Labor income is a function of schooling state X_t:

$$y_t(X_t, z_t, \tilde{z}) = \begin{cases} \theta(X_t)\big[\psi_t(\exp(\tilde{z})) + (1-\psi_t)(\exp(z_t))\big] & \text{if } X_t \in \{N, D, C\} \\ 0 & \text{if } X_t \in \{E^+, E^-, S\} \end{cases} \tag{6}$$

$$\theta(X_t) = \begin{cases} \theta(C) & \text{if} \quad X_t \in \{C\} \quad \text{and} \quad X_{t-\tau} = E^+ \quad \text{for some} \quad \tau \geq 2, \\ \theta(D) & \text{if} \quad X_t \in \{C\} \quad \text{and} \quad X_{t-\tau} = E^- \quad \text{for some} \quad \tau \geq 2, \\ \theta(D) & \text{if} \quad X_t \in \{D\}, \\ \theta(N) & \text{if} \quad X_t \in \{N\}. \end{cases}$$

While enrolled in college, labor income is equal to zero. In the other states, income depends on $\theta(X_t)$, denoting the college wage premium. Specifically, if an individual has successfully completed college following a favorable assessment of her college suitability, $\theta(X_t) = \theta(C)$, where $\theta(C) > \theta(N)$. If the individual drops out of college or receives an unfavorable assessment of her college suitability she will get $\theta(X_t) = \theta(D)$. Moreover, labor income is influenced by the current state of the economy, denoted by z_t, as well as the economic conditions at the time of labor market entry, represented by $\tilde{z}$. The parameter $0 < \psi_t < 1$ governs the extent to which initial conditions impact current income levels and I included a subscript t to allow for the possibility of shutting down the effect of initial conditions after some t periods since this effect does not seem to be permanent in the data.

The model generates three types of college dropouts. First, academic dropouts, individuals who, after learning their unsuitability for college (E^-), perhaps due to academic struggles or course failures, opt to drop out of college. In that case, even attaining the degree would not enhance their future θ, making the future investment in college tuition less worth it. This type of dropouts is the type we see in Stange (2012). Second, financial dropouts, individuals who, irrespective of their realization regarding their aptitude for college, confront an adverse productivity shock that disrupts parental transfers ($g(z_t)$), plunging them into financial distress and unable to pay for tuition. This mechanism aims to capture the wealth effect of economic recessions. Lastly, strategic dropouts, individuals who, despite realizing their prospective benefits of the college wage premium (E^+), and despite not being financially constrained, choose to abandon college due to an exceptionally robust state of the economy, preferring immediate entry into the labor force. We do not see these types of dropouts occurring in the data nor in the model in the calibration used.

Trade-offs and Predictions of the Model

The expected income for a recent high school graduate who chooses to enroll in college in $t = 0$ is the following:

$$\begin{aligned} Y^C = -f + p\Big(- f + \theta(C)\mathbb{E}_0 \sum_{t=2}^{T} \big[\psi_t(\exp(z_2)) + (1-\psi_t)(\exp(z_t))\big]\Big) \\ + (1-p)\Big(\theta(D)\mathbb{E}_0 \sum_{t=1}^{T} \big[\psi_t(\exp(z_1)) + (1-\psi_t)(\exp(z_t))\big]\Big), \end{aligned} \tag{7}$$

where $\theta(C)$ represents the college wage premium for a graduate who has realized she is a good fit for college (E^+), thus $\theta(C) > \theta(D) > \theta(N) = 1$. I exclude all parental transfers that depend on the state of the economy ($g(z_t)$) and focus only on labor income net of tuition fees. In this scenario, with probability p, the agent will be a good fit for college, pay tuition for two periods, and enter the labor market in $t = 2$, making her $\tilde{z} = z_2$. Conversely, with probability $(1 - p)$, she will not be a good fit for college, drop out, and enter the labor market in $t = 1$, resulting in her $\tilde{z} = z_1$. [2]

The expected income for a recent high school graduate who chooses not to enroll in college is

[2] In the model I do not force individuals who realize they are a good fit to drop out of college. However, they always do, and in this example I assume they do.

the following:

$$Y^N = \theta(N)\mathbb{E}_0 \sum_{t=0}^{T} \big[\psi_t(\exp(z_0)) + (1-\psi_t)(\exp(z_t))\big]. \tag{8}$$

Higher tuition costs (f) make the choice of attending college less attractive compared to entering the labor market directly. Conversely, higher probabilities of being a good fit for college (p) and a higher college wage premium (θ) increase the attractiveness of pursuing higher education.

Now, let's focus on the role of business cycles and expectations. A favorable current state of the economy (z_0) makes entering the labor market more appealing, as individuals do not earn wages while enrolled in college. This effect is further amplified by a larger ψ, indicating more persistent labor market entry conditions. Conversely, poor current economic conditions and positive future prospects make attending college more attractive, with these effects also being enhanced by a larger ψ.

Equations (7) and (8) imply that there are some thresholds for p and $\theta(C)$ for which an individual is indifferent between choosing to attend college or entering the labor force.

$$\hat{p} = \frac{\theta(N)\Lambda^0 + f - \theta(D)\Lambda^1}{\theta(C)\Lambda^2 - \theta(D)\Lambda^1 - f}, \tag{9}$$

and

$$\hat{\theta}(C) = \frac{\theta(N)\Lambda^0 + (1-p)\theta(D)\Lambda^1 + f + pf}{p\Lambda^2}, \tag{10}$$

where $\hat{p}$ corresponds to the ex-ante probability of being a good fit for college such that $Y^C = Y^N$ and $\hat{\theta}(C)$ is the college wage premium such that $Y^C = Y^N$. Λ^2, Λ^1 and Λ^0 are the lifetime expected income of entering the labor force at $t = 2$, $t = 1$ and $t = 0$, respectively.[3] I derive both $\hat{p}$ and $\hat{\theta}(C)$ in the Mathematical Appendix B.1.

The model predicts that higher tuition fees (f) would increase both the threshold probability ($\hat{p}$) and the threshold college wage premium ($\hat{\theta}(C)$). This implies that if college becomes more costly, only individuals with a higher *a priori* probability of being a good fit for college would enroll. Additionally, individuals would require a higher college wage premium to be indifferent between attending college and entering the labor market directly.

Higher expected gains from entering the labor force in $t = 2$ (Λ^2), for individuals who have spent the first two periods in college, would lower the threshold probability ($\hat{p}$). This means that even individuals less fit for college would be incentivized to enroll, and the required college wage premium for indifference would decrease. Conversely, higher expected lifetime income for individuals entering the labor force in $t = 0$ (Λ^0) would increase the threshold probability ($\hat{p}$), making less academically fit individuals prefer not to attend college, and would also raise the required college wage premium ($\hat{\theta}(C)$). The effects of higher expected lifetime income for entering the labor force in $t = 1$ are less

[3] $\Lambda^2 \equiv \mathbb{E}_0 \sum_{t=2}^{T} [\psi_t \exp(z_2) + (1-\psi_t)\exp(z_t)]$, $\Lambda^1 \equiv \mathbb{E}_0 \sum_{t=1}^{T} [\psi_t \exp(z_1) + (1-\psi_t)\exp(z_t)]$ and $\Lambda^0 \equiv \mathbb{E}_0 \sum_{t=0}^{T} [\psi_t \exp(z_0) + (1-\psi_t)\exp(z_t)]$

straightforward.[4] The effects on the college wage premium threshold are positive. Higher expected income for entering the labor market in $t = 1$ without a college degree increases the required college wage premium to be indifferent between going to college or not.

In the next section, I describe the dataset used to calibrate and estimate the model. This dataset will also reveal the two novel empirical findings replicated by the model.

2 Data

I use yearly aggregate data from the US Census to present stylized facts regarding educational choices as a response to macroeconomic conditions. I show that college enrollment has been countercyclical since 1970 in the US.

I also use Integtated Public Use Microdata Series (IPUMS) Current Population Survey (CPS) monthly micro data spanning from January 1992 to July 2024, which constitutes the central dataset for the main empirical facts in Section 3.[5] I split the data set into two: longitudinal and cross-sectional data. This dataset is particularly well-suited for examining the tradeoffs faced by young individuals during periods of high unemployment since it encompasses three major economic crises, and crucially, it includes detailed information on college dropouts—an essential variable for understanding educational decisions under economic stress. However, a notable limitation is the relatively short duration for which individuals remain in the sample.

I use the longitudinal data to show the first main empirical finding: low-income individuals are more likely to drop out of college during high unemployment rate periods, while middle and high-income individuals are more likely to stay in college amid high unemployment rate periods. Further, I observe that middle and high-income individuals are also more likely to transition from the labor force to college during high unemployment rate periods.

I use the cross-sectional data to show the second empirical finding: high unemployment rates around high school graduation exert varying effects on future college enrollment decisions across different income groups. It leads to an increased likelihood of college enrollment for middle and high-income individuals, while showing relatively insignificant changes in the probability of college attendance for their low-income counterparts.

2.1 Aggregate Yearly Data

I use historical yearly data from the CPS to examine school enrollment trends in the United States.[6] The main dependent variable is the annual college enrollment of students under 35 years old relative to the entire student age population deviations from the trend.[7] To construct this variable, I

[4] $\frac{\partial \hat{p}}{\partial \Lambda^1} = \frac{\theta(D)[\theta(N)\Lambda^0 + f - \theta(D)\Lambda^1]}{[\theta(C)\Lambda^2 - \theta(D)\Lambda^1 - f]^2} - \frac{\theta(D)}{\theta(C)\Lambda^2 - \theta(D)\Lambda^1 - f}$

[5] The reason I use the data since 1992 is because the category college dropout was non-existent prior to that date.

[6] More specifically I use the Table A.7: College Enrollment of Students 14 Years Old and Over (`https://www.census.gov/data/tables/time-series/demo/school-enrollment/cps-historical-time-series.html`).

[7] I take the following age groups from the United Nations dataset: 15 years old to 19 years old, 20 to 24, 25 to 29 and 30 to 34.

aggregate the counts of undergraduates, graduate students, and two-year college students under 35 years old and express it as a percentage of the total student age population in the US. I also apply a HP filter to account for the linear trend of this variable.

I run a linear regression to examine the relationship between the main dependent variable, yearly college enrollment deviations from trend and key business cycle variables, as specified in equation 11. The data spans yearly observations from 1970 to 2022.

$$y_t = \alpha + \beta_1 \text{ business cycle}_t + \epsilon_t \tag{11}$$

In Table 1 I present the regression results including five independent variables that capture the business cycle phase. These variables include deviations from the NAIRU, the yearly mean of the unemployment rate, a binary indicator denoting the occurrence of a recession and the real GDP yearly growth rate.[8] To align these business cycle variables with the academic calendar, I converted them so that real GDP in 1990 represents the cumulative sum of real GDP from 1989:III, 1989:IV, 1990:I, and 1990:II. This adjustment ensures that the decision to pursue college education commencing September 1990 remains independent of macroeconomic realizations in the subsequent two quarters of that year. As a robustness exercise, I extend the regression analysis to encompass linear and exponential time trends, the results persist unaltered, see Table A1.

Table 1: College enrollment is counter-cyclical

	Effect on college enrollment deviations from trend
Unemployment rate (p.p.)	0.329***
	(0.102)
Unemployment rate deviations from NAIRU (p.p.)	0.394***
	(0.102)
Recession (binary)	0.243
	(0.366)
Real GDP growth (YoY%)	-0.243***
	(0.079)

Source: CPS, World Bank population, UN population by groups, Federal Reserve Bank Saint Louis.

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

College enrollment is strongly counter-cyclical. This effect is both statistically and economically significant. An average national unemployment rate increase akin to the magnitude experienced during the last Great Recession, approximately 5.6 percentage points, would be associated with an average increase of 1.9 standard deviations of yearly college enrollment deviations from the long run trend.

[8] I am using the NBER recession periods. Since the NBER does not use yearly frequency to define recession periods, I define a recession year in period t if there is at least one recession month in the second half of $t-1$ or the first half of t. For instance, for 2002, if there is a recession month between July of 2001 and June of 2002 both included, 2002 would be considered a recession year. I do this to account for academic calendar decisions.

In conclusion, college enrollment seems counter-cyclical on aggregate. The underlying intuition suggests that during high unemployment rate periods, labor market outcomes deteriorate, thereby reducing the opportunity cost of pursuing higher education. However, high unemployment rate periods may simultaneously exert negative effects on individuals' liquidity, potentially hindering their ability to afford substantial tuition costs. Section 3 is dedicated to probing these two channels for different income levels.

