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QUANTIFYING RACIAL DISCRIMINATION IN THE 1944 G.I. BILL

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Keywords: Segregation, Equivalent variations, Education, Housing, Unemployment

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November 2, 2022

Abstract

Did the G.I. bill discriminate against Black World War II veterans? Using a variety of historical sources, I estimate similar average amounts of G.I. benefits received by Black and white World War II veterans. However, there were disparate welfare implications, as white veterans' cash-equivalents of the benefits were, on average, about three-quarters of the government's expenditure, while the average cash-equivalent among Black veterans was only a half of the government's expenditure.

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1 Introduction

Towards the end of the Second World War, the U.S. government passed the 1944 Servicemen’s Readjustment Act, commonly known as the G.I. bill.¹ The G.I. bill promised returning soldiers a variety of benefits such as education subsidies, home loan guarantees and unemployment insurance. By the end of World War II, there were over 15 million veterans who were eligible for these benefits. For many, the benefits were instrumental in clearing the path to homeownership and higher education.

There has been some debate regarding whether the G.I. bill, either by design or by implementation, discriminated against Black veterans (see Katznelson and Mettler [2008] for a lively exchange).² The language of the G.I. bill was race-neutral: Black and white veterans were entitled to the same benefits. In addition, subsequent surveys revealed similar participation rates among Black and white veterans. Yet, because of segregation, Black veterans were more restricted in the *ways* in which they could utilize their benefits. They could not use their G.I. benefits to attend all-white colleges or to buy housing in all-white neighborhoods. While Black and white veterans were able to access the same benefits, those benefits did not represent the same opportunities.

This paper constructs estimates of the racial disparities in G.I. benefits among World War II veterans. The results are summarized in Table 1. I consider two alternative measures of racial disparities. The first measure is based on government spending amounts. I estimate that the average net-present value of G.I. benefits per Black veteran was, in fact, slightly higher than the average net-present value of G.I. benefits per white veteran. This first measure captures racial disparities from the perspective of government spending. If equality is to be evaluated based on the distribution of public resources, then the G.I. bill was fair.

However, the government’s perspective is different from the veterans’ perspectives. Because of segregation and different economic conditions, Black veterans were unable to extract the same value from their G.I. benefits – even though they cost the same. A second measure of disparities is based on *cash equivalents*. The cash equivalent of a subsidy is the veteran’s willingness to pay for it. It is a measure of the dollar value of the subsidy from the veteran’s perspective. According to this measure, Black veterans received only about 70% of the G.I. benefits that white veterans received. If equality is to be evaluated based on the cash-equivalents of the benefits, then the G.I. bill was highly discriminatory.

This paper is related to an emerging economics literature on racial disparities in the United States (Darity et al. [2020], Boerma and Karabarbounis [2021], Brouillette et al.

¹For a detailed overview of the law at the time of legislation, see Lashbrook [1944].

²See also Blakemore [2019].

Table 1: Estimated average net-present-values of G.I. benefits by race

Benefit (1944 dollars)	Government Spending		Cash Equivalent	
	White	Black	White	Black
Education and training	\$427	\$477	\$245	\$ 107
Housing loans	\$101	\$70	\$89	\$61
Readjustment allowances	\$237	\$278	\$223	\$235
Total, 1944 dollars	\$766	\$826	\$557	\$404
Total, 2021 dollars	\$9,259	\$9,988	\$6,728	\$4,880
-with 5% real interest	\$396,000	\$428,000	\$288,000	\$209,000

Note: Estimates correspond to unconditional averages across all veterans, including those who did not use the G.I. benefits.

[2021] and Derenoncourt [2021]). Closely related is Turner and Bound [2003], who find that, while the G.I. bill led to an increase in college education for white veterans and for Black veterans who lived in the North, it had little effect on the college education of Black veterans who lived in the South. This paper differs from Turner and Bound [2003] in two ways. First, it considers the entire range of G.I. benefits, not just the education and training components. Second, rather than studying outcomes such as college attainment, it focuses on expenditure amounts and their associated cash-equivalents.

This paper is also related to the Katznelson-Mettler debate on racial discrimination in the G.I. bill (Katznelson and Mettler [2008]). Katznelson argues that the G.I. bill was highly discriminatory, as Black veterans were more limited in the ways in which they could utilize and access their G.I. benefits. Mettler argues that, despite the highly-segregated environment, the bill allowed Black veterans to benefit at similar rates as white veterans. Much of the debate centers around the question of whether G.I. benefits used for non-college education and training should “count”. Black veterans were less likely to use their G.I. benefits for college, but more likely to use them for other types of training, which are suspected to be of lower quality. By estimating the cash-equivalents associated with the different components of the G.I. benefits, I am able to quantify differences in the values that the G.I. benefits had for the veterans.

2 Framework

The Oxford dictionary defines discrimination as “the practice of treating someone or a particular group in society less fairly than others”. Quantifying the extent of discrimination therefore requires taking a stance on the criterion by which fairness is to be evaluated.

In this paper, I evaluate fairness based on racial disparities in the value of dispersed benefits. Crucially, this ignores some aspects of procedural fairness. For example: I estimate that, on average, Black and white veterans received similar amounts in unemployment benefits. I use this to conclude that there was no discrimination in the disbursement of unemployment benefits. However, this finding does not mean that Black and white veterans had equal access to unemployment benefits. It is possible, for example, that Black veterans were twice as likely to be unemployed, but only half as likely to have their requests for unemployment benefits approved. More generally, it is possible that the demand for the benefits was higher among Black veterans, but that they were denied at higher rates.

Unfortunately, data limitations prevent me from documenting any inequalities in access rates. While disbursement amounts are available from veteran surveys and other sources, the surveys did not ask about claims that were denied. Consequently, it is not straightforward

to assess whether there were racial disparities in access to benefits, although there are some anecdotal evidence suggesting that this was the case (Onkst [1998]).

I therefore quantify discrimination solely based on racial disparities in the value of disbursed benefits. This still leaves open the question of what is the normatively-relevant measure of “value”. I consider two alternatives:

1. The market value of the benefits received.
2. The cash equivalent of the consumption and investment possibilities embedded in the benefits.

The two measures correspond to two different normative criteria. The first one captures Dworkin’s approach, according to which fairness should be judged according to the amount that society *spends* on each individual (Dworkin [1981]). According to Dworkin’s approach, what matters is that the tax payer sacrifices the same amount of money in recognition of each veteran’s service. This normative criterion can be interpreted as measuring fairness from the perspective of government spending.

The second measure is broadly in line with Sen’s capability approach (Sen [1980]). According to this approach, fairness should be evaluated based on the extents to which the G.I. bill expanded veterans’ consumption and investment possibilities. This depends on the degree to which the veterans’ circumstances allowed them to take advantage of the G.I. benefits, as well as on the opportunities that they had for doing so. For example, the G.I. bill made it possible for white veterans to obtain a degree from the University of Mississippi, but it did not make this possible for Black veterans (because of segregationist policy). To express the value of the consumption and investment possibilities embedded in the G.I. bill, I calibrate the cash equivalents of the benefits. Racial disparities in cash equivalents capture racial inequality in the value of the benefits from the veterans’ perspectives.

