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Barriers to black entrepreneurship: Implications for welfare and aggregate output over time☆

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ABSTRACT

The number of black-owned businesses in the U.S. has increased dramatically since the 1980s, even compared to the number of non-black-owned businesses and the rise in black labor-market participation. From 1982 to 2012 the fraction black labor-market participants who owned businesses rose from 4 to 16 percent, compared to an increase of 14 to 19 percent for other participants. Combined with other evidence, this suggests black entrepreneurs have faced significant barriers to starting and running businesses and these barriers have declined over time. Interpreted through a model of entrepreneurship, we find declining barriers led to a permanent 14.4 percent increase in (consumption-equivalent) black welfare, a 5.2 percent increase in output per worker (compared to an observed 70 percent increase), and a 9 percent increase in the welfare of other labor-market participants. These impacts are in addition to any gains from declining labor-market barriers.

1. Introduction

The number of businesses owned by black men and women in the U.S. has increased dramatically over the last several decades, even compared to the rise in black labor-market participation. In 1982 only 3.5 percent of black labor-market participants owned businesses, compared to 14.5 percent of other participants. By 2012 more than 16 percent of black participants owned businesses while the same rate for non-black participants increased to 19 percent. Although growth in the black entrepreneurship rate varied across sectors, every sector saw an increase – from a small increase in retail to

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at least a doubling in all other sectors. These numbers, along with a large volume of other evidence, suggest that black entrepreneurs have faced significant barriers to starting and running businesses, and these barriers have been declining over time. Standard theories of business dynamics suggest changes in barriers to black entrepreneurship may contribute to growth in aggregate output, as well as to the welfare of black labor-market participants. This paper aims to quantify this contribution.

This paper measures the contribution of the rise of black-owned businesses to welfare and aggregate output. We interpret the data through the lens of a model of entrepreneurship, extending Hopenhayn (1992). In the model both black and non-black labor-market participants are characterized by a distribution of entrepreneurial ability and can choose to start a firm. Output produced by black-owned firms is an imperfect substitute for output produced by other firms, implying that the share of consumer expenditure on output from black-owned firms is higher the lower is the relative price of goods from black-owned firms. At the same time, all firms face decreasing returns to scale in production. New entrepreneurs must incur a cost to start a firm, so they base their entry decision in part on their ability. We introduce four forces into the model that can act to distort outcomes for black relative to non-black participants, each affecting the cost or benefit of doing business. The first is a barrier to starting a firm, which raises the fixed (independent of size) cost of starting and running a business. This fixed cost can be interpreted as the cost of generating an idea for a new product or service, the cost of acquiring permits or licenses for particular markets, or the cost of satisfying other regulatory requirements. For example the fraction of workers with occupational licenses has increased from 5 to 23 percent since the 1950s (Timmons, 2018). To the extent that this has impacted black more or less than non-black entrepreneurs, this trend would imply an increase or decrease in the relative cost of starting a black-owned firm. If society tends to look down on black entrepreneurs, this could act as a fixed cost of running a business. Costs incurred to hide the race of an owner from potential customers can similarly be interpreted as an additional cost of running a black-owned business. Garrett Morgan, businessman and inventor of several innovative products, including a respiratory device that would ultimately be adopted by fire departments across the country, hired a white actor to pose as inventor-owner in order to overcome the prejudices of white potential customers (Cook, 2012). This worked well until he and his brother used Morgan's respiratory device to enter a collapsed underground tunnel filled with natural gas to help save trapped city workers in Cleveland. After helping to save several lives, the resulting publicity hurt sales as the public became aware that Morgan was black. Jackson (2016) discusses more recent anecdotal evidence of this phenomenon, quoting black owners who hide their identities and attribute a significant fraction of their revenue to customers who would not have otherwise contracted with their firms.

The second force is a differential cost of using capital as an input into production for black and non-black firms, which could most-obviously be driven by a higher cost of obtaining credit and less access to credit. For example Greg Calhoun, eventual grocery store magnate, was turned down for a loan by multiple Alabama banks before traveling to New York and finally securing a business loan in 1984 (Harper, 2018). He went on to create and grow a successful business empire spanning multiple sectors. More broadly, a number of observational studies report lower access to credit for black entrepreneurs, controlling for entrepreneur- and firm-specific characteristics like credit worthiness and firm employment.[1] Studies using 'mystery shoppers' find similar results when otherwise-identical black and white entrepreneurs apply for business loans.[2]

The third force we allow for in our analysis is a differential cost of employing workers. For example, a higher cost of financing working capital (as described above) can also raise the effective cost of hiring and paying employees. To the extent that workers have preferences over the identity of their employer, black entrepreneurs might also need to provide more at-work amenities or other benefits to attract workers. Giuliano et al. (2011) for example use matched employee-manager data from a large retail enterprise in the late 1990s and document evidence suggesting that employees (both white and black) are more likely to quit when their manager is replaced with a black manager.