2.2 Micro CPS Data

I use IPUMS CPS monthly data spanning from January 1992 to July 2024. The CPS adopts a rotating panel design, wherein each individual appears for consecutive 4-month periods, followed by an 8-month absence from the sample, before potentially reappearing for another 4 months. I only keep observations for individuals aged at least 16 years old.

I use two data sets: one for longitudinal analyses, examining individuals' transitions both into and out of college, as well as the transitions from the labor force to college and the other dedicated to cross-sectional analysis. I present descriptive statistics for key variables in Table A2, where I applied the weights using the variable *wtfinl* to account for the sample's representativeness.[9]

For the longitudinal data, the first two columns of the table, I keep an average of nearly four observations per individual to facilitate the study of pertinent transitions. I drop observations for individuals appearing after the 8 month absence in order to better identify the relevant transitions. In the cross-sectional data set, in the last two columns, I adopt a cross-sectional approach and keep only one observation per individual. Furthermore, to discern the heterogeneous effects across different family income levels, I limit the second data set to a sub-sample comprising individuals aged 25 or younger.[10]

I only include observations from individuals who have responded to the questionnaire called *SCHLCOLL* in order to distinguish people who are currently enrolled in college or not. This variable only included people from ages 16 to 24 until 2012 and from ages 16 to 54 from 2013 onward.

The variable "family income" captures the aggregate income received by all members of the respondent's family over the past 12 months. I focus all my analysis on young individuals to better proxy this "family income" variable as external for the young individual and to avoid possible endogeneity issues regarding the relationship between own earnings and educational choices. The questionnaire explicitly defines the components comprising this income, including money derived from employment, net business or rental income, pensions, dividends, interest, social security payments, and any other monetary inflows received by family members aged 15 years or older. Given its categorical nature and the change in criterion as of October 2003, I categorize this variable into three distinct groups with comparable weights. The sample divides into three income cohorts as fol-

[9] All econometric analysis presented in the paper will be using these weights as suggested by IPUMS CPS.

[10] Family income variable also includes own individual's earnings. however, at young ages this correlation is close to 0.

lows: low-income individuals, constituting slightly more than a third of the young sample, comprise individuals with an annual family income below \$30,000. middle-income individuals, representing also slightly more than a third of the young sample, encompass those with family incomes ranging between \$30,000 and \$75,000. Lastly, high-income individuals, accounting for around a fourth of the young sample, pertain to those with an annual family income exceeding \$75,000.[11]

The variable "education" ($EDUC$), extracted from the CPS dataset, provides the educational attainment levels prevalent within the sample. I only keep the period from 1992 because there was a change in the categorical groups included in January 1992. In Table A3, I present a comparative analysis of this variable between the two distinct sample periods, including the option "Some college but no degree" that is only available from January 1992 onward.

In Figure A.2 I illustrate the evolving trends in the three principal educational level groups over time. The percentage of individuals with a high school diploma or less, accounted for approximately 68% of the population under 25 years old in 1992. However, this figure has subsequently decreased and now stands at 57%. Conversely, the percentage of individuals with a bachelor's degree or higher, constituted a mere 10% of the under 25 years old population in 1992, but this proportion has risen significantly to almost 20% in the last decade. The intermediate group includes individuals with some higher education but without a bachelor's degree. This education category has remained quite stable around 23%.

3 Main Empirical Findings

I present the central empirical findings of the paper in this section regarding the differential responses of college enrollment and completion to the changes in the unemployment rate, contingent on family income groups. High unemployment rates exert varying impacts on individuals' decisions concerning college enrollment based on their family income. These empirical findings are key to better understand the trade-offs presented in the theoretical model. Particularly, the negative wealth effect which in the model I hypothesize as liquidity constraints and the strategic efforts to avoid scarring effects stemming from bad labor market entry become pronounced during high unemployment rate periods. The negative wealth effect becomes notable as it compels individuals with lower incomes to prematurely drop out from college. Conversely, high-income individuals are more likely to enroll in college, seeking to avoid the scarring effects associated with bad labor market entries. In Section 3.1 I analyze responses following a rise in the unemployment rate in a state while being enrolled in college or in the labor force, whereas in Section 3.2 I analyze responses following a rise in the unemployment rate in a state around high school graduation. Notably, in all analyses including different income groups, the dataset is limited to individuals aged below 25 years, mitigating the potential correlation between personal income and overall family income at

[11] These brackets of income are in current \$ terms, so they are not normalized because I do not observe the exact amount, but just the bracket in which an individual belongs to. This should not be an issue given that the brackets are sufficiently broad. I also control for the year of the interview and for time trends within the income group in the main regressions shown in Section 3.

older ages.

3.1 Low-Income Are Scarred and High-Income Are Strategic

Before analyzing the heterogeneous responses of experiencing high unemployment rates while being enrolled in college for young individuals it is important to quantify the magnitude of the scarring effects of experiencing a bad labor market entry. I estimate the following regression model which brings similar results as Schwandt & Von Wachter (2019):

$$y_{i,s,t} = \beta_0 + \beta_1 u_{i,s}^{HS} + \Gamma \mathbf{X}_{i,s,t} + \epsilon_{i,s,t}, \tag{12}$$

where $y_{i,s,t}$ is the outcome variable: log of real earnings in 1992 terms for individual i, in state s in year t or a binary equals 1 if the individual was unemployed t years after own high school graduation, $u_{i,s}^{HS}$ is the unemployment rate in a state around high school graduation date and $\mathbf{X}_{i,s,t}$ are controls such as sex, race and the year of the interview.[12]

Figure 1 illustrates the dynamic evolution of the coefficient β_1 over t periods following high school graduation for individuals who did not pursue higher education and were employed at the time of the interview. A 1 percentage point (p.p.) increase in the unemployment rate in a state around high school graduation is associated with a significant decline in average real earnings for the employed population persisting for over a decade after high school completion. There is also an approximate 0.5 p.p. immediate increase in the probability of experiencing unemployment that vanishes relatively more quickly.

I repeat the same analysis for individuals who graduated from college in Figure A.3. I restricted the sample to individuals who have a college degree but not more in order to better approximate their college graduation date, 4 years after their 18th birthday. The effects of the unemployment rate in the respondent's state on real earnings are markedly mitigated. The results are consistent with intuitive expectations, where a high school graduation coinciding with a period of high unemployment rate leads to adverse impacts on earnings and unemployment probabilities. In contrast, enrolling in college during economic downturns presents the advantage of postponing labor market entry, thereby evading these deleterious and enduring consequences. Further, the negative labor market entry effects seem to virtually vanish for the college sample.

These findings are economically significant. For instance, the accumulated earnings losses from entering the labor force during a recession similar to the 2009 Great Recession would result in a substantial 8.7% decline in real earnings over the first decade of employment, even when accounting for equivalent employment probabilities. This value is computed by summing the first 10 coefficients and multiplying by 5.6, reflecting the 5.6 percentage point increase in the national unemployment rate during the 2009 recession. Additionally, entering the labor force during an economic state akin to the 2009 Great recession would be linked to a 0.54 p.p. higher likelihood of experiencing unemployment during the ten years following high school graduation. Thus, accounting for the

[12] I use the average unemployment rate in a state from January to May of the graduation year as a proxy for $u_{i,s}^{HS}$

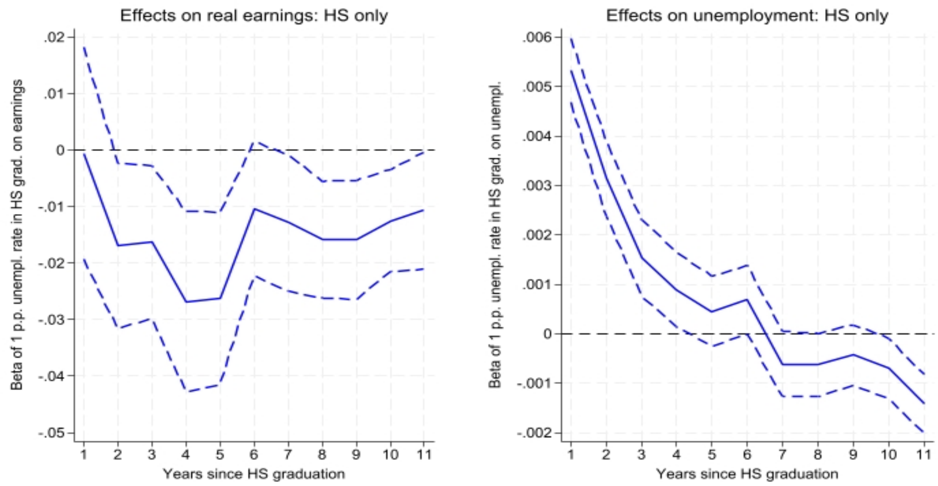


Figure 1: Negative and persistent effects of graduating during recessions.

Note: The x-axis represents the age group in the regression, that is, for the high school group, 2 years since HS graduation comprises people who are 20 years old (since I assume they graduate from high school when they are 18). I represent β_1 for each age group of the following regression: $y_{i,t} = \beta_0 + \beta_1 u_i^{HS} + \Gamma\mathbf{X}_{i,t} + \epsilon_{i,t}$, where u_i^{HS} is the unemployment rate that this cohort group experienced when they graduated high school.

higher probability of being unemployed, entering the labor market during a recession similar to the 2009 one is correlated with a significant reduction in real earnings of around 9.14% for the first decade after entry.[13] These detrimental effects of entry are comparatively lower and less persistent for college graduates, as depicted in Figure A.3.

Based on these findings, I examine whether young individuals from richer families tend to enter the labor force during better macroeconomic conditions when compared to those from relatively disadvantaged households. I use the longitudinal data shown in section 2.2. I observe an individual for up to four consecutive months, then she disappears for the subsequent 8 months and appears again in the sample for four more consecutive months. I only keep the first up to four appearances for all individuals, nevertheless, the results are robust to maintaining the full sample. The subsequent panel regressions are conducted as follows:

$$z_{i,s,t} = \alpha_0 + \alpha_1 u_{s,t} + \alpha_2 \text{Mid. Inc.} \times u_{s,t} + \alpha_3 \text{High. Inc.} \times u_{s,t} + \Gamma\mathbf{X}_{i,s,t} + \nu_{i,s,t}, \quad (13)$$

where $z_{i,s,t}$ is a binary that takes value 1 if the individual has transitioned from being enrolled in college to not be currently enrolled in that particular month, and 0 if she stayed in school. That is, an individual appearing four consecutive months, if she was working in the first period, then enrolled in college in the second period and she kept enrolled during the third month and finally dropped out of college in the last month, $z_{i,s,t}$ would be: $z_{i,s,t} = N/A$ for $t = 1$, $z_{i,s,t} = 0$ for $t = 2$, $z_{i,s,t} = 0$ for $t = 3$ and $z_{i,s,t} = 1$ for $t = 4$. If she is not enrolled nor has she been enrolled during

[13] I calculate this value by multiplying the real earnings losses conditional on being employed by the probability of being employed (0.9946). I assume that with the remaining probability earnings are 0.

this time range then $z_{i,s,t}$ is missing. Another example, if an individual appears to be enrolled in college the first month and then she drops out in the second period we would have: $z_{i,s,t} = 0$ for $t = 1$, $z_{i,s,t} = 1$ for $t = 2$ and $z_{i,s,t} = N/A$ for $t = 3$ and $t = 4$. I also run the regression for which $z_{i,s,t}$ takes value of 1 if the individual has transitioned from the labor force to college and 0 if she has stayed in the labor force.

$u_{s,t}$ is the current unemployment rate in the respondent's state s during the interview.[14] I controlled for sex, race, age, income group, binary of the state, a coefficient capturing a linear time trend and another for the interaction of this time trend with each income group.[15] From this analysis I exclude people who complete the degree, therefore only considering people who leave college without earning the degree.