To illustrate the measures of racial disparities that I study, consider a simple setup in which there are only two goods: higher-education (h) and consumption (c). A veteran whose income is m and faces prices p_c and p_h solves the following optimization problem:

$$V(m, p_c, p_h) = \max_{h,c} E_w[u(c, wh)] \text{ s.t. } p_c c + p_h h = m \quad (1)$$

where u is an increasing utility function, w is the returns to education (which may be unknown at the time of decision-making), and E_w is the expectation operator. The function V describes the veteran’s preferences over different combinations of income and prices.

Consider a G.I. bill that subsidizes education at a rate of s . The first measure of racial disparities that I estimate is the difference in average government spending, where the gov-

ernment spending on each veteran is given by:

$$\text{Government spending} = sp_h h^*(p_c, p_h, s, m) \quad (2)$$

where $h^*(p_c, p_h, s, m)$ is the amount of higher education that the veteran chooses to consume given the subsidy.

The second measure that I estimate is the difference in the average cash-equivalents of the subsidy, which is defined based on the identity

$$V(m + \text{Cash equivalent}, p_c, p_h) = V(m, p_c, (1 - s)p_h) \quad (3)$$

Intuitively, the cash equivalent is related to the veteran's willingness to pay for the subsidy. If the veteran decides not to take advantage of the subsidy, then his cash-equivalent of it is 0. In the other extreme, if the veteran would have decided to go to college regardless of the subsidy, then the subsidy is a pure cash transfer: he can use the money that he would have spent on college for whatever he likes. In both of these cases, the cash-equivalent is equal to the amount of government spending.

The more interesting case is an intermediate case, in which the veteran decides to go to college only because it is subsidized. In this case, the cash equivalent of the subsidy is not zero, because the veteran chooses to take advantage of it. But it is not clear whether he would have preferred the subsidy over, say, an unconditional transfer amounting to 50% of the tuition. His cash-equivalent is the amount of an alternative unconditional cash transfer that makes him exactly indifferent with respect to taking the subsidy instead. It can be interpreted as the nominal value of the subsidy from the veteran's perspective.

It is worth emphasizing that both government spending and cash-equivalents depend on the prices p_c and p_h , which are the prevailing prices at the time in which the benefits were claimed. Neither depend on the realized returns to education, w , or on subsequent changes in the relative prices of consumption and education. The implication is that the subsequent increase in the returns to education and the increase in the relative cost of higher education have no bearing on the calculation of these two measures. Similarly, the subsequent appreciation of housing does not matter for the calculation of inequities in the housing benefit in 1944.

These observations are pertinent to the discussion because some of the critiques of the G.I. bill relate to its long-term effects on the racial wealth gap (see, for example, Agbai [2022]). The G.I. bill almost certainly contributed to the racial wealth gap, as white veterans disproportionately used their benefits for college education and housing, which yielded higher returns than other benefits. However, it is crucial to point out that expected returns to

education are already reflected in college tuition rates, and expected appreciation in housing is already reflected in home prices. The focus on the long-run wealth gap is misleading because it over-emphasizes long-run returns over short-run benefits, and because it confuses expected returns with realized returns. For these reasons, the approach here is to quantify discrimination in terms of the value of the benefits at the time of legislation.

2.1 Cash-equivalents

To calculate the average cash-equivalents of each benefit, I distinguish between veterans who used the benefits and those who did not. The cash-equivalent is set to 0 for all veterans that did not use the benefits. To calibrate the cash-equivalents for the veterans who received benefits, it is convenient to make some functional-form assumptions about the utility function. For each expenditure category, x , (housing, education or unemployment), assume that the utility function over x and other consumption expenditure, c , takes the form:

$$U(c, x) = c + \Psi x^\sigma \tag{4}$$

This functional form assumes that there exists some good, c , which has no diminishing marginal utility. Furthermore, it is assumed that Black and white veterans face the same price of that good.

Given this functional form, the cash-equivalent depends on the parameters σ and Ψ . I assume that the parameter σ , which captures the technological substitutability with other forms of consumption, was the same for white and Black veterans. However, I allow for the possibility that Black and white veterans had different values for Ψ . This can capture, for example, racial differences in the returns to schooling, or racial differences in the quality of schooling or housing that could be obtained given segregation and redlining policies. Racial differences in Ψ capture both racial differences in the quality of x (for example, differences in the quality of higher education opportunities), and racial differences in background conditions that affect the “usefulness” of x . For example, the college subsidy was less useful for veterans who were not college-ready.

Appendix A describes how, given this functional form, equivalent variations can be inferred from (a) estimates of the subsidy rates, s ; (b) the log-change in the consumption of x that is attributed to the subsidy. The preference parameters, σ and Ψ , are generally unobservable, but they can be inferred from veterans’ responses to the subsidies. To illustrate the approach, consider the following example. Assume that tuition was subsidized at the rate s , and that a certain veteran chose to buy h units of higher education. The solution to his constrained-optimization problem (of maximizing u subject to his budget constraint) im-

plies that the marginal utility from purchasing additional education is similar to the marginal utility from an additional unit of consumption, so that

$$\sigma\Psi h^{\sigma-1}p_h(1-s) = p_c$$

This optimality condition implies that only certain combinations of σ and Ψ are consistent with his decision to purchase h units of education, given prices p_h and p_c and the subsidy rate, s . The parameters σ and Ψ can be separately identified by considering empirical estimates of the causal effects of the subsidy. If, without the subsidy, the veteran would have purchased $\underline{h} < h$ units of education, then σ and Ψ must also solve

$$\sigma\Psi \underline{h}^{\sigma-1}p_h = p_c$$

Thus, we have two equations in two unknowns, which can be used for inferring the preference parameters Ψ and σ .

Uncertainty and caveats. Within each racial group, this approach distinguishes only between two types of veterans – those who received benefits and those who didn't. It assumes away any heterogeneity in cash-equivalents among veterans of the same racial group who received benefits.

In addition, there is some uncertainty about the validity of this functional-form assumption. It's main advantage is that it allows for a simple computation of cash-equivalents. Assuming different functional forms for the utility functions may alter the results.

3 Benefit amounts

This section discusses the methodology for estimating the G.I. benefit amounts and their associated cash equivalents. In what follows, I focus on the net-present-value of G.I. benefits, at the time of legislation (1944). G.I. benefits were claimed over several years: veterans were eligible for unemployment and self-employment benefits until 1953, for education and training benefits until 1956, and for home loan guarantees for many decades.³ Consequently, computing the net-present value of the benefits requires inflation adjustments, and taking a stance on the real interest rate. Inflation adjustments are made based on the Consumer

³The original legislation included an expiration of the home loan benefits, but it was extended several times: see Fetter [2013].

