

The Inequality of Educational Opportunities: Microeconomic Barriers with Macroeconomic Costs

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1 Introduction

More than ever, an adequate education is today the chief route for personal success. The disparity in earnings between college and high school educated workers has been widening relentlessly over the last three decades, and on top of this quantity and quality of schooling are positively correlated with several other desirable outcomes ¹.

In light of this, the growing disparity in terms of educational outcomes among children of different economic backgrounds is a particularly troublesome dimension of the rise of income inequality that is taking place in the United States. Despite its historic reputation as the land of opportunity, America stands out today as a country where one's schooling prospects are strongly tied to the income and education of his or her parents. Gaps in terms of achievement start forming very early in children's schooling careers, and then widen over time as students are exposed to increasingly diverging opportunities to develop their skills.

While the debate on these issues is mostly cast in terms of equity considerations, in this essay I want to emphasize some implications for the economy-wide allocative efficiency. At a time where knowledge intensive activities play a predominant part in driving and shaping economic growth, it is crucial for a society to appropriately select the "right" individuals to pursue higher education and be at the frontier of this process. A society where students coming from wealthy background obtain advantages that go

¹Among others, see Lochner and Moretti (2004) for the effect on crime, Milligan et al. (2004) on civic participation, Currie and Moretti (2003) on child health outcomes and Easterbrook et al. (2015) on wellbeing.

beyond their merits is not using efficiently the resources at its disposal, since part of the pool of potential talent is not exploited to its full potential. This failure of meritocracy is potentially very costly, not only for those whose opportunities are limited in the first place, but also for the economy as a whole.

I do not wish to argue that economic efficiency should be the only (or even the most important) goal to keep in mind when designing the educational system. However, to the extent that family background confers advantages that distort the allocation of resources and make the economy less productive, it is rather uncontroversial that the correction of such distortions would be a desirable goal, going beyond any equity versus efficiency trade-off.

As mentioned earlier, students of different backgrounds receive different levels of educational investment at all the various stages of their schooling careers. In the interest of concreteness, in this essay I focus on what happens at the college enrolment stage. Of course much of the gap between rich and poor students forms before that, and indeed several studies by James Heckman and co-authors suggest that educational investments in early years are more effective in shaping an individual's human capital. In light of this, inefficiencies arising at this stage are probably a relatively small subset of the overall loss deriving from the inequality of educational opportunities, and my analysis should be treated as a conservative one. Moreover, proposals aimed at expanding college opportunities often dominate the policy debate on this topic², and therefore it is particularly interesting to understand whether there are large potential efficiency gains stemming from this type of interventions.

Even when restricting the attention to such limited focus, the analysis entails a number of difficulties. First, one needs to be explicit on what determines the marginal product of college investment, and how it differs among different students at the end of high school. Second, a proxy for this unobservable bundle of attributes needs to be constructed from the available data, in order to understand whether the observed sorting into college enrolment is the outcome of an efficient process.

In this essay I aim to make progress on this front by relying on some of the insights from the burgeoning literature on skills formation. Several recent studies document that the accumulation of human capital is a dynamic process, and that at each stage of the life cycle there are important complementarities between the current stock and the productivity of new investment (Heckman and Cunha, 2007; Cunha et al., 2010). In other words, a college education is particularly "effective" on those students who have developed the appropriate cognitive tools by the end of high school, and if the

²For example, in January 2014 the White House released a list of "Commitments to Action on Expanding College Opportunities".

objective is to maximize the aggregate stock of human capital³ those should be the ones attending college. Since children from rich families attend better schools and receive more educational inputs early on, the fact that they are more likely to go to college is not informative per se of an efficiency loss at this point⁴. A symptom of a misallocation of educational inputs would be instead having students from disadvantaged backgrounds systematically investing less in their higher education, conditionally on having achieved the same level of human capital by the end of high school. Whether this is currently a quantitatively relevant issue in the United States is the main object of this article.