Table 2: Transitions from enrolled to dropout and from labor force to enrolled

	College Dropouts		LF → College	
	(1)	(2)	(3)	(4)
$u_{s,t}$	0.186**	0.147**	-0.310**	-0.093
	(0.082)	(0.063)	(0.156)	(0.080)
Mid. Inc. × $u_{s,t}$	-0.231***	-0.196***	0.663***	0.525***
	(0.073)	(0.062)	(0.131)	(0.104)
High. Inc. × $u_{s,t}$	-0.244***	-0.208***	0.910***	0.665***
	(0.083)	(0.071)	(0.182)	(0.139)
Obs.	706,702	706,702	2,024,651	2,024,651
R-squared	0.000	0.004	0.006	0.015
Controls	No	Yes	No	Yes
Test Middle ($\alpha_1 + \alpha_2$)	-0.045	-0.049	0.353***	0.431***
Test High ($\alpha_1 + \alpha_3$)	-0.058*	-0.061**	0.600***	0.572***

Panel regression using random effects. Effects in p.p. with respect to staying in college / staying in the labor force. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

I present the results of the panel regression in Table 2 and the results of the pool cross-section regression in Table A4 which are almost identical. In columns (1) and (2) I show that individuals from lower income backgrounds are more susceptible to experiencing scarring effects generated by periods of high unemployment rate periods. Specifically, the positive coefficient $\hat{\alpha}_1 > 0$ indicates that, on average, low-income students are more prone to drop out of college during periods of high unemployment rates. Contrary, the coefficients $\hat{\alpha}_1 + \hat{\alpha}_2 < 0$ and $\hat{\alpha}_1 + \hat{\alpha}_3 < 0$ reveal that middle-income and high-income students actually are more likely to stay enrolled in college during high unemployment rate periods.

The results in columns (3) and (4) indicate that low-income individuals exhibit a negative or no significant change in their likelihood of transitioning from the labor force to college during unfavorable economic conditions, whereas their middle and high-income counterparts are substantially

[14] I also run the same regressions using the lag of the unemployment rate as well. The results are robust to these specifications as shown in Table A5

[15] I also use a set of binaries for years and these binaries interacted with each income group instead of imposing a linear trend and the results are very similar.

more likely to undertake such transitions.

These findings are also economically significant. A rise in the unemployment rate in a state akin to the rise experienced in the 2009 crisis is associated with a 0.8 percentage point increase in the likelihood of dropping out of college for low-income individuals (0.147*5.6), constituting 10% of the mean for this socio-demographic group. Conversely, the same increase in the unemployment rate is linked to a 0.3 percentage point decrease, equivalent to 3% of the mean in the probability of dropping out of college for middle-income individuals, and a decrease of 0.3 percentage points, equivalent to 4% of the mean, for their high-income counterparts. When examining the probability of transitioning from the labor force to college, there is almost no change for low-income individuals during periods of high unemployment rates, only a drop of 0.5 pp, or a 3% of their mean. In contrast, this rise in the unemployment rate corresponds to an increase in this probability of 2.4 percentage points, accounting for 15% of the mean, for middle-income individuals, and a rise of 3.2 percentage points, equivalent to 13% of the mean, for high-income individuals.

In Table A6 I show the analysis decomposed by sex and we see virtually no differences between male and female respondents. Further, Tables A7 and A8 present a parallel analysis employing the max and the mean unemployment rate in a state including the 4 months leading up to the census interview leading to indistinguishable results.

These empirical findings show the importance of the negative wealth effect impacting mainly low-income individuals by compelling them to prematurely drop out of college. This often forces them into the labor force during unfavorable economic conditions, thereby incurring the scarring effects shown in Figure 1. Intuitively, this wealth effect appears less present for high-income enrollees, as they appear more likely to persist in college even amidst periods of high unemployment rates. Moreover, high-income individuals exhibit strategic behavior within the labor force, choosing to enroll in college during economic downturns, strategically optimizing their entry conditions. In summary, low-income individuals bear the lasting scars of economic recessions—stemming from adverse labor market entries and the inability to complete their degrees due to financial distress—while high-income individuals strategically avoid these scars by leveraging college enrollment.

3.2 College Enrollment and Completion Disparities

In general, high-income individuals are more likely to go to college. In Table 3 I provide an insight into the educational composition disparities across different income groups. In the upper section of the table I show college disparities and focus on these three groups: high-school diploma only, gone to college and posses a college degree, that last one being a subset of the gone to college group. In the lower section of the table I exclude enrolled currently students to address the issue of including current students within the subcategory of "some college but no degree", who are yet to complete their degrees. I focus on two groups: high-school diploma only (but not currently enrolled in college) and college dropouts.

For each of these sections I show the proportions of each group for low-income, middle-income and high-income and at the bottom of each section I compute disparity ratios. Specifically, the proportion of young individuals with college attendance relative to those with only a high school diploma is 1.94 times higher for high-income individuals than for their low-income counterparts. In comparison, this difference is relatively smaller at 1.19 times higher for middle-income individuals compared to low-income individuals.

Table 3: Composition of education by income groups

	Including enrolled students		
% within income group	HS diploma only	Gone to college	College degree
low-income	29.16	33.96	6.77
middle-income	26.09	36.28	9.10
high-income	18.75	42.28	12.23
Disparity Ratios		College / HS	Degree / HS
Mid. inc. / low-income		1.19	1.50
High inc. / low-income		1.94	2.81
	Excluding enrolled students		
% within income group	HS diploma only	Dropout	
low-income	32.66	11.96	
middle-income	28.27	11.75	
high-income	19.76	10.73	
Disparity Ratios		Drop. / HS	
Mid. inc. / low-income		1.15	
High inc. / low-income		1.48	

Source: IPUMS CPS.

Note: The top panel represents the proportions of people aged between 18 and 25 years old who have a high school diploma only, have gone to college and have a college degree within each income group. The remaining fraction corresponds to young people who do not have a high school diploma. Notice that, for low ages, it is common to not have completed high school yet. These proportions are only informative as baseline relative comparisons between income groups. In the bottom panel I display disparity ratios, which show the fraction of people who have gone to college with respect to people with a high school only for middle (high) income divided by the same fraction for low-income. That is $(\frac{\text{Gone to college}}{\text{HS only}})^{\text{Middle-income}} / (\frac{\text{Gone to college}}{\text{HS only}})^{\text{Low-income}}$

The disparities in educational attainment have significant implications for lifetime earnings, with high-income young adults generally exhibiting a higher likelihood of possessing college degrees or some college education, leading to comparatively higher average earnings. Figure 2 provides a detailed illustration of the average real earnings trajectory by age for each educational group. The chart starts at age 16 for the "high school only" group, age 20 for college dropouts, and age 22 for college degree holders. Notably, all educational groups reach their earnings peak around the ages of 45 to 50. It is intuitive that college dropouts initially earn less than individuals with no higher education due to their lack of experience; however, they eventually surpass the earnings of their non-college-educated counterparts by 4% over their lifetime. Meanwhile, college degree holders earn, on average, a remarkable 62% more than those without a college education during their lifetime. In Figure A.4 I also provide an extensive examination of the occupational sorting patterns among young adults with different educational backgrounds across 79 distinct occupational categories within the dataset (all except the military which I excluded). I show that individuals with college education tend to sort into better paid and less volatile occupations on average.

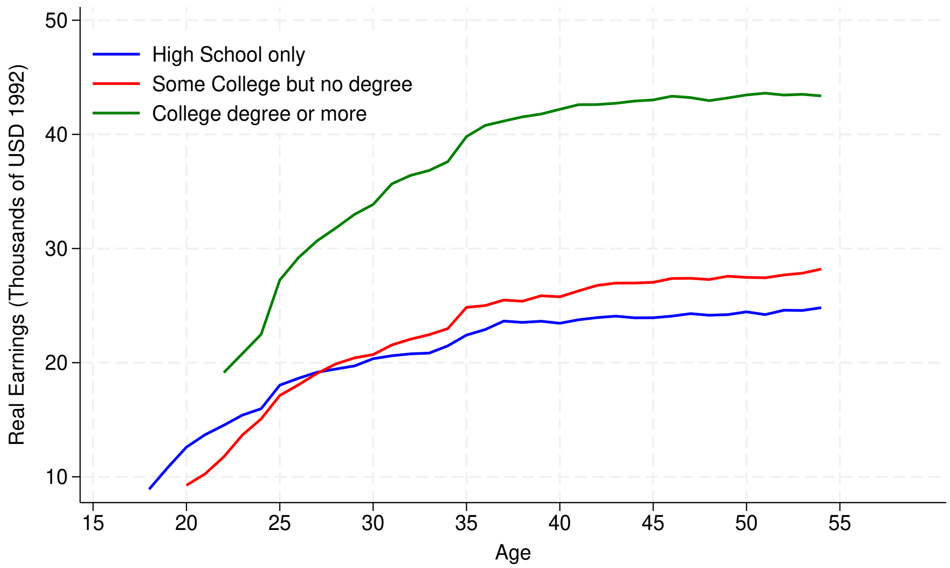


Figure 2: Lifetime real earnings by educational group

Note: I plot the average real earnings collapsed by age for each educational group. Again, I exclude current enrolled students to better identify college dropouts.

Considering the substantial variations observed in lifetime earnings and occupational choices across distinct educational groups, although I am not suggesting a direct causal relationship between obtaining a college degree and real earnings from the previous charts, I explore the potential effects of periods of high unemployment rates on subsequent college enrollment for individuals belonging to different income strata. I analyze the micro IPUMS CPS monthly dataset spanning from January 1992 to July 2024. Employing cross-sectional data, I estimate the following linear probability model regression that shows the echo effect of having experienced high unemployment rates during your high school graduation on your future educational attainment:

$$y_{i,s,t} = \beta_0 + \beta_1 u_{i,s}^{HS} + \beta_2 \text{Mid. Inc.}_{i,s,t} \times u_{i,s}^{HS} + \beta_3 \text{High. Inc.}_{i,s,t} \times u_{i,s}^{HS} + \Gamma \mathbf{X}_{i,s,t} + \epsilon_{i,s,t}, \tag{14}$$

where $y_{i,s,t}$ is a binary that equals 1 if an individual i from state s in period t has gone to college at some point in their lifetime relative to having only a high school diploma, and 0 otherwise. I also explore in separate regressions the probabilities of being a college dropout and a college graduate. The unemployment rate in the respondent's state around high school graduation, denoted as $u_{i,s}^{HS}$, is considered as the key variable of interest, and it is interacted with the family income group. $\mathbf{X}_{i,s,t}$ are control variables such as age, race, sex, a linear time trend at the yearly level and family income group. Specifically, I focus on estimating the coefficients β_2 and β_3, which represent the interaction effects of the unemployment rate in the respondent's state around high school graduation with the family income group. For the low-income group, the coefficient β_1 represents the marginal effect of the unemployment rate in the respondent's state around high school graduation, while for the middle-income group, it is $\beta_1+\beta_2$, and for the high-income group, it is $\beta_1+\beta_3$. It is noteworthy that the subscript t is absent as this analysis is cross-sectional, examining variations across individuals.

Since the dataset does not provide precise graduation dates I construct a proxy for them. I rely on the year of the interview and the individual's age, assuming that high school graduation occurs at 18 years old. Accordingly, I use the average unemployment rate in the respondent's state during January to May of the graduation year as a proxy for the macroeconomic conditions at that time.[16] Furthermore, I adopt the assumption that an individual's family income group at the time of the interview reflects their income group at the time of high school graduation. This assumption should not be problematic given the age range of individuals considered, between 18 and 25 years old, and the relatively broad nature of family income categories, which do not undergo substantial changes within a few years.