Price Index (CPI).⁴ I set the real interest at 5%.⁵

Tables 13 and 14 in the appendix detail the data sources used for the analysis.

3.1 Education and training

The G.I. bill included provisions for education and training benefits. The benefits could be used for a variety of education and training programs, including college, high school completion, trade schools and on-the-job training. The benefits had two components: tuition subsidies and stipends.

The rates at which veterans took advantage of the education and training benefits can be estimated based on the 1979 Survey of Veterans (SOV), and are summarized in Table 2.⁶⁷ As pointed out by Turner and Bound [2003] and Katznelson and Mettler [2008], the survey suggests that Black veterans were at least as likely to take advantage of the education and training benefits. However, white veterans were more likely to use their benefits for college, while Black veterans were more likely to use their benefits for other types of education and training.

The 1950 Census confirms that Black and white veterans used the education benefits at similar rates (see Table 3). In 1950, about 20% of WWII veterans, both Black and white, report being “in school”. The difference between Black and white veterans is not statistically or economically significant, which is consistent with the SOV.

I assume that there was no tuition for apprenticeships, on-the-job training, or farm training. To estimate tuition costs for other education and training programs, I distinguish between three categories: high school, technical schools (which group the categories “flight school”, “other school” and “correspondence” in the 1979 SOV), and college.

Tuition rates for each of these categories can be estimated based on the Study of Consumer Purchases in the United States, 1935-1936.⁸ The survey documents the expenditure

⁴Unfortunately, Federal Reserve Bank of St. Louis (FRED) reports the CPI only starting from 1947. I therefore use the CPI reported in: Robert J. Shiller, *Stock Market Data Used in “Irrational Exuberance”* Princeton University Press, 2000, 2005, 2015, updated; available at <http://www.econ.yale.edu/shiller/data.htm>.

⁵Interest rates vary based on the asset’s underlying liquidity and risk. For example, in 1955, the 10-year annualized real stock return was around 10%, while the 10-year annualized real bond return was around 1% (see Robert J. Shiller, *Stock Market Data Used in “Irrational Exuberance”* Princeton University Press, 2000, 2005, 2015, updated; available at <http://www.econ.yale.edu/shiller/data.htm>). I choose 5% as an intermediate value.

⁶I am grateful to the National Bureau of Economic Research for giving me access to the microdata and the codebook.

⁷The estimated participation rates similar (but not identical) to those reported in the of the Veterans Administration [1950] (1950 SOV), which were 43% for whites and 49% for “non-whites”.

⁸Published by The Inter-University Consortium for Political and Social Research (ICPSR 8908): see <https://www.icpsr.umich.edu/web/ICPSR/series/171>.

Table 2: Education and training benefits

	Participation rate		Average Months	
	White	Black	White	Black
College	17.3 % (16.3,18.5)	10.6% (7.2,13.9)	23.3 (22.4, 24.3)	26 (21.8, 30.3)
High school	0.7% (0.5,1.1)	5.3% (2.8,7.7)	13.2 (9.8, 16.6)	17 (11.4, 22.6)
Other school	11.8% (10.8, 12.7)	21.1% (16.7, 25.6)	12.7 (11.9, 13.6)	14.5 (12.3, 16.6)
On the job	9.8% (8.9, 10.7)	10.3% (7, 13.7)	17.1 (16.1, 18.2)	15.2 (11.6, 18.8)
Any program	39.1% (37.7, 40.1)	46.2% (40.8, 51.7)	18.6 (18, 19.2)	17.2 (15.5, 18.9)

Note: Estimates are based on a sample of 4,220 white WWII veterans and 309 Black WWII veterans. Average months correspond to average benefit months conditional on participation. Estimates are based on sample weights, and are conditional on having served for at least 90 days (thus being eligible for benefits). The category “other school” groups together the categories “Flight school (not correspondence)”, “Other school (not correspondence)” and “Correspondence”. The category “On the job” groups together the categories “Apprentice”, “On-the-job” and “Farm training”. Brackets correspond to 95% confidence intervals.

Table 3: Share of WWII veterans in school during the 1950 Census

	White	Black
In school (%)	21.2	19.2
	(20.6,21.7)	(17.3,21.1)

Note: Estimates are based on the 1950 Census, which includes 20,020 white WWII veterans, and 1,592 Black WWII veterans. Brackets correspond to 95% confidence intervals. Estimates are based on sample weights.

patterns of households during 1935-1936, including education expenditures. It asks about annual expenditures on tuition and on books and school supplies. It also asks how many household members attend school, which can be used to convert household expenditures to measures of expenditures per student. The survey distinguishes between high school, business or technical school, and college. The survey also classifies households by race. This allows me to create a measure of tuition cost by institution type and by race.

To convert the 1935-1936 measures to 1944 dollars, I inflate estimates using category-specific price indexes from the Bureau of Economic Analysis.⁹ To adjust college prices, I use the price index for Higher Education; to adjust high school prices, I use the price index for Nursery, elementary, and secondary schools; and, to adjust the tuition of the “other schools” category, I use the price index for Commercial and vocational schools.¹⁰ To adjust the price of books and supplies, I use the price index for “Educational books”.

Table 4 presents estimates of the inflation-adjusted costs of tuition and books for the different education and training categories by race. Because the VA paid only up to \$500 for tuition and books, the data is censored at 500. However, the uncensored estimates are similar, as tuition rates of over \$500 were rare at the time (see Table 5).¹¹

The estimates suggest that, in 1935-1936, white people attended slightly more expensive high schools and colleges. However, technical training was almost twice as expensive for Black people. I am not sure why that is. The sample size is small: there are only 11 observations of Black households enrolled in technical schools. However, the data for these 11 households consistently shows tuition rates that are higher than the tuition rates for white

⁹Table 2.5.4. Price Indexes for Personal Consumption Expenditures by Function.

¹⁰In principle, it is necessary to account for the fact that not all veterans used their education benefits in 1944, but rather they used it over the period 1944-1956. However, according to Table 2.5.4, the relative prices of higher education and commercial and vocational schools remained stable throughout this period.

¹¹The table illustrates that the \$500 limit was relevant only for college tuition, and only in a small fraction of cases, as most tuition rates were well-below the \$500 limit.