As a proxy for the stock of human capital that students have accumulated by the time of college enrolment decisions, I rely on the results from a standardized test administered at the end of high school. While cognitive tests are obviously imperfect metrics for the elusive concept of human capital, recent research shows that they reflect both innate ability and educational inputs received during childhood (Cascio and Lewis, 2005), and that they are generally good predictors of successful college careers. For the purpose of this essay, the key issue is not whether this is a perfect measure of accumulated skills, rather whether it captures on average differences between students of different economic backgrounds. On one hand, it is likely that several types of skills matter for college education, and individuals from wealthy families might be more developed in some other dimension that the test I use does not capture⁵. On the other hand, one might think that some of the environmental advantages enjoyed during childhood might lead high income students to perform better in standardized tests, beyond what implied by their edge in terms of accumulated human capital⁶. Further research is needed to establish which of these two opposing views has more merit. In

³As emphasized earlier, the design of college admissions is likely to be based on other considerations on top of this. The purpose of this exercise is to investigate to what extent deviations from a "perfect sorting" scenario are taking place, without implying that such scenario would be entirely desirable in practice.

⁴Here I am referring exclusively to efficiency at the college enrollment stage, conditional on the stock of skills accumulated by the end of high school. The disparities in the allocation of resources at earlier stages are probably responsible of even bigger deviations from efficiency, considering the evidence from the skill formation literature discussed above.

⁵In particular, lines of work in economics (Rubinstein and Heckman, 2001; Heckman et al., 2006; Cunha et al., 2010) and psychology (Wolfe and Johnson, 1995; Duckworth and Seligman, 2005) emphasize the role of non-cognitive skills, such as motivation, self-esteem and self-control, for schooling performance and labor market outcomes. While these skills are possibly even more problematic to measure, various metrics have been developed for this purpose. In Rossi (2015), I show that controlling for the scores in two of these tests (the Rosenberg Self-Esteem Scale and the Rotter Locus of Control Scale) does not alter the main conclusions presented in this essay.

⁶If this is the case, my analysis would underestimate the barriers to college investments faced by low income students.

the meantime, I view as a reasonable compromise to take these test scores at face value, keeping in mind that unmeasured differences in human capital might somewhat affect any estimate of the total efficiency loss.

My analysis suggests that college access opportunities in the United States are far from being equalized. Students from disadvantaged background invest significantly less than their wealthier peers at the same level of pre-college skills, and this disparity is reflected in the subsequent labor market outcomes. Interestingly, the *extensive margin*, i.e. the decision on whether to attend some college or not, accounts only for a small part of the overall gap. Barriers to college investment for low income students seem to be mostly related to aspects like the prestige of the college attended, the probability of obtaining a given degree and the overall quality of the college experience (I refer to the combination of these factors as the *intensive margin* of college investment). This distinction has important implications for the scope of possible efficiency improving policies, which should mostly target disadvantaged students that do attend college but do not carry out this investment in a way appropriate for their potential.

The rest of this essay is structured as follows. In Section 2 I briefly describe the data used in my analysis, while Section 3 I describe the evidence on the disparity of college investment between poor and rich families. Finally, Section 4 concludes by discussing possible policies and broader implications for the US economy.

2 Data

In this article I use data from the 1979 wave of the National Longitudinal Survey of the Youth (NLSY79). This dataset provides a nationally representative panel of 12687 young men and women that were between 14 and 22 years old in 1979. It includes detailed information on education, labor market outcomes and, crucially for my purposes, results of standardized tests designed to measure cognitive skills that were administered to sample members roughly at the end of high school.

As a measure of the family socioeconomic status, I use total net family income in 1978 and 1979. This should be informative of the resources available to families in the years where college choices are made. I exclude from the sample individuals that do not live either with their parents or at a temporary address (such as a student dorm), since for those family income might not be informative of the actual resources at their disposal when choosing whether to go to college⁷. While family income is a natural

⁷To soften the concerns about the possible bias arising from short term fluctuations in income, I follow a common practice in the intergenerational mobility literature by taking the simple average of the two years.

proxy for the socioeconomic status, the results of my analysis would not be affected if I were to use parental educational attainment.