Table 4: College enrollment and completion and the business cycle

	Attended college (1)		College Degree or more (2)		College Dropout (3)	
$u_{i,s}^{HS}$	0.169***	0.191	-0.002	-0.286**	0.226***	0.260**
	(0.060)	(0.121)	(0.063)	(0.112)	(0.073)	(0.108)
Mid. Inc. × $u_{i,s}^{HS}$	0.547***	0.356	0.728***	0.284	0.366***	0.281*
	(0.083)	(0.234)	(0.094)	(0.223)	(0.105)	(0.223)
High. Inc. × $u_{i,s}^{HS}$	0.850***	0.363	2.065***	0.969***	0.777***	0.438*
	(0.083)	(0.255)	(0.114)	(0.192)	(0.132)	(0.221)
State Controls	No	Yes	No	Yes	No	Yes
Clustered SE state	No	Yes	No	Yes	No	Yes
Obs.	665,552	665,552	364,787	364,787	324,353	324,353
R-squared	0.020	0.059	0.045	0.263	0.006	0.029
Test Middle ($\beta_1+\beta_2$)	0.716***	0.547***	0.726***	-0.003	0.592***	0.541***
Test High ($\beta_1+\beta_3$)	1.019***	0.554***	2.063***	0.683***	1.004***	0.698***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

I present the estimated coefficients in Table 4 that describe the echo effect of having experienced a rise in the unemployment rate in the respondent's state around high school graduation on an individual's educational attainment some months or years after, derived from equation (14) and clustering standard errors at the state level. A 1 percentage point increase in the unemployment rate in the respondent's state around high school graduation on college enrollment is correlated with a 0.191 percentage point increase on the probability of having attended college, column (1), for low-income individuals. For the middle-income group the combined effect is substantially larger,

[16] The analysis is replicated with alternative specifications, utilizing both the maximum unemployment rate between January and May, and solely the unemployment rate in May. Robustness checks show that the results hold under each of these specifications. This choice of months is deliberate, as it coincides with the period when recent graduates initiate their job search or submit college applications. Examining macroeconomic conditions later in the year would not capture these crucial decision-making processes as effectively.

of $\beta_1 + \beta_2 = 0.191 + 0.356$ amounting to 0.547 percentage points, and for the high-income group the effect is $\beta_1 + \beta_3 = 0.191 + 0.363$, which results in a 0.554 percentage point increase. The same rise in unemployment rate is correlated with a 0.286 p.p. reduction on the probability of having earned a college degree for low-income, column (2), an almost no change for middle-income and a significant 0.683 rise in their probability of having earned a college degree for high-income. In column (3) we see that all groups are more likely to having dropped out of college if they experienced high unemployment rates around their high-school graduation, but this effect is significantly larger for high-income individuals.

The economic implications of these findings are significant. For example, an increase in a state's unemployment rate equivalent to the 5.6 percentage point rise during the 2009 crisis is associated with a 1.07 percentage point increase in the likelihood of college attendance among low-income individuals—representing a 3.1% relative increase from their baseline rate of 33.96%. In comparison, the same rise corresponds to an 8.4% relative increase for middle-income individuals and a 7.4% increase for high-income individuals. When examining the probability of earning a college degree years later, the same unemployment shock is linked to a 23.6% decrease for low-income individuals, a marginal 0.2% decrease for middle-income individuals, and a substantial 31.3% increase for high-income individuals. Using the ratios presented in Table 3 I present a numerical exercise using the linear probability model coefficients presented in Table 4. In Table A9 I show the baseline disparity ratios across: college enrollment vs. high school only, college dropout vs. high school only, and college degree holder vs. high school only. Within each disparity group, I compare the ratios between middle and low-income, as well as between high and low-income. The first column presents the average disparity ratio, while the second column represents the disparity ratio corresponding to an increase in the unemployment equivalent to the 5.6 percentage points observed during the 2009 recession, using the coefficients derived from Table 4.[17]

The response patterns to having experienced a high unemployment rate in a state during each individual's high school graduation differ significantly across income groups. For those from low-income families, having experienced high unemployment rates around high school graduation is correlated with a low rise in their probability of having attended college and a decline in their probability of having earned a college degree. For high-income individuals the rise is substantially larger both in their likelihoods of having attended and completed college. The implication of these findings is that periods of high unemployment rates around high school graduation are associated with considerable divergence of existing educational composition disparities between low and high-income individuals.

Tables A11 and A12 reveal that the counter-cyclicality in college enrollment is more pronounced among the male population, being 50% stronger for middle-income and 12% stronger for high-income individuals. Low-income individuals, both male and female, are significantly less responsive. High-income males exhibit a 13% stronger response in college completion rates to changes in the

[17] Table A10 extends this analysis to associate degrees, focusing on both academic and occupational degrees. The results for occupational degrees show minimal reaction to changes in the unemployment rate. However, for academic degrees, the reaction closely mirrors what we observe for regular college degrees.

unemployment rate compared to high-income females. This heightened counter-cyclicality in male enrollment also leads to a higher probability of college dropout following a recession around high school graduation. Specifically, middle-income males react 35% more strongly than middle-income females, and high-income males react 21% more strongly compared to high-income females.

The dynamics of the college dropouts is particularly interesting. A rise in the unemployment rate in the respondent's state concurrent with high school graduation is associated with a subsequent rise in the likelihood of individuals becoming college dropouts relative to those with only a high school diploma. This can be attributed to the pronounced rise in college enrollments subsequent to a decline in the opportunity cost coming from a worse labor market. This surge in enrollment encompasses individuals who, under different economic circumstances, might not have pursued higher education. Consequently, a subset of these individuals, after realizing they are a bad fit for college, in the model realizing the E^{-}, opt to drop out from college. As such, periods of high unemployment rates around the time of high school graduation not only impact the overall magnitude of college attendees but also the socio-economic composition of this cohort. The economic downturn encourages individuals who may have not previously contemplated attending college to do so, which eventually heightens the likelihood of observing an augmented count of college dropouts. This effect is specially larger for high-income individuals. Among individuals with low-income, the increase in the probability of becoming a college dropout is of a comparatively modest magnitude.

These two empirical findings have notable implications, particularly concerning college dropouts. When the unemployment rate rises around high school graduation date, it is associated with an increase in the probability of college dropouts from, mainly, middle and high-income groups. This can be attributed to these income groups being more inclined to enroll in college during challenging economic times. However, the surge in college enrollment during periods of high unemployment rates does not directly translate into a proportionate increase in college completion. On the contrary, the impact of a spike in unemployment differs for individuals already enrolled in college. In this case, a rise in the unemployment rate is correlated with an increase in the probability of dropping out for low-income individuals already attending college, while it leads to an increase in the probability of staying and completing the degree for middle and higher income individuals. As a result, periods of high unemployment rates exhibit diverse implications for the economic background of college dropouts, contingent upon the timing of the economic shock.

3.3 Robustness

In this subsection, I subject the two primary empirical findings of the paper to a battery of robustness tests. To further investigate the first empirical fact, I re-estimate regression (13) while employing an alternative specification for macroeconomic conditions around high school graduation dates. Specifically, I consider using the maximum unemployment rate and the average unemployment rates between January and May of the 18th birthday, as opposed to the current observed unemployment rate. Tables A7 and A8 present the results obtained from these alternative specifications. The results are robust to the ones shown in Section 3.1. The implications of this first empirical fact are that richer individuals are more inclined to evade the negative entry effects illustrated in Figure 1.

To further investigate the second empirical fact, I re-estimate regression (14) while adopting an alternative specification for macroeconomic conditions around high school graduation dates. Specifically, I consider using the maximum unemployment rate occurring between January and May of the 18th birthday, as opposed to the average rate. Tables A13 and A14 present the results obtained from these alternative specifications. The results remain very similar to the ones presented using the average state unemployment rate between the months of January until May. I also use the unemployment rate in May only, a proxy for the high school graduation month, during the 18th birthday (Tables A15 and A16), which yields consistent and robust outcomes.

Finally, in Table A17 I show the first empirical fact but excluding the COVID years. The magnitude of the probability of dropping out of college during high unemployment rate periods for low-income individuals drops but it is still positive and statistically significant. For middle and high-income individuals this probability is even more negative than in the case with the full sample. Regarding the transitions from the labor force and college the results remain almost unchanged. In Tables A18 and A19 I show the results of the second empirical fact. The results remain similar as well.

3.4 Discussion of the Main Assumptions

A fundamental assumption underpinning the empirical framework is the appropriateness of using the variable FAMINC from the IPUMS CPS dataset as a reliable proxy for family income, which remains independent of own earnings. Failure to meet this assumption could result in simultaneity bias, wherein higher income individuals are not only more likely to attend college, but individuals who attend college may also have higher earnings following graduation. This assumption gains importance due to the data's nature, as the information pertaining to family income is collected during interviews, not at the time of high school graduation. Consequently, observations encompass individuals aged around 30 to 40 years who have already graduated from college and currently earn above-average incomes. This situation could introduce bias, suggesting a positive relationship between higher family income and the likelihood of college attendance. While the FAMINC variable includes own earnings, all empirical analyses focus exclusively on young individuals aged 25 years or younger.

Figure A.5 portrays average real earnings by age and family income groups. Starting at age 23, the earnings lines diverge, with higher family income groups earning more on average. However, below the age of 23, there is little variation in own earnings across income groups. In order to increase sample size, particularly for college graduates who might require additional years, all empirical analyses are conducted up to age 25. I performed additional regressions, restricting the sample to ages 23 or younger, and the results remain mainly robust. The results in Table A20 remain consistent when limiting the age to 23 years old. Tables A21 and A22 depict nearly identical findings concerning college enrollment and completion's counter-cyclical nature across income groups. Consequently, the main empirical findings of the paper hold under scenarios where family income exhibits little to no correlation with own earnings (ages 23 or lower) or is almost uncorrelated (ages 25 or lower).

An additional consideration regarding this variable relates to the family income group observed for each individual, which corresponds to the time of the survey rather than the high school graduation period. A potential concern arises if, during the period from high school graduation to the interview date (spanning up to 7 years or 5 years for the 23-year-old sample), individuals experiencing higher unemployment rates around high school graduation dates are more or less likely to switch their family income category before the interview date. This becomes particularly relevant as estimators could be biased if the unemployment rate in the respondent's state around high school graduation correlates with the probability of switching income groups during this time frame.

4 Solution Method and Calibration

To solve the model I assume individuals exclusively choose their schooling, consumption, and savings during the initial three periods ($t = 0$, $t = 1$ and $t = 2$). From $t = 3$ to $t = T$ they only consume a known amount of deterministic income that also depends on their educational status achieved. Each t in the model is equivalent to 2 years and the world starts when individuals graduate high school, so when they are 18 years old.

I discretized the state space that includes the ex-ante probability of being well-suited for college (p), the initial asset level (a_0), and the initial productivity state (z_0). The utility function is logarithmic ($u(c) = \ln(c)$). I calculated the expected lifetime consumption, earnings, and utility for all a, p and z grids and all potential educational decisions. The feasible educational choices are: never going to college, enrolling in college in the initial period ($t = 0$), and enrolling in college in the subsequent period ($t = 1$). Enrolling in college involves an upfront tuition cost, denoted by f, which students must pay in their first period. In return, they expect to benefit from a future college wage premium, with probability p of being a good fit for college. If they are indeed a good fit, they will continue and pay a second tuition fee f. Otherwise, they will drop out and enter the labor force immediately.

In expected terms, there is no reason to drop out of college, because, if an individual expects to drop out of college in $t = 0$ it is not optimal to enroll in college in the first place. College dropouts in the model will only occur if a shock, whether realizing one is a bad fit for college or experiencing a recession that impacts their budget constraints via parental income, consequently pushing the individual into a binding financial situation. I calculate each of these scenarios separately by comparing the utility levels given the optimal asset and consumption trajectories for each case. This sequential process leads to an optimal educational choice, as a function of the individual's probability of a favorable outcome upon college enrollment (p), their initial asset endowment (a), and their initial productivity shock (z). I computed all utilities in expected terms contingent upon the initial productivity shock.

Table 5 presents the calibrated and estimated model parameters. I set some of the parameters in terms of average annual income for no college individuals to get a better intuition of the magnitudes. Given Equation 6 and that each t is equivalent to 2 years, I use the term $\bar{y}^{NC}$ to refer to the annual average income for no college individuals and $\bar{y}^{C} = \theta(C)\bar{y}^{NC}$ to refer to the annual average income for college graduates. [18]

To match an interest rate of 8% in a span of 2 years, roughly equivalent to a 4% annual rate, I set β accordingly. I fix the time horizon at $T = 20$, a total of 21 periods after high school graduation ($t = 0$), or 42 years (so 18 + 42 = 60 years old), including $t = 0$, where each period denotes a 2-year interval. The part of the parental transfers function that depend only on the state of the economy ($g(z)$) is set to have mean 0, thus subtracting 1 to z, I used different specifications and the main results hold. The mean of the productivity process (μ) is set to be equal to 1. The autoregressive coefficient ρ is tuned to generate business cycles of 2 years, thereby a recession in the present increases the likelihood of a faster recovery within two years. ξ represents the liquidity constraints in the model and in the baseline model I set it at the 1.5 year average income for non-college individuals $-1.5\bar{y}^{NC}$. I set the college wage premium $\theta(C)$ to match the causal findings by Heckman et al. (2018) and I set the college wage premium for dropouts $\theta(D)$ to be non-existent as with non-college individuals. [19] I estimate three parameters using moments in the data. I estimate the variance of the business cycle, the effect of entry conditions on current wages and tuition costs.