Table 4: Average annual costs of tuition and books (1944 dollars)

	High school	Technical school	College
White	\$18 (13, 23)	\$81 (53, 109)	\$202 (172, 233)
Black	\$12 (7, 15)	\$169 (74, 265)	\$173 (122, 224)

Note: Estimates are based on the Study of Consumer Purchases in the United States, 1935-1936. They are adjusted to 1944 dollars using the appropriate price indexes from the BEA. Brackets correspond to 95% confidence intervals.

students. The higher estimate is not driven by outliers (this is also reflected by the confidence interval). The data suggests that similar proportions of Black and white students enrolled in technical training enroll in private institutions (about half). Within public technical training institutions, tuition rates are similar for Black and white households. The difference in tuition rates comes from private institutions.¹²

In addition to subsidizing tuition, the G.I. bill paid stipends. Stipend amounts varied with the number of dependents. According to Table B1 in Bound and Turner [2002], stipends depended on whether the veteran was single, had one dependent, or two or more dependents. I use the 1950 Census to estimate the share of veterans in school which fall into each of these categories (no dependents, one dependent, or more than one dependent). The VA Annual Reports¹³ document the number of veterans who claimed education and training benefits in each year. Table B1 in Bound and Turner [2002] describes the stipend amounts in each year, as a function of the number of dependents. Based on this information, I estimate the average inflation-adjusted monthly stipend to be around \$66 (for both Black and white veterans).

Overall, these estimates suggest that government spending on college was higher for white veterans than for Black veterans, but that this difference was offset by the difference

¹²The survey includes 6 Black households with students enrolled in private technical institutions, and 19 white households with students enrolled in private technical institutions. The tuition rates for all 6 Black households is above the median tuition rate for the white households.

¹³Available at <https://www.va.gov/vetdata/Report.asp>.

in spending on other schools, which was higher for Black veterans.¹⁴

To compute the cash-equivalents, it is necessary to estimate the implied subsidy rates. The costs of attending school or training have two components: tuition and opportunity costs. Table 5 details the subsidies on these two components, for the different education and training types. The table suggests that tuition subsidies were similar for Black and white veterans. However, opportunity costs for attending school were lower for Black veterans, as they had lower average wages (see table 7). Based on these differences, I estimate the implied subsidy rates reported in Table 6. According to these estimates, the implied subsidy rates for Black veterans were close to 100%, while for white veterans they were significantly lower.

The high implicit subsidy rates raise the question of why *only* 46.2% of Black veterans took advantage of the education and training benefit. Since it was subsidized at close to 100%, we would have expected the vast majority to take advantage of the benefit *if* there were education and training opportunities that could benefit them. The fact that the uptake was far from 100% is indicative of a low Ψ : many veterans did not take advantage of this program because it did not provide education and training opportunities that could meaningfully advance their goals.

To calibrate σ , it is necessary to know how the G.I. education benefits affected educational attainment. Bound and Turner [2002] estimate that the G.I. benefits increased college attendance for white veterans by between 0.15 and 0.52 years. For the purpose of this calibration, I assume that the education benefits increased college attainment by 0.3 years, or 2.7 months. This implies an estimate of $\sigma = 0.18$.

These estimated cash-equivalents suggest that, although they cost more, the education and training benefits that Black veterans received were substantially less valuable to them. The higher uptake among Black veterans is attributed to the higher subsidy rates.

Uncertainty and caveats. The rates of usage of different education and training benefits are somewhat imprecisely estimated. For example, the 95% confidence intervals for the average number of benefit months for Black veterans is between 6.3 months and 8.8 months. This range implies that estimated government spending on stipends for Blacks may be 15% above or below the point estimates. The confidence bands also suggest that tuition rates for

¹⁴To calculate the net present value of the benefits, it is necessary to account for the fact that benefits were claimed between 1944 and 1956. I apply a real discount rate of 5% and calculate the average discounting applied to school benefits and on-the-job training benefits, based on data from the VA Annual Reports for fiscal years 1946-1956. The reports list the number of veterans receiving training benefits by quarter. The results suggest that, to account for the time pattern of benefits, it is necessary to multiply the average real benefit amounts by 0.83 (both for school benefits and for on-the-job benefits).

Table 5: Subsidies on education and training: breakdown

	Average Cost	Average G.I. benefit	Subsidy rate
Tuition and books, college: white	\$235	\$202	86%
Tuition and books, college: Black	\$188	\$173	92%
Tuition and books, other schools: white	\$81	\$81	100%
Tuition and books, other schools: Black	\$169	\$169	100%
Tuition and books, high school: white	\$18	\$18	100%
Tuition and books, high school: Black	\$12	\$12	100%
Forgone labor: white	\$1,532	\$792	52%
Forgone labor: Black	\$940	\$792	84%

Note: Entries represent annual costs and benefit amounts. Tuition costs are estimated based on the 1935-1936 household expenditure survey, and converted to 1944 dollars using the appropriate BEA price indexes. G.I. benefits for tuition correspond to the average of the censored distribution of tuition costs, where the censoring reflects the VA limit of \$500 per year. Forgone labor costs are estimated based on the 1950 census, and the VA benefit amount corresponds to the average annual stipend (both expressed in 1944 dollars).

Table 6: Calibration results: subsidies on education and training

	College	Other schools	High school	On-the-job
White	58%	54%	52%	52%
Black	87%	87%	84%	84%

Table 7: Monthly wages for World War II veterans that were not in school, 1950 (1944 dollars)

	White	Black
Monthly wage	\$128	\$78
	(\$126,\$129)	(\$75,\$82)

Estimates are based on a sample of 16,484 white WWII veterans and 1,292 Black WWII veterans that were not attending school, from the 1950 Census. Estimates are based on sample weights, and brackets correspond to 95% confidence intervals.

Blacks may be up to 17% above or below their point estimates. Estimates for whites are somewhat more precise (because there is a larger sample).

This implies uncertainty regarding the amounts of government spending. In particular, it is impossible to rule out with reasonable degrees of confidence that there were no racial differences in average government spending on education and training benefits. Better data, such as VA administrative records, would allow for the construction of more precise estimates.

There is also some uncertainty with respect to the appropriate calibration of the elasticity parameter, σ . However, the gaps between the government spending amounts and the cash equivalents are primarily driven by the high implied subsidy rates. The subsidy rates are estimated based on the costs of education and the market wages. Market wages are estimated with good precision from the Census data.

There is also some uncertainty about the estimated education costs. Education costs are assumed to follow the same patterns after WWII as they did in 1935-1936; however, it is likely that the G.I. bill allowed veterans to enroll in more-expensive programs. This suggests that the costs to the government were higher than what I estimate here. There is also uncertainty about the estimates of the 1935-1936 costs, and in particular the high estimated cost of technical training for Black people, which is estimated based on only 11 observations.

3.2 Home loan guarantees

One of the G.I. benefits was access to home loan guarantees. VA-guaranteed loans were regulated to have low interest rates, low down-payments and long maturities.¹⁵

The home loan guarantee program was extended several times, so veterans remained eligible for VA-guaranteed loans throughout their adulthoods. Consequently, the share of veterans who had ever used VA loans increased over time (see Table 8). In 1950, few veterans took advantage of VA loan guarantees. Furthermore, at the time, white veterans were three times more likely than Black veterans to have VA-guaranteed home loans.

However, this racial disparity substantially decreased over the years. In 1987 (when most veterans were in their 60s), about 37% of white WWII veterans had used a VA loan at some point, and the corresponding number for Black WWII veterans was 32%. The difference between these rates is not statistically significant.