Individuals are considered to have attended some college when the highest grade they have completed is 13th or higher. Since the focus on the analysis is on college enrolment choices, I discard all observations relative to high school dropouts (i.e., those individuals whose highest grade completed is 11th or lower)⁸.

The main proxy for accumulated human capital that I use in this article is the result in the Armed Forces Qualifications Test (AFQT). This is part of the Armed Services Vocational Aptitude Battery (ASVAB), a ten section written exam normally administered to entering military recruits to determine eligibility for enlistment and "trainability". The same test was administered to the whole sample of the NLSY79, proving an invaluable tool to evaluate differences in cognitive skills across the US society⁹. The scores are normalized so that they range from 0 to 100.

To shed light on medium term labor market outcomes for college graduates, I construct hourly wages at 35 (or the closest possible alternative) from data on total labor earnings and hours worked available in the NLSY79. Observations for which hours per week are below 10 or above 100 are dropped. In order to net out the effect of characteristics that are not the main focus of this essay, I regress (log) wages on race, gender and age controls, and use the estimated residuals throughout.

The final sample is composed by 3000 individuals for whom I have complete information on family income, education, test scores and wages. All the statistics reported below make use of the provided sample weights.

⁸Given that high school dropouts come disproportionately from low income families, the inclusion of these observations in the analysis of college enrolment decisions would reinforce the conclusion that family background plays an important role in shaping educational careers.

⁹I construct the raw AFQT scores by combining the results obtained in different sections of the Armed Services Vocational Aptitude Battery (ASVAB) test, according to the formula documented in NLS (1992). A small complication arises from the fact that the test was taken in 1981 by all students in the sample, who at the time were at different grades. In order to clean test scores from the component due to schooling differences in 1981, I adopt the following procedure, which is similar to the one described in Carneiro and Heckman (2002): I divide students in groups according to the highest grade attended in their life, and within each group I take the sum of the constant and residual estimated from a regression of the raw AFQT score on the difference between the grade attended in 1981 and 12.

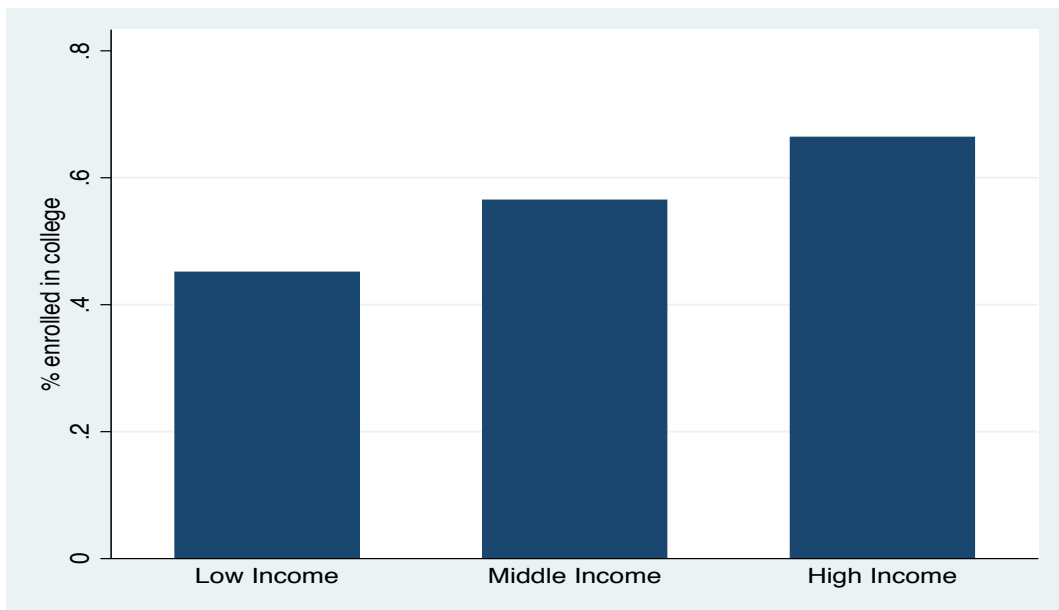
3 Evidence

In this section I present evidence on the differential investment on college education by family background. I consider in turn two dimensions of this disparity. First, I examine whether students from wealthy backgrounds are more likely to pursue some college education after high school (the extensive margin of college investment). Then, I focus on those that do attend college to ask whether family background is associated with elements such that the quality of the institution attended, the type of degree obtained and subsequent labor market outcomes (the intensive margin of college investment).