To estimate the variance of the business cycle parameter (σ) I target the relative change in real earnings weighted by the probability of being employed for young people during the 2009 crisis. In my sample, real earnings fell by 11.4% but since the probability of being unemployed rises by 5.6 p.p., the real drop in earnings is of 16.56%.

The second estimated parameter is the impact of initial labor market conditions on current wages (ψ). This estimation aligns with the earnings of an individual with only a high school diploma, comparing those who entered the labor force during a high unemployment rate period to those who entered during an expansion.[20] The empirical values are sourced from Figure 1, focusing on the initial 6 years (3 periods in the model) post labor force entry. The empirical value of 0.899 means that an individual entering the labor force during a recession earns on average 10.10% less than an individual entering in an expansion for the first 6 years.[21] I already account for the higher probability of being unemployed during these 6 years.

[18] The average bi-annual income for no college, given the income process, is equal to $2\bar{y}^{NC} = \exp(\mu)$ so the average annual income is the same divided by 2, $\bar{y}^{NC} = \frac{\exp(\mu)}{2}$. In the calibration I set μ, the mean of the productive process equal to 1.

[19] An alternative version of the model estimates both $\theta(C)$ and $\theta(D)$ to match the difference in lifetime earnings between these two groups and individuals with only a high school diploma as shown in Figure 2. However, these differences are far from causal, that is why in the baseline calibration I used the findings by Heckman et al. (2018).

[20] The reason I focus only on individuals with only a high school diploma is because their earnings and high school graduation are a better proxy for labor market entry and as shown in Figure A.3 college degree holders tend to escape these scarring effects.

[21] I use a rise in the unemployment rate of the magnitude experienced in 2009, which corresponds to a 5.6 percentage point rise. I also use 6 years instead of 10 due to the fact that in the model there are only 3 periods of endogenous decisions, which correspond to 6 years in the data.

Table 5: Calibrated and estimated parameters

Parameter	Value	Description
Calibrated:		
β	0.926	2 year discount factor (4% annual int. rate)
a_0^{max}	$16\bar{y}^{NC}$	Maximum starting level of assets
T	20	Total number of 2-y periods (plus $t = 0$)
$g(z)$	$6\bar{y}^{NC}(z-1)$	Cyclical parental transfers mean 0. In recessions falls by $\bar{y}^{NC}$
μ	1	Mean of the productivity process. This gives $\bar{y}^{NC} = \frac{\exp(1)}{2}$
ρ	-0.2	Auto-regressive parameter
ξ	$-1.5\bar{y}^{NC}$	Liquidity constraints. 1.5 year average non-college income
$\theta(C)$	1.2	College wage premium from Heckman et al. (2018)
$\theta(D) = \theta(N)$	1	College wage premium for college dropouts and high-school
Estimated:		
σ^2	0.1623	Variance of the error term of the productivity process
Moment	Emp. Value	Model Value
$\frac{\text{Y}^{\text{Rec}}}{\text{Y}^{\text{Exp}}}$	0.834	0.834
ψ	0.12	Effect of entry conditions on wages
Moment	Emp. Value	Model Value
$\frac{\text{Y}_{\text{young}}^{\text{NC Rec}}}{\text{Y}_{\text{young}}^{\text{NC Exp}}}$	0.90	0.89
f	1.09	Tuition fees. Full tuition ($2f$) is equivalent to 160% of $\bar{y}^{NC}$
Moment	Emp. Value	Model Value
$\frac{(\text{Col./HS})^H}{(\text{Col./HS})^L}$	1.94	1.95

Note: I estimate three parameters in the model. First, σ is the variance of the error term in the business cycle parameter. I target the ratio of average real earnings at the peak of the recession with respect to the boom for the young population aged below 25 years old weighted by the different probability of being unemployed. Second, ψ is the parameter that states how important are labor market entry conditions on current wages. I target the ratio of the real earnings of an individual who entered the labor market during a recession vs. an individual who entered during an expansion, focusing only on individuals with no college education so that the labor market entry is more identifiable. For the college tuition f parameter I target the college enrollment disparity ratio between high and low income young individuals that I documented in Table 3.

Lastly, I estimate the parameter f, governing tuition costs. I match this parameter with a moment of the data that displays the disparity in college enrollment between high-income and low-income individuals, shown in the second empirical finding in Section 3.2, more specifically in Table 3. This value for tuition costs, taking into account that full tuition costs are $2f$, correspond to the 160% of the average annual income for no college ($\bar{y}^{NC}$). The final two columns show the difference between the model and empirical moment values.

5 Results

In this section I present the main results of the model given the aforementioned parametrization I used. The results align with the main empirical findings I documented in Section 3.

In Table 6 I show the main results that model reproduces from the empirical section.

Table 6: Summary of main results of the model

	Expansion			Recession		
Income level	Low	Middle	High	Low	Middle	High
	Result 1: Financial Dropouts					
% of Dropouts	0	0	0	14.3	0	0
	Result 2: Cyclicality of college enrollment in $t = 0$					
% of $t = 0$ enrollment	50.9	82	63.2	32.6	81	80.8
	Result 3: p threshold for enrolling in $t = 0$					
p threshold for $t = 0$ enrollment	50.6	18.8	21.7	68.5	19.8	17.5
	Result 4: Strategic delays, enrollment in $t = 1$					
% of $t = 1$ enrollment	0	0	16	0	0	2.4

Note: For all results, I compute the average for each income level. I have a total of 20 grids for initial asset a_0. The first 7 correspond to low income (bottom 35%), the following 8 correspond to middle income (40%) and the top 5 to high income (25%) mirroring the definitions in the empirical section. The average is computed for all 25 grids for the different probability of being a good fit for college p.

The first result shows the percentage of individuals who already received a good signal about their college suitability by income level that drop out of college in expansions and in recessions. In periods of economic expansion there are no financial dropouts. However, in recessions, 14.3% of the low-income group, the most financially vulnerable, drops out of college due to the negative influence of parental transfers ($g(z)$). This behavior is shown in the data in the first columns of Table 2.

The second result explores the cyclical patterns of college enrollment by income levels. I show the percentage of individuals opting for immediate college enrollment (in $t = 0$). Immediate college enrollment decreases during recessions for low-income individuals, stays virtually unchanged for middle-income and increases significantly for high-income. The stronger counter-cyclicality of college enrollment for high-income individuals is shown in Table 4, however we did not observe this strong pro-cyclicality in college enrollment for low-income in the data. We only observed small counter-cyclicality instead.

The third result shows the ex-ante probability thresholds for each income group deciding to immediately enroll in college. For low-income, the p threshold rises significantly during recessions, that is, only individuals who are *a priori* more likely to succeed in college, enroll. This p almost does not change for middle income but it does drop significantly for the high-income group. This fall in p will result in a subsequent rise in academic dropouts, as we observe in the data in Table 4 coming mainly from the high-income group. In the data, we also observed these type of college dropouts, although in a significantly smaller scale, with lower and middle income individuals.

Finally, I show how the incentives to strategically delay labor market entry to avoid the scarring effects generated by economic recessions vary by income level. We only observe this behavior from the high-income group, especially during expansions who defer college entry to capitalize on the favorable labor market conditions. This aligns with the trends shown in the last two columns of Table 2.

6 Counterfactuals

In this section I present the two main counterfactuals of the paper which answer the two main research questions of the paper: What is the lifetime impact of experiencing an economic recession while being enrolled in college by income levels? And what is the lifetime impact of experiencing an economic recession at high school graduation by different income levels? I also will address the same simulations but exploring the role of the two main rigidities in the model: liquidity constraints and the persistent effects of labor market entry conditions on wages.

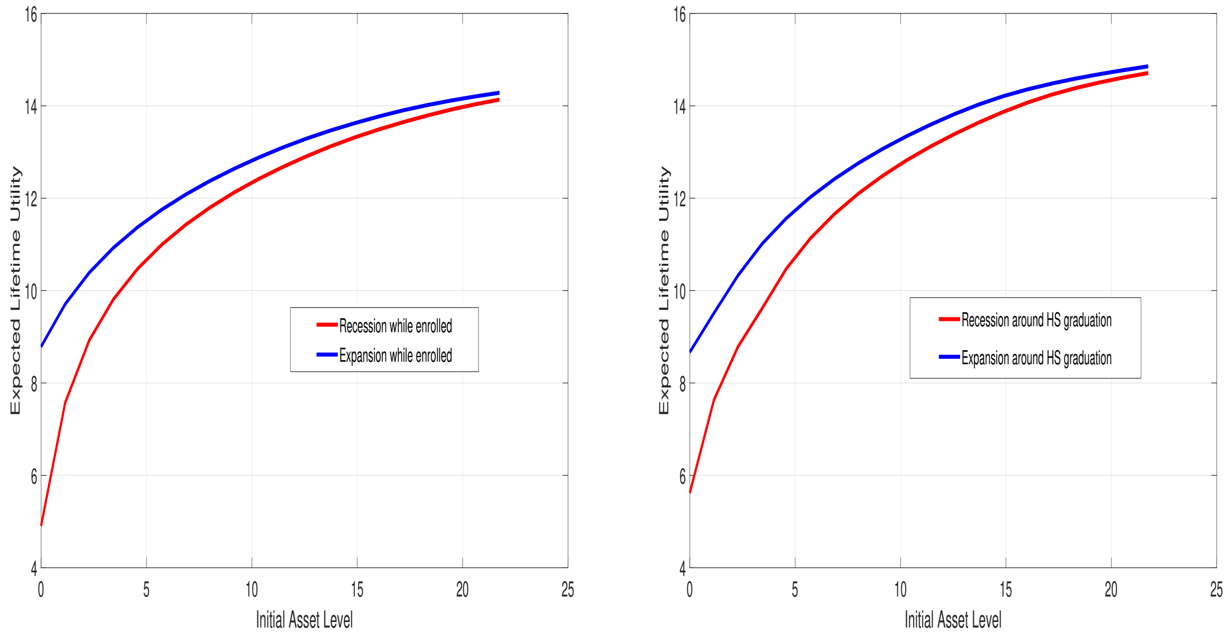
First, I quantify the lifetime impacts of experiencing an economic recession while enrolled in college by income levels. For this first counterfactual I only consider enrolled students who already observed they are a good fit for college and therefore if they decide to complete the degree they will enjoy college wage premium. Second, I quantify the lifetime impacts of experiencing an economic recession around high school graduation by income levels by averaging out all grids of p. For the graph below I fix a p for illustration purposes and maintaining the same 2-D characteristics.[22] In Figure 3 I plot the expected lifetime utility levels for each initial asset level. The blue curve represents an individual experiencing an economic expansion during their college enrollment or around high school graduation, while the red curve represents an individual experiencing a recession during the same period.

Experiencing an economic recession has negligible effects across all income groups except for the low-income one. Among this segment, they experience an expected loss of 15% in terms of expected lifetime utility if the shock occurs while enrolled in college and of 13.8% if the shock occurs around high-school graduation. For middle-income individuals the loss is only of 3.1% and 3.4% respectively while high-income only suffers a 1.4% and 1.5% reductions.

Low-income individuals are the most affected. If the economic shock occurs while they are enrolled in college, 14% drop out and enter the labor market during unfavorable conditions—missing out on the college wage premium and facing poor initial job prospects. If the shock happens around high school graduation, they are less likely to enroll in college and still face a weak labor market. In contrast, middle- and high-income individuals tend to use college enrollment and completion as a buffer against recessions, and during economic expansions, they often delay college to take advantage of higher wages.

I now explore the role of fixing a different probability of succeeding in college p for the second counterfactual, since in the first counterfactual is only focused on individuals who already know they

[22] In the baseline scenario I fix p to be equal to 62.5% which corresponds to the 16th grid out of 25. I also explore how these losses depend on p



(a) Experiencing a recession while enrolled in college (b) Experiencing a recession at HS graduation

Figure 3: Lifetime effects of experiencing an economic recession by income level

are a good fit for college. I also explore the role of the two main rigidities for both counterfactuals, liquidity constraints (ξ) and the influence of labor market entry conditions (ψ).