There were some systematic differences between Black and white veterans in the timing and amounts of their VA loans. According to the 1979 survey, first-home purchases of Black veterans happened, on average, 4 years later than first-home purchases of white veterans. The average purchase price of their first homes (after adjusting for inflation) was 19.4% lower. Taking into account the timing and purchase prices, I estimate that the average net-present-value of white veterans' VA-financed first homes was \$5,283, and the average net-present-value of Black veterans' VA-financed first homes was \$3,795.

The extent to which borrowers benefited from VA loan guarantees depends on their counterfactual mortgage rates. For example, a borrower that was assessed to have low default risk would have been able to borrow at favorable rates, regardless of the VA guarantee. In contrast, the terms of the VA loans would have constituted a significant improvement for borrowers that were considered more risky by conventional mortgage issuers.

Some evidence of racial differences in conventional mortgage terms are documented in the 1950 Residential Finance Survey (RFS).¹⁶ In 1950, Black homeowners in every income bracket bought homes that were cheaper than the homes of white homeowners in the same income bracket. This suggests that they had less favorable mortgage terms, making home purchases relatively more expensive.¹⁷ One factor that may have contributed to unfavorable conventional loan terms was higher delinquency rates among nonwhites. Among all home-

¹⁵The 1960 Residential Finance Survey confirms that VA loans had less variable terms than conventional loans. For example, virtually 100% of VA loans had interest rates of between 4% and 5.5%, with a median of 4.5%. For conventional mortgages, there was much more variation: 62% of loans had interest rates of over 6%, and about 10% had interest rates of below 4.5 percent, with a median of 5.6%.

¹⁶See Ratcliff et al. [1957].

¹⁷Ratcliff et al. [1957]: Page 68 and Table 69.

Table 8: Percent of veterans who had used a VA loan guarantee

	1950 SOV	1950 RFS	1979 SOV	1987 SOV
White	13%	6%	39%	37%
			(38%, 41%)	(36%,39%)
Black	5%	2%	29%	32%
			(24%, 34%)	(26%,38%)

Note: Estimates correspond to unconditional averages across all veterans, including those who did not take advantage of the G.I. benefits. The 1979 SOV estimates are based on a sample of 4,428 white WWII veterans and 323 Black WWII veterans who served for at least 90 days. The 1987 SOV estimates are based on a sample of 3,336 white WWII veterans and 262 Black WWII veterans. Estimates are based on sample weights, and brackets correspond to 95% confidence intervals. The estimates from the 1950 RFS were constructed based on Table 68 in Ratcliff et al. [1957], which allows for the construction of estimates of VA-backed mortgages per white and Nonwhite veteran (assuming 14 million white WWII veterans and 1 million nonwhite WWII veterans). The estimates from the 1950 SOV correspond to participation rates in all VA loan guarantee programs, which include also business loan guarantees.

owners, the delinquency rate in 1950 was 5.8%. Among nonwhites, the rate was 13.2%.¹⁸ In part, this difference is explained by the lower average income of nonwhite borrowers. Regardless of the source, differences in delinquency rates likely translated into differences in mortgage terms.¹⁹

There were also racial disparities in access to Federal Housing Authority (FHA) loans. The terms of FHA loans were only slightly less favorable than those of VA-guaranteed loans. Consequently, the VA guarantee did not imply a high subsidy for veterans who would have qualified for FHA loans. It is likely that white veterans would have qualified at higher rates than Black veterans: According to the 1960 Residential Finance Survey, 4% of VA loans were for nonwhite households, whereas only 2% of FHA loans were for nonwhite households.

Because I do not have direct information on mortgage terms by race, I calibrate counterfactual mortgage rates based on the following assumptions. First, I assume that the shares of veterans that would have qualified for FHA loans are the same as in the non-veteran population (24% for whites and 13% for nonwhites). Second, I assume that FHA loan terms were the same for Black and white borrowers, but that conventional loans were not. For

¹⁸See page 71 and Table 62 in Ratcliff et al. [1957].

¹⁹Direct evidence of racial differences in mortgage costs is available for more-recent time periods. See, for example, Bayer et al. [2018].

conventional loans, I estimate the relative risk premiums of white and Black veterans based on the relative delinquency rates of white and nonwhite borrowers as reported in the 1950 Residential Finance Survey.

Appendix B describes the calculation of the value of the VA loan guarantee, and Table 9 details the calibration parameters.

The implied subsidy rates can be calculated based on the ratio of the net present value of the mortgage payments guaranteed by the VA, and the net present value of the mortgage payments for the same home if it were financed through a conventional or FHA loan. This calculation implies that the VA loan guarantee subsidized housing for Black veterans at a higher rate than for white veterans, reflecting the assumption that Black veterans had less favorable terms on conventional loans, and more limited access to FHA loans.

To calibrate the parameter σ , I rely on the findings of Fetter [2013]. Fetter [2013] estimates that, as a result of the G.I. bill, veterans purchased their homes about 5 years earlier. He finds no strong effects on selection into homeownership. Using his methodology, I find no statistically-significant effect on home values conditional on homeownership.²⁰ I therefore assume that the counterfactual net-present value of spending on homes is given by the same value, discounted by 5 years using a real interest rate of 5%. The implied estimates of the structural parameters are summarized in Table 10.

The results of this analysis are summarized in Table 1. According to these estimates, both the government spending on housing benefits and its cash-equivalents were lower for Black veterans than for white veterans.

Uncertainty and caveats. The primary source of uncertainty is the estimated market values of the home loan guarantees. This estimation requires making substantial assumptions about the mortgages that Black and white veterans would have been able to obtain without VA guarantees. The estimates are based on aggregates from the non-veteran population, which accounts neither for selection into military service nor for selection into homeownership. Better information about credit conditions would allow for more credible estimates of the market value of the loan guarantees.

There is also some statistical uncertainty about the rates of usage of VA loans, particularly among Black veterans. For example, the share of homeowners among Black World War II veterans in 1979 is estimated to be between 62% and 70%. Of those, the share that took

²⁰I use the 1960, 1970 and 1980 Census, which report home values. I instrument veteran status with birth cohort cutoffs (as in Fetter [2013]) and regress the log of home values on (instrumented) veteran status, including year fixed-effects, birth-quarter fixed effects, and a continuous birth cohort control. I find that veteran status was associated with home values that are about 3% higher, but the effects are not statistically significant from 0. The confidence interval is (-5%,11%).