3.1 Extensive Margin

For the sake of simplicity, I split my sample in three groups according to family income terciles. Figure 1 shows the share of individuals in each group with at least some college education.

Figure 1: College Enrollment by Family Income Terciles



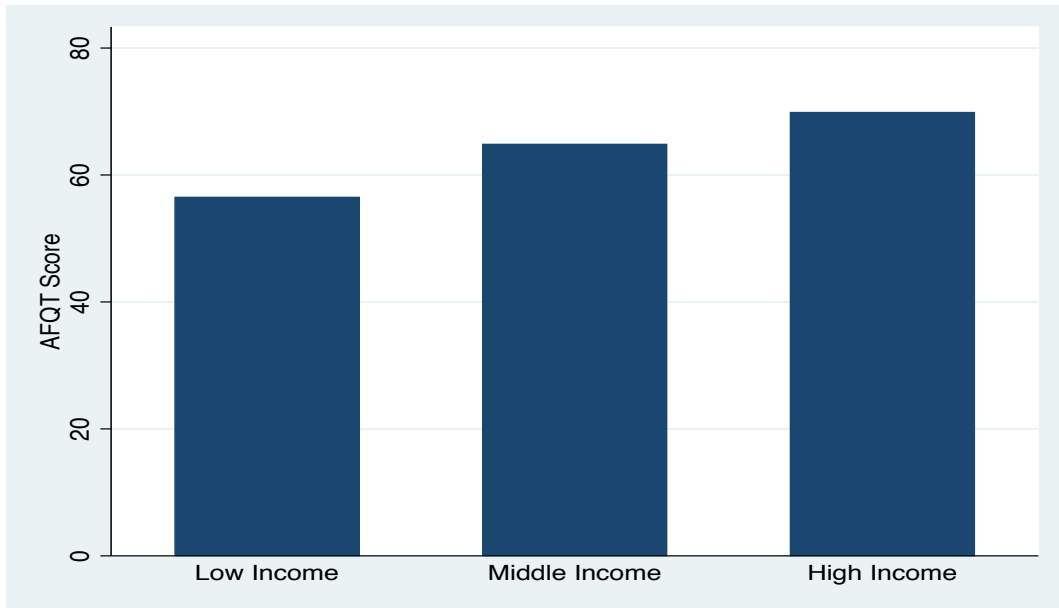
Notes: Height of the bar represents share with more than 12 years of schooling within each family income group. Source: NLSY79.

The differences between groups are quite substantial: more than 60% of children from "High Income" families get some education beyond high school, while the corresponding figure for the "Low Income" group is just above 40%¹⁰. As discussed in

¹⁰The college attendance figures reported here are slight higher compared to the ones from other sources (such as, for example, Belley and Lochner (2007)), since here high school dropouts are excluded from the sample. As mentioned above, results do not depend on this sample restriction.

the introduction, this disparity is not particularly puzzling, given that students coming from rich families are likely to be more prepared for college given that they have attended better schools and in general lived in environments more favorable to human capital accumulation. Indeed, Figure 2 documents how these students achieve substantially higher scores in the AFQT test, with the "High Income" group outperforming the "Low Income" one by more than a standard deviation.