In Table 7 I show the % losses from experiencing a recession in both periods of analysis with the baseline parametrization shown in Table 5 and comparing it with other policy relevant counterfactuals. The first three columns correspond to the effects for students enrolled in college who already learned about their college suitability and the last three columns to the effects for individuals around their high-school graduation. As always, I separate between the three main income groups. In the first experiment I show the different expected lifetime utility losses from experiencing an economic recession for different probabilities of being a good fit for college (p), for this experiment I only show the effects of the economic recession hitting around high-school graduation since the first counterfactual only focuses on students who already know they are a good fit for it. In the second experiment I show the effects of tightening and relaxing the liquidity constraints in this economy and in the last one I show the effects of vanishing and increasing the effects of labor market entry conditions on current wages.

In the first experiment, I show that recessions disproportionately harm low-income individuals, particularly those with a high *ex-ante* probability of succeeding in college. These individuals stand to gain the most from college enrollment but are unable to access it due to financial constraints. In contrast, among high-income individuals, recessions tend to affect those with lower probabilities of college success. Economic downturns incentivize them to enroll in college despite their low likelihood of completing it successfully.

Table 7: Policy relevance: The role of p, ξ and ψ

	% Loss in Expected Lifetime Utility in a Recession					
	While enrolled			Around HS graduation		
Income level	Low	Middle	High	Low	Middle	High
1) Prob. of good fit p						
$p = 12.5\%$	-	-	-	13.21	3.39	1.92
Baseline averaging across p	-	-	-	**13.83**	**3.37**	**1.45**
$p = 100\%$	-	-	-	14.78	3.21	1.41
2) Liquidity Constraints ξ						
$\xi = -1.3\bar{y}^{NC}$	16.19	3.13	1.41	14.67	3.37	1.45
Baseline $\xi = -1.5\bar{y}^{NC}$	**14.97**	**3.13**	**1.41**	**13.83**	**3.37**	**1.45**
$\xi = -2\bar{y}^{NC}$	14.54	3.13	1.41	13.83	3.37	1.45
3) Labor market entry conditions ψ						
$\psi = 0$	15.06	3.17	1.43	13.63	3.33	1.42
Baseline $\psi = 0.12$	**14.97**	**3.13**	**1.41**	**13.83**	**3.37**	**1.45**
$\psi = 0.5$	15.10	3.02	1.36	15.10	3.50	1.54

Note: The first experiment corresponds to check the losses in expected lifetime utility if the recession occurs around high school graduation, the last 3 columns, for different probabilities of being a good fit for college p. For this experiment I only focus on the second counterfactual, since the first already selects individuals who already had their realization about their college suitability. The second experiment corresponds to tighten the liquidity constraints in the first row, and then relaxing it in the last one with respect to the baseline. The more negative the ξ is the more relaxed the constraint is. The final experiment has to do with lowering the rigidities in the labor market that end up with lower values of ψ, that means, that labor market entry conditions matter less for current wages and increasing the rigidities in the last row.

In the second experiment, I find that relaxing liquidity constraints surprisingly do not play a major role in shaping the impact of recessions on schooling decisions. Easing these constraints primarily benefits low-income individuals who are already enrolled in college by decreasing their probability of becoming a financial dropout. However, when the recession occurs around high school graduation, even financially unconstrained low-income individuals tend to prefer consuming their limited assets in the present rather than investing in college. This behavior is consistent with the model's relatively low patience parameter β, especially considering that each period t spans two years and that the "present" refers most of the youth phase. On the other hand, tightening them does harm low-income individuals significantly both while enrolled and around their high-school graduation.

In the final experiment, I show that removing or intensifying labor market entry frictions (ψ) significantly alters recession outcomes. When a recession hits during college, eliminating this friction leads to larger losses for middle and high-income, as they stay enrolled and enter the labor market in the following period which is likely going to be an expansion. Due to the negative auto-regressive parameter ($\rho = -0.2$), they would benefit more from stronger entry effects to sustain high wages. Thus, greater rigidity reduces losses. For low-income individuals, the effects are mixed: those who remain in college benefit from the rigidity, while those who drop out prefer its absence, as they enter the labor market during the recession. When the recession occurs around high school graduation, the impact of labor market entry rigidities becomes clearer. Intensifying these frictions amplifies losses across all groups, reduces college enrollment, and makes strategic delays among high-income individuals even more pronounced.

7 Conclusions

College decisions in response to macroeconomic conditions can either amplify or buffer the long-term effects of recessions. Low-income individuals are particularly vulnerable: recessions often force them to drop out of college and enter the labor market under unfavorable conditions, leading to persistent earnings losses. In contrast, high-income individuals use college enrollment and completion strategically to shield themselves from downturns and benefit from better labor market entry.

When recessions occur during college, low-income individuals face average lifetime utility losses of 15%, which worsen under tighter liquidity constraints and stronger labor market rigidities. Middle-income individuals lose around 3%, and high-income only 1.4%, as they tend to remain enrolled and graduate.

If the recession hits around high school graduation, low-income individuals lose 13.8% in lifetime utility, compared to 3.4% for middle-income and 1.5% for high-income groups. These losses are again exacerbated by financial constraints and labor market frictions. Notably, recessions prevent highly prepared low-income individuals from attending college, while incentivizing less prepared high-income individuals to enroll—often resulting in higher dropout rates.

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A Additional Figures and Tables

Figures

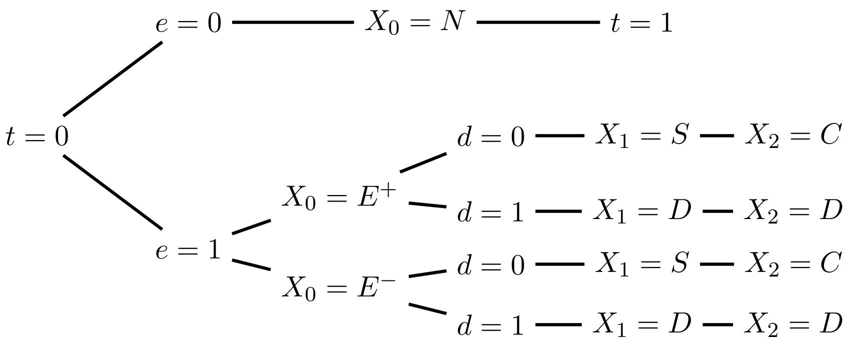

Figure A.1: Diagram of schooling decisions

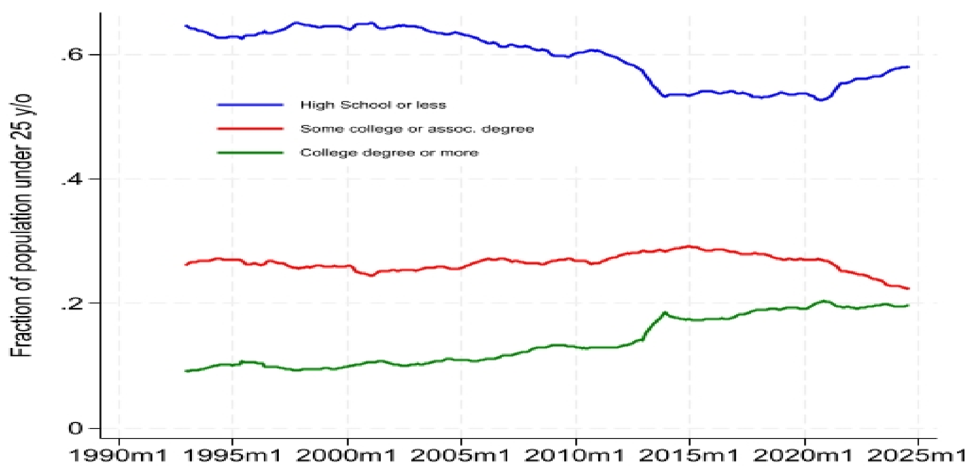

Figure A.2: Evolution of educational groups over time.

Note: I compute the 12-month moving averages fractions of employed people under 25 years old in the sample that have a High School diploma or less, some college education (including people with associate degrees) and a college degree or more. I only include non-current students. The fractions sum up to 1 in each month.

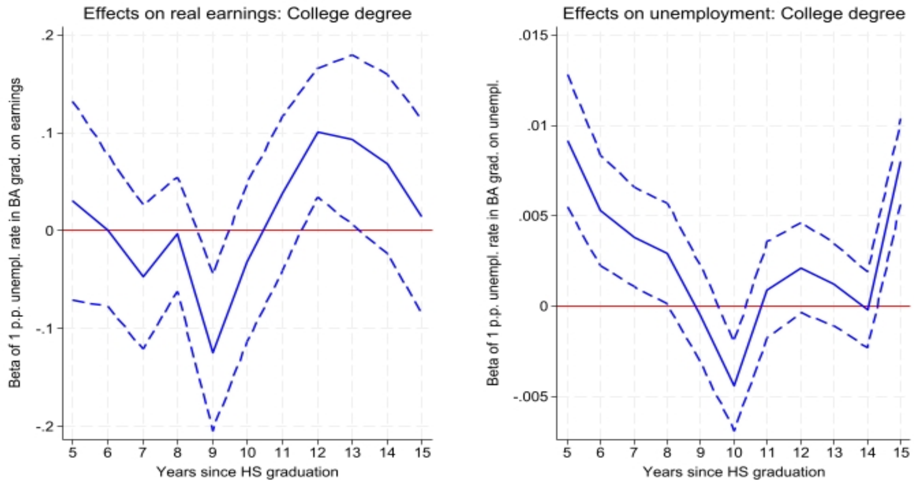

Figure A.3: Negative and persistent effects of graduating from college during recessions.

Note: The x-axis represents the age group in the regression, that is, for the college group, 6 years since HS graduation comprises people who are 24 years old (since I assume they graduate from high school when they are 18), and therefore I assume they entered the labor market 4 years after graduating from HS. I represent β_1 for each age group of the following regression: $y_{i,t} = \beta_0 + \beta_1 u_i^{BA} + \Gamma \mathbf{X}_{i,t} + \epsilon_{i,t}$, where u_i^{BA} is the unemployment rate that this cohort group experienced when they graduated from college.

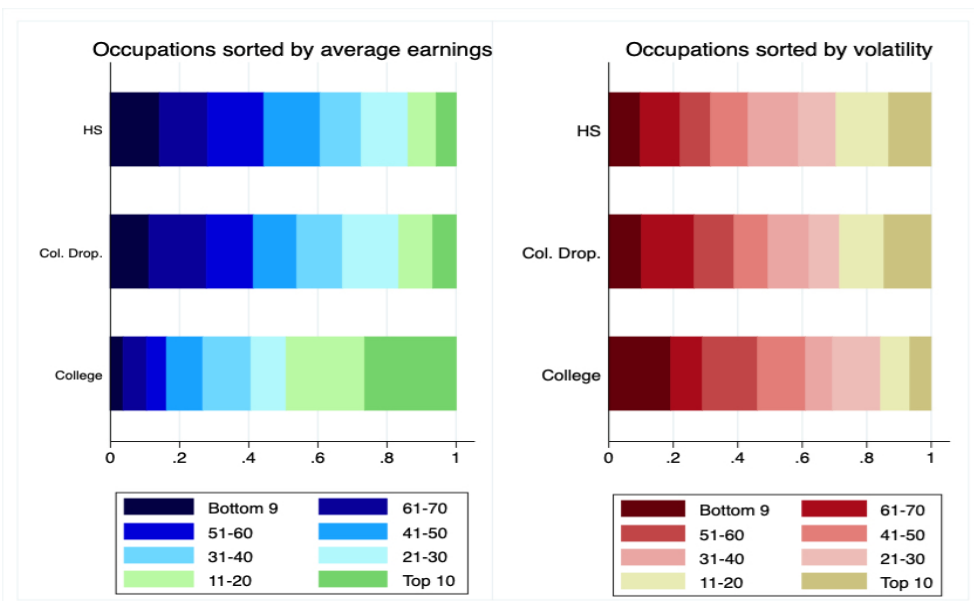

Figure A.4: Occupation sorting by earnings and volatility. Relative proportion by educational group.

Note: In the left panel I show the proportion of workers in each occupation bracket for three different educational groups. Occupations are sorted by average real earnings. People with only high are over-represented in occupations with lower average real earnings whereas the opposite is true with people with a college degrees. In the right panel I repeat the exercise but the occupation sorting is done via occupation volatility. So, the bottom 9 occupations are the 9 occupations with lower volatility in their earnings across time.