Table 9: Calibration inputs for housing benefits

Parameter	Value	Target
Home value, White (1944 dollars)	\$5,283	NPV of first home price, 1979 SOV
Home value, Black (1944 dollars)	\$3,795	NPV of first home price, 1979 SOV
Share of whites who used VA financing	0.37	1987 SOV
Share of Blacks who used VA financing	0.32	1987 SOV
Interest on VA loans	4.5%	Median rate, 1960 RFS
Loan to value ratio, VA loans	0.91	Median, 1960 RFS
Term, VA loans	25 years	Median, 1960 RFS
Interest on FHA loans	4.6%	Median rate, 1960 RFS
Loan to value ratio, FHA loans	0.84	Median, 1960 RFS
Term, FHA loans	24 years	Median, 1960 RFS
Interest on conventional loans, Whites	5.6%	Median rate, 1960 RFS
Risk free rate	4.12%	10-year T-bill rate, FRED
Ratio of Black and white default risk	2	Ratio of delinquency rates, 1950 RFS
Interest on conventional loans, Blacks	7%	(Derived)
Loan to value ratio, conventional loans	0.68	Median, 1960 RFS
Term, conventional loans	15 years	Median, 1960 RFS
White veterans that qualify for FHA	24%	(FHA loans)/(non-VA loans), 1960 RFS
Black veterans that qualify for FHA	13%	(FHA loans)/(non-VA loans), 1960 RFS

Table 10: Calibration of the structural parameters for computing equivalent variations

Parameter	Value
Interest rate for computing NPV	5%
G.I. bill's effect on timing of home purchase	5 years earlier
<hr/>	
Log change in housing due to G.I. bill	0.244
σ_{White}	0.78
σ_{Black}	0.76
<hr/>	
Housing subsidy, s : White	5.1%
Housing subsidy, s : Black	5.7%
Ψ_{White}	7.7
Ψ_{Black}	9

advantage of VA loan guarantees is estimated to be between 37% and 51%. Administrative data on VA loan guarantees would allow for more precise estimates.

Finally, there is some uncertainty associated with the parameter σ . This parameter is estimated based on the effect of the G.I. bill on the timing of homeownership. However, it is possible that the housing subsidy not only led to earlier home purchases, but also to the purchase of more-expensive homes (although I do not find strong evidence of this: see footnote 27). This would imply that the estimated change in the net-present-value of housing consumption is higher than what I use for my estimates.

3.3 Business and Farm Loans

In addition to mortgages, veterans were eligible for VA-guaranteed business and farm loans. Unfortunately, neither the 1979 Survey of Veterans nor the 1987 Survey of Veterans asks about these loans. However, the total value of these loans was relatively small: according to the VA Annual Reports, the proportion of guarantees for business and farm loans out of total guarantees peaked in 1946 at 7%, and dropped to 1.5% by 1956.

The value of these loan guarantees relative to the value of home loan guarantees can be gleaned from the ratio of loans to commitments. For home loans, VA commitments were, on average, 50% of the value of the loan. For farm and business loans, commitments were about 40%, suggesting that lenders assumed more of the risk.

Participation rates can be estimated by comparing the first two columns of Table 8. The first column reports the participation rates of veterans in all loan guarantee programs, including both home-loan guarantees and business and farm loan guarantees. The second column is an estimate of the participation rates in the home loan guarantees in 1950. The difference between the two is a plausible estimate of the participation rates in the business and farm loan guarantee programs. Both for white veterans and for Black veterans, the implied participation rates are in the single digits.

To get an upper-bound on the amount of government spending on farm and business loans, assume that the loan-to-value ratio on these loans was 100%. Under this assumption, the value of the loan is the value of the purchase. Assume further that the subsidy on these loans was 20% – about four times as high as the implied subsidies for home purchases. These numbers imply an upper bound on the government spending on business and farm loans of \$12 per veteran.

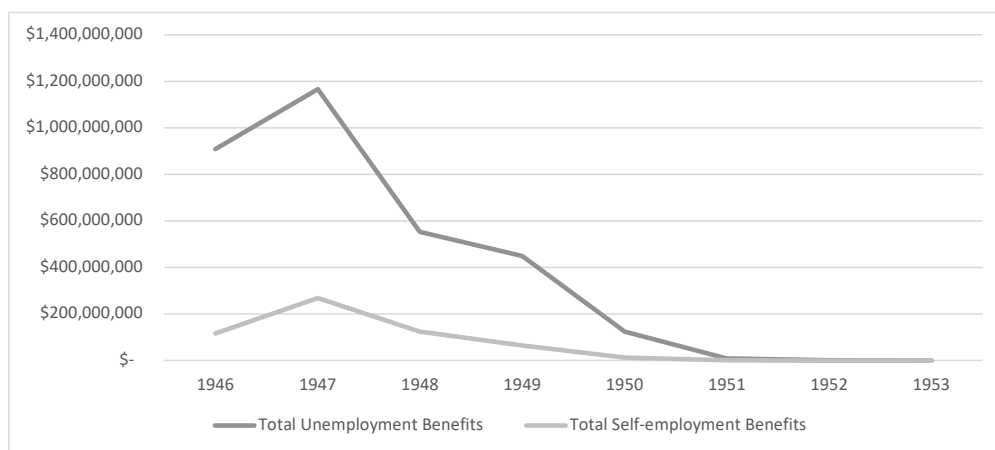
Given that the average value of these benefits was likely small, I ignore these benefits and set them to 0 for all veterans.

3.4 Unemployment and self-employment benefits

Under the G.I. bill, veterans were entitled to \$20 a week in unemployment benefits, for up to 52 weeks. The G.I. bill also included some provisions for self-employment benefits. Both benefits could be claimed for 7 years after the end of the war.

The VA Annual Reports report the annual amount of unemployment and self-employment benefits paid in each year between 1946–1953 (see Figure 1).²¹ Unfortunately, these benefits are not reported by race, and the 1979 and 1987 Surveys of Veterans do not ask about these benefits.²²

Figure 1: Disbursement of Unemployment and Self-employment benefits



Source: VA Annual Reports, 1946-1953.

The 1950 Survey of Veterans reports the participation rates in “readjustment allowances”, which include both unemployment benefits and self-employment benefits. The participation rates are reproduced in Table 11. This survey suggests that Black veterans were more likely to have received readjustment allowances than white veterans. Unfortunately, I could not obtain the estimates of the average amounts that were received.²³

There are two reasons why unemployment benefits may not have been disbursed in proportion to participation rates. First, there may have been racial differences in average unemployment duration, which would imply different average benefit amounts. I do not find evidence of this in the 1950 Census: in 1950, the average unemployment duration was about 17 weeks, both for white veterans and for Black veterans. However, it is not clear whether

²¹The eligibility period for unemployment benefits was 7 years after the end of the war, so World War II veterans were not eligible for VA unemployment benefits after 1953.

²²I have also submitted a Freedom of Information Act Request to the VA, requesting this breakdown (FOIA 22-07046-F IAD). Unfortunately they were unable to produce any records containing this information.

²³The report was obtained from the National Archives. Some of the sections are missing, including a section titled “Amounts”.

Table 11: Readjustment Allowances Participation Rates By Race

	White	Black
Participation rate	52%	61%

Source: of the Veterans Administration [1950], Table 12 (page 33).