Figure 2: AFQT Scores by Family Income Terciles



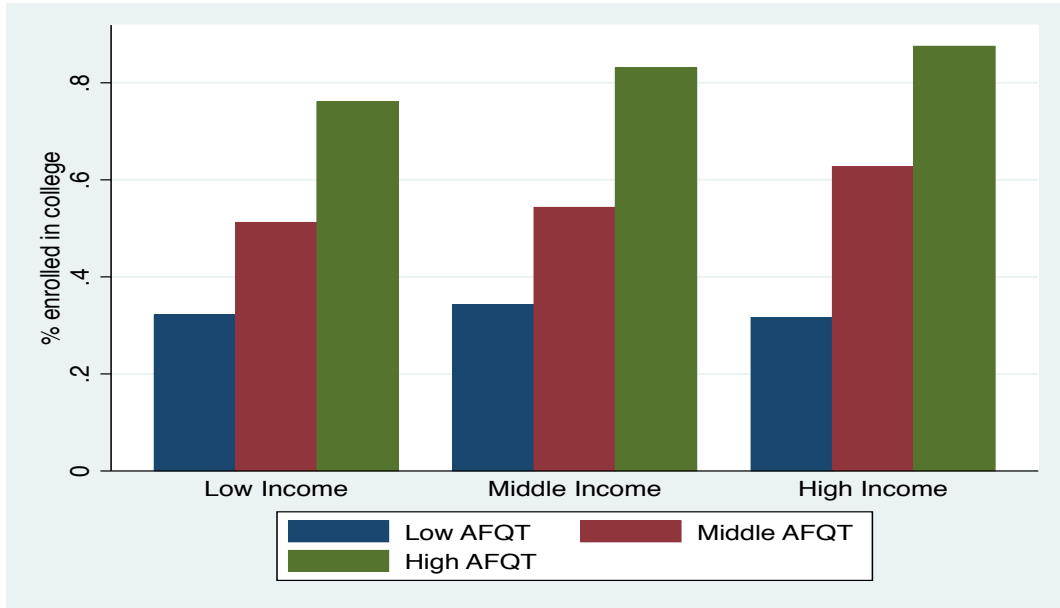
Notes: Height of the bar represents the average AFQT score within each family income group. Source: NLSY79.

In order to understand whether family income represents a barrier for college enrollment on top of its impact on academic ability, Figure 3 breaks down each income group in three subgroups according to test scores terciles.

While there seem to be some differences across income groups, overall the disparity is not dramatic. Almost 85% of the individuals in the "High Income" - "High AFQT" group attend college, while the corresponding figure for the high achievers in the low and "Middle Income" group is lower by approximately 10 percentage points. Similar gaps can be noted for the individuals in the "Middle AFQT" group, while the differences are even smaller between those that score poorly in the test.

On the basis of this and further evidence, Carneiro and Heckman (2002) argue that college enrollment choices are mainly determined by the human capital accumulated during childhood, while credit constraints and other frictions are unlikely to play a big role. As discussed in the next section, however, the pattern displayed in Figure 3 masks enormous heterogeneity across income groups in the quality of the college experience.

Figure 3: College Enrollment by Family Income and AFQT Scores



Notes: Height of the bar represents share with more than 12 years of schooling within each family income and test scores group. Source: NLSY79.

3.2 Intensive Margin

Even when they attend college, students from low income families appear to pick schools that often are not up to their potential. The issue of "academic undermatch" has been at the center of a small but growing literature in educational economics, which has consistently shown that the problem is pervasive in the US, especially within low income groups and ethnic minorities (see, among the others, Cabrera and La Nasa (2001), Hill and Winston (2010), Pallais and Turner (2006) and Smith et al. (2013)). A particularly enlightening study for my purposes is Smith et al. (2013), which uses nationally representative data to quantify the extent of academic undermatch for students of different socioeconomic groups. According to their definitions, 49.6% of students with a lower socioeconomic status are undermatched, while the corresponding figure for students with a higher socioeconomic status is 34%. The contrast is starker for potential high achievers: 60% and 50.4% of disadvantaged students who potentially have access to "selective" and "somewhat selective" colleges are undermatched, while the corresponding figures for richer students are 43.3% and 28.7%.

A similar message emerges from the work of Hoxby and Avery (2012): the authors document that the majority of low income students who do extremely well in standardized tests do not even apply to selective colleges, and overall follow seemingly inefficient application strategies. Using data from the 1979 and 1997 waves of the NLSY, Kinsler

and Pavan (2011) document that family income strongly affects the quality of the college attended, and that the effect is even stronger for the most recent wave.