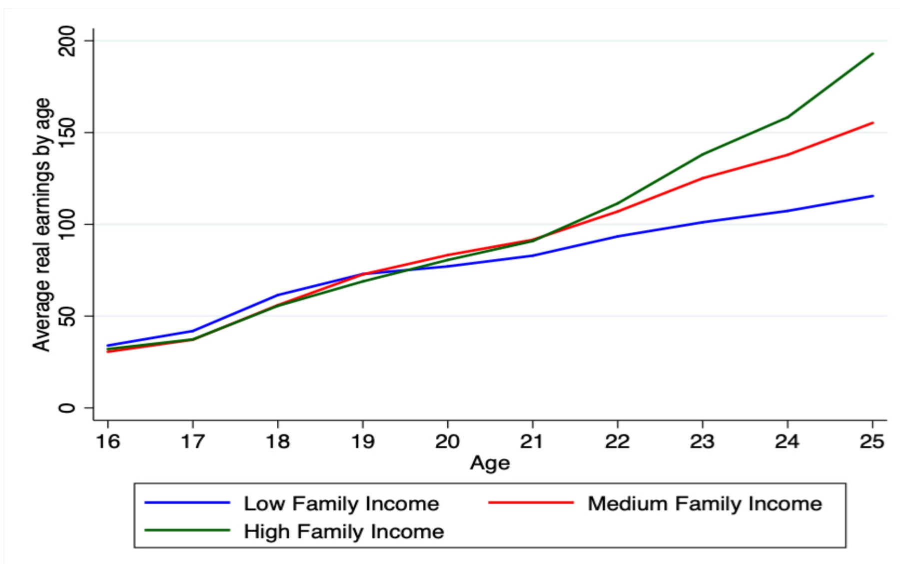

Figure A.5: Differences in real earnings by age and family income group

Tables

Table A1: College enrollment is counter-cyclical using linear and exponential trends

	Effect on college enrollment deviations from trend
Unemployment rate (p.p.)	0.398***
	(0.077)
Unemployment rate deviations from NAIRU (p.p.)	0.405***
	(0.077)
Recession (binary)	0.242
	(0.322)
Real GDP growth (YoY%)	-0.233***
	(0.064)

Source: CPS, World Bank population, UN population by groups, Federal Reserve Bank Saint Louis.

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2: IPUMS CPS data: Descriptive Statistics weighted

	Longitudinal		Cross-sectional	
	All ages	Age $\leq$ 25	All ages	Age $\leq$ 25
Age	30.19	20.09	30.48	20.28
Sex (Female %)	50.42	50.21	50.37	50.14
Race (White %)	75.39	76.11	75.48	76.25
High-school or less (%)	48.35	61.79	47.41	60.22
Some college (%)	27.11	28.48	27.86	29.96
Bachelor's or more (%)	24.54	9.73	24.73	9.81
Weekly earnings ($)	796.43	416.87	775.26	387.43
Family Income (x = Yearly Income)				
Low % ($x <$ \$30k)	26.87	35.67	26.63	35.58
Middle % (\$30k $\leq x <$ \$75k)	36.23	36.95	36.18	36.90
High % ($x \geq$ \$75k)	36.90	27.38	37.19	27.52
Labor force (%)	72.56	61.61	72.29	61.68
Employed (%)	66.51	53.53	66.83	54.33
Unemployed (%)	6.06	8.08	5.46	7.35
Appearances	3.78	3.74	1	1
Individuals	**2,158,404**	**1,086,525**	**2,158,558**	**1,075,005**

Source: IPUMS CPS.

Table A3: Education variable change in criterion

Variable label	Jan. 1976 - Dec. 1991	Jan. 1992 - Dec. 2022
Low		
None, preschool, or kindergarten	✓	✓
Grades 1, 2, 3, or 4	X	✓
Grade 1	✓	X
Grade 2	✓	X
Grade 3	✓	X
Grade 4	✓	X
Grades 5 or 6	X	✓
Grade 5	✓	X
Grade 6	✓	X
Grades 7 or 8	X	✓
Grade 7	✓	X
Grade 8	✓	X
Grade 9	✓	✓
Grade 10	✓	✓
Grade 11	✓	✓
Grade 12th grade, no diploma	X	✓
Grade 12th grade, diploma unclear	✓	X
High school diploma or equivalent	✓	✓
Middle		
1 year of college	✓	X
2 years of college	✓	X
Some college but no degree	X	✓
Associate's degree, occ/voc prog.	X	✓
Associate's degree, academic prog.	X	✓
3 years of college	✓	X
High		
4 years of college	✓	X
Bachelor's degree	X	✓
5 years of college	✓	X
6 years of college	✓	X
Master's degree	X	✓
Professional school degree	X	✓
Doctorate degree	X	✓

Source: IPUMS CPS.

Table A4: Transitions from enrolled to dropout and from labor force to enrolled using pool cross-section

	College Dropouts		LF → College	
$u_{s,t}$	0.143***	0.131*	-0.028	0.050
	(0.033)	(0.073)	(0.022)	(0.071)
Mid. Inc. × $u_{s,t}$	-0.236***	-0.192***	0.461***	0.367***
	(0.048)	(0.070)	(0.031)	(0.088)
High. Inc. × $u_{s,t}$	-0.182***	-0.142*	0.665***	0.458***
	(0.046)	(0.079)	(0.038)	(0.124)
Obs.	706,702	706,702	2,024,651	2,024,651
R-squared	0.001	0.004	0.007	0.015
Controls	No	Yes	No	Yes
Test Middle ($\alpha_1 + \alpha_2$)	-0.009***	-0.060	0.434***	0.417***
Test High ($\alpha_1 + \alpha_3$)	-0.039	-0.011	0.638***	0.508***

Pooled cross-section regression. Effects in p.p. with respect to staying in college / staying in the labor force. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A5: Transitions from enrolled to dropout and from labor force to enrolled using the lag of unemployment rate

	College Dropouts	LF → College
$u_{s,t-1}$	0.161**	-0.119
	(0.066)	(0.081)
Mid. Inc. × $u_{s,t-1}$	-0.190***	0.533***
	(0.062)	(0.104)
High. Inc. × $u_{s,t-1}$	-0.176***	0.645***
	(0.066)	(0.134)
Obs.	706,702	2,024,651
R-squared	0.004	0.015
Test Middle ($\alpha_1 + \alpha_2$)	-0.029	0.415***
Test High ($\alpha_1 + \alpha_3$)	-0.015	0.526***

Panel regression using random effects. Effects in p.p. with respect to staying in college / staying in the labor force. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A6: Transitions from enrolled to dropout and from labor force to enrolled by sex

	Dropouts	LF $\rightarrow$ College	Dropouts	LF $\rightarrow$ College
	Male		Female	
$u_{s,t}$	0.149**	-0.081	0.143*	-0.104
	(0.060)	(0.075)	(0.076)	(0.093)
Mid. Inc. $\times$ $u_{s,t}$	-0.216***	0.430***	-0.176*	0.633***
	(0.056)	(0.084)	(0.093)	(0.140)
High. Inc. $\times$ $u_{s,t}$	-0.208***	0.647***	-0.206**	0.677***
	(0.070)	(0.137)	(0.086)	(0.149)
Obs.	327,825	1,064,289	378,877	960,362
R-squared	0.004	0.010	0.004	0.012
Test Middle ($\alpha_1 + \alpha_2$)	-0.068	0.349***	-0.033	0.529***
Test High ($\alpha_1 + \alpha_3$)	-0.059	0.567***	-0.063**	0.572***

Panel regression using random effects. Effects in p.p. with respect to staying in college / staying in the labor force.
Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A7: Transitions from enrolled to dropout and from labor force to enrolled using max unemployment rate

	College Dropouts	LF $\rightarrow$ College
$\max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	0.140**	-0.127*
	(0.057)	(0.077)
Mid. Inc. $\times$ $\max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	-0.174***	0.478***
	(0.056)	(0.095)
High. Inc. $\times$ $\max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	-0.179***	0.537***
	(0.061)	(0.120)
Obs.	706,702	2,024,651
R-squared	0.004	0.015
Test Middle ($\alpha_1 + \alpha_2$)	-0.034	0.351***
Test High ($\alpha_1 + \alpha_3$)	-0.038	0.410***

Panel regression using random effects. Effects in p.p. with respect to staying in college / staying in the labor force.
Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A8: Transitions from enrolled to dropout and from labor force to enrolled using average unemployment rate

	College Dropouts	LF $\rightarrow$ College
$\overline{u}_{s,t}$	0.129**	-0.099
	(0.059)	(0.081)
Mid. Inc. $\times$ $\overline{u}_{s,t}$	-0.191***	0.566***
	(0.059)	(0.106)
High. Inc. $\times$ $\overline{u}_{s,t}$	-0.225***	0.733***
	(0.070)	(0.145)
Obs.	706,702	2,024,651
R-squared	0.004	0.015
Test Middle ($\alpha_1 + \alpha_2$)	-0.062*	0.467***
Test High ($\alpha_1 + \alpha_3$)	-0.095***	0.634***

Panel regression using random effects. Effects in p.p. with respect to staying in college / staying in the labor force. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A9: Implied compositional change by income groups

Disparity Ratios	Col. enrolled / HS		Drop. / HS		Col. degree / HS	
	Avg.	Shock	Avg.	Shock	Avg.	Shock
Mid. inc. / Low inc.	1.19	1.30	1.14	1.22	1.50	1.67
High inc. / Low inc.	1.94	2.16	1.48	1.63	2.81	3.67

Source: IPUMS CPS.

Note: For each column group I show the average disparity ratio in the first column, which correspond to the same values I showed in Table 3 and the second column are the implied disparity ratios given the regression results from Table 4. The implied disparity ratios are calculated for a rise in the unemployment rate in a state of 5.6 p.p. which is similar to the one experienced in 2009.

Table A10: Associate degrees and the business cycle

	Assoc. occupational		Assoc. academic	
	(1)	(2)	(3)	(4)
$u_{i,s}^{HS}$	-0.140***	-0.044	0.077*	-0.029
	(0.039)	(0.052)	(0.044)	(0.067)
Mid. Inc. $\times$ $u_{i,s}^{HS}$	0.137**	0.058	0.265***	0.180
	(0.060)	(0.079)	(0.068)	(0.122)
High. Inc. $\times$ $u_{i,s}^{HS}$	0.215***	0.018	0.500***	0.318**
	(0.076)	(0.083)	(0.091)	(0.142)
Controls	No	Yes	No	Yes
Obs.	286,910	286,910	290,301	290,301
R-squared	0.002	0.032	0.006	0.051
F-test Middle ($\beta_1 + \beta_2$)	-0.003	0.013	0.342***	0.152
F-test High ($\beta_1 + \beta_3$)	0.075	-0.026	0.577***	0.290**

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A11: College enrollment and completion and the business cycle by sex

	Att. college	College or more	Att. college	College or more
	Male		Female	
$u_{i,s}^{HS}$	0.199	-0.243**	0.181	-0.330**
	(0.124)	(0.112)	(0.152)	(0.140)
Mid. Inc. × $u_{i,s}^{HS}$	0.461**	0.270	0.260	0.287
	(0.183)	(0.163)	(0.315)	(0.306)
High. Inc. × $u_{i,s}^{HS}$	0.386	0.960***	0.340	0.965***
	(0.234)	(0.170)	(0.305)	(0.274)
State Controls	Yes	Yes	Yes	Yes
Clustered SE state	Yes	Yes	Yes	Yes
Obs.	317,594	179,901	347,958	184,886
R-squared	0.049	0.224	0.060	0.289
Test Middle ($\beta_1 + \beta_2$)	0.661***	0.027	0.442**	-0.044
Test High ($\beta_1 + \beta_3$)	0.585***	0.717***	0.521**	0.635***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A12: College dropouts and college degree and the business cycle by sex

	College Dropout	
	Male	Female
$u_{i,s}^{HS}$	0.300**	0.220*
	(0.129)	(0.108)
Mid. Inc. × $u_{i,s}^{HS}$	0.314	0.235*
	(0.206)	(0.282)
High. Inc. × $u_{i,s}^{HS}$	0.457**	0.403
	(0.209)	(0.332)
State Controls	Yes	Yes
Clustered SE state	Yes	Yes
Obs.	166,521	157,832
R-squared	0.027	0.027
Test Middle ($\beta_1 + \beta_2$)	0.614***	0.455*
Test High ($\beta_1 + \beta_3$)	0.757***	0.624**