Table 12: Weekly wages for employed World War II veterans, 1950 (1950 dollars)

	White	Black
Monthly wage	\$46.3	\$31.1
	(\$45.9,\$46.6)	(\$29.8,\$32.4)
Implied subsidy	43%	64%

Estimates are based on a sample of 37,530 employed veterans from the 1950 Census. Estimates are based on sample weights, and brackets correspond to 95% confidence intervals.

there were racial differences in unemployment duration in 1945-1949, which is when the bulk of unemployment benefits were disbursed.

Second, there is evidence of discrimination in the disbursement of unemployment benefits, particularly in the Deep South. Onkst [1998] reports that, often, Black veterans were denied unemployment benefits after refusing to accept menial and poorly-paid jobs, which the VA officers deemed “suitable” for them. Although there is currently no estimate of how widespread this type of discrimination was, it was apparently quite prevalent in some places. For example, Onkst [1998] reports that “only a “few” black veterans were drawing unemployment compensation in Alabama’s most heavily populated black counties”.²⁴

In lieu of better data, I assume that unemployment and self-employment benefits were disbursed in proportion to the participation rates reported in the 1950 SOV. The estimated government expenditures on unemployment and self-employment benefits are reported in Table 1.

The cost of unemployment is the forgone market wages. Table 12 present the average

²⁴The quote is from page 521 in Onkst [1998].

weekly wages for employed veterans by race. Unemployment benefits subsidize unemployment. Because weekly unemployment benefits were the same for Black and white veterans and the market wage of employed white veterans was higher than the market wage of employed Black veterans, the implied subsidy was higher for Black veterans. For white veterans, the average replacement rate was 43%, while, for Black veterans, the average replacement rate was 64%.

The calibration of σ is based on the findings by Landais [2015], who studies the elasticity of unemployment weeks to unemployment benefits in the United States during the 1970s and 1980s. Landais [2015] finds that a 10% increase in unemployment benefits increases the duration of unemployment by 4%. These estimates are based on replacement rates of about 50%, and are conditional on unemployment. These estimates suggests that $\sigma \approx -1.6$.

These parameters imply that the cash-equivalents of the unemployment benefits were similar for Black veterans and for white veterans, even though government spending was higher for Black veterans. This is because the implied subsidy rate on unemployment was higher for Black veterans.

Uncertainty and caveats. As highlighted above, the key uncertainty has to do with average disbursement amounts. The total amount of government spending on readjustment allowances is accurately estimated from the VA annual reports. In addition, the participation rates reported in the 1950 SOV are a reliable estimate of the shares of veterans who received *some* readjustment allowances. The key uncertainty has to do with the racial breakdown of the average amounts that veterans received conditional on claiming readjustment allowances.

4 Discussion

Concerns about racial discrimination in the G.I. bill sparked a debate about the need for corrective measures (see Katznelson and Mettler [2008]). Some legislators are in the process of proposing a bill that would extend the G.I. benefits to descendants of Black WWII veterans.²⁵ This paper aims to inform this debate by providing estimates of the racial disparities in the value of the G.I. benefits.

The estimates suggest that, on average, Black veterans received less in housing benefits, but more in education and training benefits. Taken together, the average spending per Black veteran was about the same as the average spending per white veteran. This suggests that

²⁵The name of the bill is The Sgt. Isaac Woodard, Jr. and Sgt. Joseph H. Maddox GI Bill Restoration Act of 2021; see <https://www.majoritywhip.gov/media-center/press-releases/clyburn-moulton-introduce-landmark-legislation-provide-black-wwii>.

the G.I. bill was not designed with the intent of shortchanging Black veterans. Although segregation excluded Black veterans from certain benefits, the legislators provided sufficient avenues for Black veterans to take advantage of the G.I. bill, so that, in the end, average tax dollars spent on Black and white veterans were about the same.

At the same time, from the veterans' perspectives, the G.I. bill was discriminatory because it subsidized expenditures that white veterans were more likely to have made anyway. For many white veterans, the G.I. benefits were pure cash transfers, because plans of college and homeownership were already in place. In contrast, Black veterans often took advantage of the G.I. benefits only because they were heavily subsidized. Because of segregation, what the G.I. bill offered them was of lower quality. The average cash-equivalent among Black veterans was only 70% of the average cash-equivalent among white veterans. What mattered for Black veterans was not the amount of dollars that the government spent on their benefits, but rather the extent to which those benefits could be used to advance their goals. Widespread segregation meant that, for many Black veterans, the G.I. benefits were not very useful.

This analysis refocuses the debate on two types of questions. The first is about the relevant metric of racial disparities. If racial injustice is to be judged based on government spending amounts, then, according to the estimates in this paper, the G.I. bill was fair. In contrast, if injustice is to be judged based on the value that the benefits had for the veterans, then the G.I. bill was far from just. To close the gap in the net-present-value of real G.I. benefits, it would be necessary to transfer \$80,000 to each Black World War II veteran or his descendants.²⁶

The second type of question is empirical. The analysis here illustrates that, based on publicly-available data, estimates of racial disparities in G.I. benefits require significant extrapolations. However, with administrative records, government spending amounts might be able to be estimated with better accuracy. Making such data available would significantly advance the public discussion.

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²⁶This estimate is based on the last row and last two columns of Table 1.

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A Equivalent variations

The prices of c and x are normalized to be 1 (this is a normalization of the units in which c and x are measured). The consumer's indirect preferences over income, m , and a subsidy on x , s , are represented by the indirect utility function:

$$V(m, s) = \max_{c, x} U(c, x) \text{ s.t. } c + (1 - s)x = m \quad (5)$$

The first order conditions yield:

$$\sigma \Psi x^{\sigma-1} = 1 - s \Rightarrow x = \left(\frac{1 - s}{\sigma \Psi} \right)^{\frac{1}{\sigma-1}} \quad (6)$$

Substituting into the budget constraint yields:

$$c = m - (1 - s)x = m - (1 - s) * \left(\frac{1 - s}{\sigma \Psi} \right)^{\frac{1}{\sigma-1}} = m - \frac{(1 - s)^{\frac{1}{\sigma-1} + 1}}{(\sigma \Psi)^{\frac{1}{\sigma-1}}} = \quad (7)$$

$$m - \frac{(1 - s)^{\frac{\sigma}{\sigma-1}}}{(\sigma \Psi)^{\frac{1}{\sigma-1}}}$$

Thus, the utility is given by

$$m - \frac{(1 - s)^{\frac{\sigma}{\sigma-1}}}{(\sigma \Psi)^{\frac{1}{\sigma-1}}} + \Psi \left(\frac{1 - s}{\sigma \Psi} \right)^{\frac{\sigma}{\sigma-1}} = m + (1 - s)^{\frac{\sigma}{\sigma-1}} \left(\frac{\Psi}{(\sigma \Psi)^{\frac{\sigma}{\sigma-1}}} - \frac{1}{(\sigma \Psi)^{\frac{1}{\sigma-1}}} \right) \quad (8)$$