A related finding reported by Hoxby and Avery (2012) is that students from low income families choose to attend colleges closer to their place of origin. This might reflect a gap in information about better alternatives, as argued by Hoxby and Turner (2013), or more generally the fact the distance from home embodies a larger cost for low income individuals. Since they disproportionately come from disadvantaged regions, lack of mobility makes them even more likely to attend institutions of lower quality.

Substantial disparities in time use during college have also been documented. For example, and Belley and Lochner (2007) find that poor students are disproportionately more likely to work part time during college, an aspect that might significantly impact their learning experience.

Another crucial dimension over which college experiences are highly heterogeneous across US students is given by the type of degree it terminates with. While Figures 1 and 3 classify as attending some college any student who goes beyond the 12th grade, many of these students eventually drop out without obtaining any formal recognition, while others are awarded with bachelors and graduate degrees. Figure 4 restricts attention to students in the "High AFQT" group¹¹ to document that those from low income families attending some college fare worse in terms of the obtained degree. Particularly puzzling is the gap in the dropout rate: students in the "Low Income" group are twice as likely to terminate their college career without any formal recognition compared to those in the "High Income" group, despite the fact that we are considering only high achievers in terms of test scores from both groups.

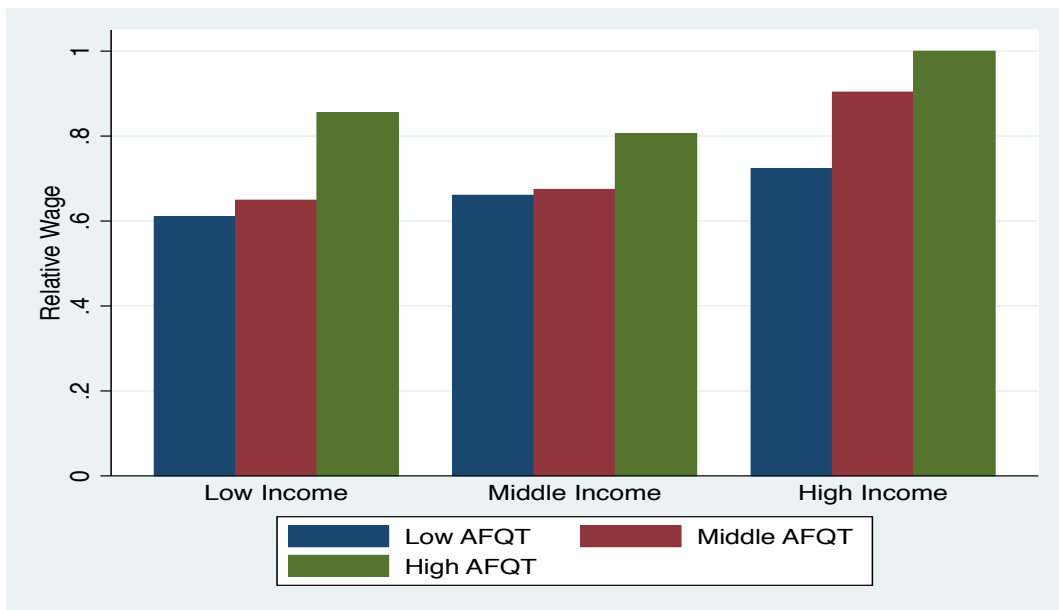
Are all these dimensions of college investment important for human capital accumulation? This is obviously a difficult question to address empirically. While there is quite convincing evidence on the fact that college quality matters (Black and Smith, 2006; Kinsler and Pavan, 2011), and it is well known that advanced degree are associated with substantial advantages in the labor market¹² (Frazis, 1993; Jaeger and Page, 1996; Park, 1999), the relevance of other factors discussed in this section is hard to identify. A possible way to shed some light on the combined impact of these differential investments on the intensive margin is to compare subsequent earnings of college students across family income groups. To the extent that wages reflect workers' marginal product, earning gaps between students with similar skills at the beginning of their college career (as

¹¹The results are very similar for the other ability groups.