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A13: College enrollment and completion and the business cycle using the maximum unemployment between January and May

	Attended college		College Degree or more	
$\max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	0.047	0.162	-0.173***	-0.194**
	(0.055)	(0.103)	(0.055)	(0.085)
Mid. Inc. $\times \max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	0.174**	0.090	0.252***	0.125
	(0.076)	(0.162)	(0.079)	(0.158)
High. Inc. $\times \max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	0.184**	-0.016	0.582***	0.271**
	(0.077)	(0.153)	(0.095)	(0.111)
State Controls	No	Yes	No	Yes
Clustered SE state	No	Yes	No	Yes
Obs.	665,552	665,552	364,787	364,787
R-squared	0.019	0.059	0.042	0.262
Test Middle ($\beta_1 + \beta_2$)	0.221***	0.251**	0.079	-0.069
Test High ($\beta_1 + \beta_3$)	0.231***	0.145	0.408***	0.078

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A14: College dropouts and college degree and the business cycle using the maximum unemployment between January and May

	College Dropout	
$\max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	0.020	0.163
	(0.065)	(0.103)
Mid. Inc. $\times \max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	0.115	0.110
	(0.091)	(0.174)
High. Inc. $\times \max\{u_{s,t-4}, u_{s,t-3}, u_{s,t-2}, u_{s,t-1}, u_{s,t}\}$	0.217**	0.107
	(0.108)	(0.138)
State Controls	No	Yes
Clustered SE state	No	Yes
Obs.	324,353	324,353
R-squared	0.005	0.029
Test Middle ($\beta_1 + \beta_2$)	0.135**	0.273*
Test High ($\beta_1 + \beta_3$)	0.237***	0.270***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A15: College enrollment and completion and the business cycle using only May

	Attended college		College Degree or more	
$u_{i,s}^{HS}$	0.085	0.158	-0.145**	-0.253***
	(0.057)	(0.108)	(0.058)	(0.095)
Mid. Inc. $\times$ $u_{i,s}^{HS}$	0.294***	0.183	0.392***	0.191
	(0.079)	(0.183)	(0.084)	(0.181)
High. Inc. $\times$ $u_{i,s}^{HS}$	0.355***	0.088	0.953***	0.463***
	(0.081)	(0.175)	(0.102)	(0.132)
State Controls	No	Yes	No	Yes
Clustered SE state	No	Yes	No	Yes
Obs.	665,552	665,552	364,787	364,787
R-squared	0.019	0.059	0.042	0.263
Test Middle ($\beta_1 + \beta_2$)	0.379***	0.340***	0.248***	-0.063
Test High ($\beta_1 + \beta_3$)	0.441***	0.246**	0.809***	0.209**

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A16: College dropouts and college degree and the business cycle using only May

	College Dropout	
$u_{i,s}^{HS}$	0.105	0.204*
	(0.068)	(0.111)
Mid. Inc. $\times$ $u_{i,s}^{HS}$	0.181*	0.153
	(0.097)	(0.195)
High. Inc. $u_{i,s}^{HS}$	0.346***	0.186**
	(0.116)	(0.155)
State Controls	No	Yes
Clustered SE state	No	Yes
Obs.	324,353	324,353
R-squared	0.006	0.029
Test Middle ($\beta_1 + \beta_2$)	0.286***	0.357**
Test High ($\beta_1 + \beta_3$)	0.451***	0.390***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A17: Transitions from enrolled to dropout and from labor force to enrolled excluding COVID

	College Dropouts	LF $\rightarrow$ College
$u_{s,t}$	0.105*	-0.055
	(0.061)	(0.079)
Mid. Inc. $\times$ $u_{s,t}$	-0.207***	0.579***
	(0.061)	(0.107)
High. Inc. $\times$ $u_{s,t}$	-0.268***	0.854***
	(0.075)	(0.157)
Obs.	688,976	1,983,714
R-squared	0.004	0.015
Test Middle ($\alpha_1 + \alpha_2$)	-0.102***	0.524***
Test High ($\alpha_1 + \alpha_3$)	-0.163***	0.799***

Effects in p.p.. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A18: College enrollment and completion and the business cycle excluding COVID

	Attended college		College Degree or more	
$u_{i,s}^{HS}$	0.180***	0.271**	-0.080	-0.250**
	(0.060)	(0.119)	(0.063)	(0.114)
Mid. Inc. $\times$ $u_{i,s}^{HS}$	0.527***	0.364	0.643***	0.274
	(0.083)	(0.229)	(0.095)	(0.212)
High. Inc. $\times$ $u_{i,s}^{HS}$	0.819***	0.387	1.781***	0.835***
	(0.087)	(0.265)	(0.115)	(0.200)
State Controls	No	Yes	No	Yes
Clustered SE state	No	Yes	No	Yes
Obs.	647,525	647,525	354,199	354,199
R-squared	0.020	0.058	0.042	0.261
Test Middle ($\beta_1 + \beta_2$)	0.707***	0.635***	0.563***	0.024
Test High ($\beta_1 + \beta_3$)	0.999***	0.658***	1.702***	0.585***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A19: College dropouts and college degree and the business cycle excluding COVID

	College Dropout	
$u_{s,t}$	0.232***	0.325***
	(0.073)	(0.105)
Mid. Inc. $\times$ $u_{s,t}$	0.367***	0.297
	(0.106)	(0.212)
High. Inc. $u_{s,t}$	0.832***	0.519**
	(0.133)	(0.241)
State Controls	No	Yes
Clustered SE state	No	Yes
Obs.	316,336	316,336
R-squared	0.006	0.029
Test Middle ($\beta_1 + \beta_2$)	0.599***	0.622***
Test High ($\beta_1 + \beta_3$)	1.064***	0.843***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A20: Transitions from enrolled to dropout and from labor force to enrolled with 23 year old or younger

	College Dropouts	LF $\rightarrow$ College
$u_{s,t}$	0.139**	-0.140*
	(0.069)	(0.082)
Mid. Inc. $\times$ $u_{s,t}$	-0.187***	0.509***
	(0.065)	(0.106)
High. Inc. $\times$ $u_{s,t}$	-0.194***	0.655***
	(0.075)	(0.140)
Obs.	237,750	1,762,211
R-squared	0.003	0.023
Test Middle ($\alpha_1 + \alpha_2$)	-0.048	0.368***
Test High ($\alpha_1 + \alpha_3$)	-0.055*	0.514***

Effects in p.p.. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A21: College enrollment and completion and the business cycle with 23 year old or younger

	Attended college		College Degree or more	
$u_{i,s}^{HS}$	0.217***	0.330**	-0.175***	-0.185
	(0.066)	(0.129)	(0.064)	(0.124)
Mid. Inc. $\times$ $u_{i,s}^{HS}$	0.462***	0.378*	0.341***	0.227
	(0.094)	(0.195)	(0.096)	(0.161)
High. Inc. $\times$ $u_{i,s}^{HS}$	0.690***	0.323	1.338***	0.735***
	(0.097)	(0.238)	(0.125)	(0.183)
State Controls	No	Yes	No	Yes
Clustered SE state	No	Yes	No	Yes
Obs.	532,803	532,803	275,928	275,928
R-squared	0.018	0.062	0.026	0.242
Test Middle ($\beta_1 + \beta_2$)	0.678***	0.708***	0.166**	0.042
Test High ($\beta_1 + \beta_3$)	0.907***	0.653***	1.163***	0.550***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A22: College dropouts and college degree and the business cycle with 23 year old or younger

	College Dropout	
$u_{s,t}$	0.231***	0.378***
	(0.080)	(0.127)
Mid. Inc. $\times$ $u_{s,t}$	0.267**	0.215
	(0.116)	(0.201)
High. Inc. $u_{s,t}$	0.723***	0.399*
	(0.146)	(0.210)
State Controls	No	Yes
Clustered SE state	No	Yes
Obs.	262,485	262,485
R-squared	0.007	0.036
Test Middle ($\beta_1 + \beta_2$)	0.498***	0.591***
Test High ($\beta_1 + \beta_3$)	0.954***	0.774***

Effects in p.p. with respect to only High School. Clust. standard (state level) errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

B Mathematical Appendix

B.1 Derivation of p and θ thresholds

To derive the threshold values for p and θ at which an individual would be indifferent between going to college and entering the labor force directly, we need to set the expected incomes Y^C and Y^N equal to each other:

$$Y^C = Y^N$$

Given the equations:

$$\begin{aligned} Y^C = -f + p\left(-f + \theta(C)\mathbb{E}_0 \sum_{t=2}^{T} [\psi_t \exp(z_2) + (1-\psi_t)\exp(z_t)]\right) \\ + (1-p)\left(\theta(D)\mathbb{E}_0 \sum_{t=1}^{T} [\psi_t \exp(z_1) + (1-\psi_t)\exp(z_t)]\right) \end{aligned}$$

$$Y^N = \theta(N)\mathbb{E}_0 \sum_{t=0}^{T} [\psi_t \exp(z_0) + (1-\psi_t)\exp(z_t)]$$

Set $Y^C = Y^N$:

$$\begin{aligned} -f + p\left(-f + \theta(C)\mathbb{E}_0 \sum_{t=2}^{T} [\psi_t \exp(z_2) + (1-\psi_t)\exp(z_t)]\right) \\ + (1-p)\left(\theta(D)\mathbb{E}_0 \sum_{t=1}^{T} [\psi_t \exp(z_1) + (1-\psi_t)\exp(z_t)]\right) \\ = \theta(N)\mathbb{E}_0 \sum_{t=0}^{T} [\psi_t \exp(z_0) + (1-\psi_t)\exp(z_t)] \end{aligned}$$

To simplify, let's denote:

$$\Lambda^2 = \mathbb{E}_0 \sum_{t=2}^{T} [\psi_t \exp(z_2) + (1-\psi_t)\exp(z_t)]$$

$$\Lambda^1 = \mathbb{E}_0 \sum_{t=1}^{T} [\psi_t \exp(z_1) + (1-\psi_t)\exp(z_t)]$$

$$\Lambda^0 = \mathbb{E}_0 \sum_{t=0}^{T} [\psi_t \exp(z_0) + (1-\psi_t)\exp(z_t)]$$

The equation becomes:

$$-f + p\left(-f + \theta(C)\Lambda^2\right) + (1-p)\left(\theta(D)\Lambda^1\right) = \theta(N)\Lambda^0$$

Expanding and defining $\hat{p}$ as the p such that $Y^C = Y^N$:

$$-f - \hat{p}f + \hat{p}\theta(C)\Lambda^2 + \theta(D)\Lambda^1 - \hat{p}\theta(D)\Lambda^1 = \theta(N)\Lambda^0$$

Rearranging:

$$-\hat{p}f + \hat{p}\theta(C)\Lambda^2 - \hat{p}\theta(D)\Lambda^1 = \theta(N)\Lambda^0 + f - \theta(D)\Lambda^1$$

$$\hat{p}\Big(\theta(C)\Lambda^2 - \theta(D)\Lambda^1 - f\Big) = \theta(N)\Lambda^0 - \theta(D)\Lambda^1 + f$$

Solving for $\hat{p}$:

$$\hat{p} = \frac{\theta(N)\Lambda^0 - \theta(D)\Lambda^1 + f}{\theta(C)\Lambda^2 - \theta(D)\Lambda^1 - f}$$

This equation gives the threshold value for p at which an individual would have the same lifetime income if she decides to go to college and if she decides to enter the labor force directly.

I do the same for the derivation of $\hat{\theta}(C)$ which is college wage premium such that $Y^C = Y^N$.

Starting from:

$$-pf + p\hat{\theta}(C)\Lambda^2 - p\theta(D)\Lambda^1 = \theta(N)\Lambda^0 + f - \theta(D)\Lambda^1$$

Rearranging:

$$p\hat{\theta}(C)\Lambda^2 = \theta(N)\Lambda^0 - \theta(D)\Lambda^1 + p\theta(D)\Lambda^1 + f + pf$$

$$p\hat{\theta}(C)\Lambda^2 = \theta(N)\Lambda^0 + (1-p)\theta(D)\Lambda^1 + f + pf$$

Solving for $\hat{\theta}(C)$:

$$\hat{\theta}(C) = \frac{\theta(N)\Lambda^0 + (1-p)\theta(D)\Lambda^1 + f + pf}{p\Lambda^2}$$

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Diego Vivanco Vargas, Camilo Levenier Barría, Lissette Briones Molina

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