The equivalent variation, EV , is given by the solution to:

$$m + (1 - s)^{\frac{\sigma}{\sigma-1}} \left(\frac{\Psi}{(\sigma\Psi)^{\frac{\sigma}{\sigma-1}}} - \frac{1}{(\sigma\Psi)^{\frac{1}{\sigma-1}}} \right) = m + EV + \left(\frac{\Psi}{(\sigma\Psi)^{\frac{\sigma}{\sigma-1}}} - \frac{1}{(\sigma\Psi)^{\frac{1}{\sigma-1}}} \right) \quad (9)$$

Yielding:

$$EV = \left((1 - s)^{\frac{\sigma}{\sigma-1}} - 1 \right) \left(\frac{\Psi}{(\sigma\Psi)^{\frac{\sigma}{\sigma-1}}} - \frac{1}{(\sigma\Psi)^{\frac{1}{\sigma-1}}} \right) \quad (10)$$

Calibration. By equation 6, it holds that

$$\ln(x) = \frac{1}{\sigma - 1} \ln(1 - s) - \frac{1}{\sigma - 1} \ln(\sigma) - \frac{1}{\sigma - 1} \ln(\Psi) \quad (11)$$

Assume that we know that the subsidy increased $\ln(x)$ by $\Delta \ln(x)$. Then, we can infer σ based on the equation

$$\Delta \ln(x) = \frac{1}{\sigma - 1} (\ln(1 - s) - \ln(1)) = \frac{1}{\sigma - 1} \ln(1 - s) \quad (12)$$

The parameter Ψ can then be inferred based on the equilibrium expenditure on x , using equation 11:

$$(\sigma - 1) \ln(x) = \ln(1 - s) - \ln(\sigma) - \ln(\Psi) \Rightarrow \ln(\Psi) = \ln(1 - s) - (\sigma - 1) \ln(x) - \ln(\sigma) \quad (13)$$

B Calculating the value of housing benefits

I start by illustrating how I calibrate risk premiums based on delinquency rates. Consider a risk-neutral lender, who can borrow at the risk-free nominal interest rate, r^* . Given a probability of default of p (and assuming that the lender does not value the collateral), the lending rate r must solve the indifference condition

$$1 + r^* = (1 - p)(1 + r) \Rightarrow 1 + r = \frac{1 + r^*}{1 - p} \Rightarrow r \approx r^* + p \quad (14)$$

Based on this identity, we can calibrate the difference between white conventional mortgage rates and Black conventional mortgage rates. The risk free rate can be calibrated based on the 10-year treasury rate, which, in 1960, was 4.12%, suggesting $r^* = 0.0412$. The median conventional mortgage rate for all borrowers in 1960 was 5.6%, suggesting that

$$0.056 = r^{White} = r^* + p^{White} = 0.0412 + p^{White} \Rightarrow p^{White} = 0.0148 \quad (15)$$

In 1950, the delinquency rate of Blacks was over twice as high as the delinquency rates for whites. Assuming that the relative risk of delinquency of Black and white borrowers remained roughly the same throughout the period, the risk premium for Blacks can be calibrated as

$$p^{Black} = 2 * p^{White} = 0.0296 \quad (16)$$

Next, I show how the real price of the home purchase is affected by its financing terms. Let H denote the price of a home. Consider a fixed-rate mortgage with an interest rate of r and monthly payments of m , to be repaid in T periods. The downpayment is d .

In the first period, the owner takes out a loan of $H - d$. In the next period, the owner pays the monthly payment, m , but his debt increases at the interest rate, r . His debt becomes:

$$(1 + r)(H - d - m) = (1 + r)(H - d) - (1 + r)m \quad (17)$$

In the following period, he pays an additional m , so his debt is:

$$(1 + r)((1 + r)(H - d) - (1 + r)m - m) = (1 + r)^2(H - d) - (1 + r)^2m - (1 + r)m \quad (18)$$

So, in each period, t , the remaining debt is

$$(1 + r)^t(H - d) - m \sum_{\tau=1}^t (1 + r)^\tau \quad (19)$$

In period T , the loan is paid off. This means that

$$(1 + r)^T(H - d) = m \sum_{t=1}^T (1 + r)^t$$

Hence,

$$m = \frac{(1 + r)^T(H - d)}{\sum_{t=1}^T (1 + r)^t} \quad (20)$$

How much did the person pay for the home? Let r^* denote the market interest rate. The net present value of the amount that the owner pays for the home is:

$$p = d + \sum_{t=0}^{T-1} \frac{m}{(1 + r^*)^t} = H - (H - d) + m \sum_{t=0}^{T-1} \frac{1}{(1 + r^*)^t} \quad (21)$$

The term $H - d$ is the size of the loan, and the ratio $H/(H - d)$ is the inverse of the loan-to-value ratio. Using this formula and Table 1 from Fetter [2013], we can calculate

the value of the G.I. benefits as the difference in the price of a home with the G.I. bill and without.

Table 13: Data sources

Source	Extracted statistic
1950 Census	<ol style="list-style-type: none"> 1. Racial population shares (for segregation adjustment) 2. School attendance in 1950 3. Wages (for education and unemployment subsidies) 4. Dependents (for stipends) 5. Unemployment and self-employment rates 6. Residual income (for unemployment benefits)
1950 Survey of Veterans	<ol style="list-style-type: none"> 1. Participation rates in VA benefits
1979 Survey of Veterans	<ol style="list-style-type: none"> 1. Months of each education and training benefit 2. Price and year of purchase of first home
1987 Survey of Veterans	<ol style="list-style-type: none"> 1. Number of times used VA home loans
1945-1956 VA Annual Reports	<ol style="list-style-type: none"> 1. Veterans using education benefits by year 2. Unemployment and self-employment benefits by year 3. Farm and business loan guarantees
1950 Residential Housing Survey	<ol style="list-style-type: none"> 1. Number of VA loans by race 2. Delinquency rates
1960 Residential Housing Survey	<ol style="list-style-type: none"> 1. Loan terms 2. Racial breakdown of VA and FHA loans
1935-1936 Study of Consumer Purchases	<ol style="list-style-type: none"> 1. Tuition rates
Bureau of Economic Analysis	<ol style="list-style-type: none"> 1. Inflation adjustments for tuition rates
Shiller Stock Market Data (2015)	<ol style="list-style-type: none"> 1. CPI inflation

Table 14: Data sources: Continued

Source	Extracted statistic
Federal Reserve Bank of Saint Louis	1. 10-year T-bill rate (for estimating home loan benefits)
Reticker [1945]	1. State unemployment benefits
National WWII Museum	1. Military pay (for counterfactual unemployment benefits)
Bound and Turner [2002]	1. Stipend amounts as a function of year and dependents 2. G.I. bill's effect on college attainment
Fetter [2013]	1. G.I. bill's effect on the timing of home purchases
Landais [2015]	1. Unemployment response to changes in unemployment benefits