¹²While it is difficult to disentangle to what extent wage premia are due to a "sheepskin effect" or differential human capital accumulation, it seems uncontroversial that completing a given degree entails benefits compared to stopping short of it.

measured by the AFQT score) might be attributed, at least in part, to differences in the overall quality of their college investment. Of course this comparison is only suggestive, given that labor markets might not be fully competitive, family connections could help also in the job search process or simply AFQT scores might underestimate the human capital gap at the end of high school. Nevertheless, the pattern emerging from Figure 4 is informative and striking: at every level of pre-college skills¹³, higher family income is reflected in substantially higher wages.

Figure 4: Relative Wages by Family Income and AFQT Scores



Notes: Height of the bar represents the relative average wage for each group compared to the "High Income"- "High AFQT" group. Source: NLSY79.

4 Discussion and Conclusions

The previous section documents that many low income students with high potential do not get a college education of the same level of their wealthier peers. But exactly what friction is preventing them from doing so? Addressing this question is clearly key to the design of appropriate policies that might make the US higher education system more fair and meritocratic.

Borrowing constraints represent a possible culprit widely explored in the economics literature. Since future earnings might not be pledged as collateral, individuals from

¹³The only exception is given by the fact that the high achievers in the "Low Income" group earn slightly more than the corresponding students in the "Middle Income" group.

poor families are unable to finance as much education as they would want. The evidence on the relevance of this mechanism for the US higher education system is rather mixed: Cameron and Heckman (1998), Keane and Wolpin (2001) and Carneiro and Heckman (2002) argue that they are binding for at most a small share of students, while Brown et al. (2012) find that they do play an important role when the different incentives of parent and children are explicitly taken into account. It is unclear to what extent such friction can account for the predominant role of the intensive margin discussed earlier: while differences in the dropout rate or in hours worked during college might be partially ascribed to financial motives, attending colleges of higher quality is not necessarily more expensive for high achieving students, as documented by Hoxby and Avery (2012).

Recent contributions have considered barriers of different nature. A common finding is that students from disadvantaged background know less about the quality of different colleges and their relative standing in terms of academic ability. Hoxby and Turner (2013) and Carrell and Sacerdote (2013) implement interventions aimed to that providing information and mentoring to low income students during the application process, and find that very simple and cost effective policies can raise their enrolment rate and lead them to apply to institutions of the appropriate quality. On a related note, recent work in psychology (Goodman and Gregg, 2010) suggests that the socio-economic status shapes children's and parents' attitudes towards higher education, with low income families developing a more skeptical view on the importance and desirability of a successful college career. Informational and aspirational barriers seem to have great potential in explaining the college investment gaps across family income groups, and are also directly consistent with the importance of the intensive margin emphasized in the previous section. It is unclear whether this should be taken as good news for policy. On one hand informational interventions, such as the one developed by Hoxby and Turner (2013), are relatively simple and cheap to implement, at least compared to financial aid. On the other hand, some of the factors that hold back low income students are probably hard wired in the familiar and social environment, and policies might have a hard time affecting those. To this end, an approach that integrates findings from economics and psychology seems to be the way forward.

As emphasized in this essay, these policies have the potential to make the US economy more productive through a better allocation of talent. But how large would these gains be? Answering this question requires a formal model taking a stand on the production technology for human capital and final output, and on the process that governs the allocation of college resources to students of different abilities and family backgrounds. In Rossi (2015) I provide such a model and I find that efficiency gains from

the removal of these barriers are potentially very large, on the order of magnitude of 10% of the US GDP¹⁴. While this figure might be specific to the methodology used in that paper, the general message is that the benefits from correcting distortions at the college enrolment stage are quantitatively not trivial.

Evidence suggests instead that college access opportunities have become more unequal over time. In light of the quantitative results mentioned above, the widening gap between socioeconomic groups has probably already left its mark on the US economic performance over the last few decades. In an era where the human capital boost due to the baby boom generation is fading out and new sources of growth are difficult to come by, a more equal access to educational resources might be exactly what is needed.

Word Count: 4336 words

¹⁴This estimate is relative to the combined effect of removing barriers of every nature, i.e. informational, financial or other. The inference in Rossi (2015) does not depend on which friction is more important in practice.

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