The fourth and final force is a barrier to investing in the initial productivity of an entering firm, effectively increasing the cost of choosing a given level of initial productivity. To the extent black entrepreneurs face higher costs of accessing financial capital in general, this could result in higher effective costs of investment in productivity. To the extent entrepreneurs learn best practices from observing and communicating with other more-experienced entrepreneurs, a difference in access to these networks could result in differential costs to obtain a given level of productivity.

To evaluate how barriers have evolved over time, we use a model of entrepreneurship to interpret trends in entrepreneurship rates, average revenues per firm, average labor productivity per firm, and capital-labor ratios for black and non-black entrepreneurs. We then use the model to estimate several counterfactuals with respect to the evolution of aggregate output and the welfare of black and non-black labor-market participants. Interpreted through the model, observed trends suggest that each of the barriers described above have declined over time. Relative to non-black, startup costs for black entrepreneurs have decreased by 64 percent. The effective tax on labor for black-owned firms has decreased from 33 down to 11 percent, and the effective cost of using capital has declined slightly from 50 to 26 percent relative to the cost for non-black firms. Finally, the cost of investing in productivity for black, relative to non-black entrepreneurs, decreased significantly by two-thirds, similar to the decline in entry costs. Together, these changes increased the welfare of working black men and women by 14.4 percent, non-black welfare by 9 percent, and aggregate output per worker by 5.2 percent.[3] Further,

[1] For example Blanchflower et al. (2003); Cavalluzzo and Cavalluzzo (1998), and Asiedu et al. (2012).

[2] See Bone et al. (2014) and Bone et al. (2019) for examples.

[3] Welfare here is calculated as the welfare of labor force participants, treating labor-force participation and and relative wages as exogenous.

we find that output per worker in 2012 would be at least 8.2 percent higher if black entrepreneurs were treated identically to other entrepreneurs, while black and non-black welfare would be at least an additional 17.6 and 12.4 percent higher. This suggests the potential for significant additional gains if barriers continue to decline.

In mapping the model to the data we allow for changes in labor-market discrimination and labor productivity over time. For these measures we borrow from Hsieh et al. (2019), an important related work. Hsieh et al. examine labor-market data for black and non-black workers over time, inferring changes in labor-market discrimination (modeled as taxes on black wages) and barriers to human capital investment, relative to non-black workers.[4] From them we take the effective tax on labor income faced by black labor-market participants, as well as relative labor productivity.[5] By treating each of these variables (along with labor-market participation) as exogenous in the model, we can therefore calculate the impact of barriers to black entrepreneurship *over and above* the impact of labor-market barriers calculated by Hsieh et al. (2019).

A large literature has studied the impact on aggregate output and productivity from policies and institutions that cause resources to be misallocated across firms (Restuccia and Rogerson, 2017). Although some of the mechanisms mapping barriers to aggregate output in this paper are highlighted in the misallocation literature, we depart from much of the literature in considering barriers applied to a specific and exogenously-identified group of potential entrepreneurs. This has important implications for inferring the impact of misallocation from firm-level data. It is standard in the misallocation literature to take the observed distribution of producers as given, and infer the distribution of firm-level distortions from firm-level observations. Doing this for the U.S. in 1982, one would mistakenly infer that only a small fraction of firms face high barriers. Further, such an analysis would take as given average productivity across producers, which ignores the possibility that barriers to black entrepreneurship discourage relatively high-productivity potential black entrepreneurs from starting firms while encouraging more low-productivity non-black entrepreneurs. An important conclusion from our model is that the change in barriers to black entrepreneurship over time led to an increase in black-owned firms, and that these firms replaced less productive non-black entrepreneurs that would have entered had barriers remained at their 1982 levels. Further, our measures of group-specific distortions are less open to common criticisms of the misallocation literature. Because black/non-black status is a relatively well-defined and exogenous characteristic of business owners, we can more confidently interpret measured distortions as a real feature of the business environment. For example to the extent that average revenue products of variable inputs differ systematically across black vs other entrepreneurs within an industry, controlling for firm and entrepreneur characteristics, we can confidently infer the existence of barriers to production for black entrepreneurs. In the broader misallocation literature, in contrast, observed differences in average revenue products across firms can be interpreted in many ways, some policy relevant (like taxes) and some as features of market structure (like markups dependent on firm size).

To date, research on this topic has mostly been either descriptive, documenting the increase in the absolute number of black-owned businesses, for example Howard (2019); or focused on empirically identifying particular barriers to and determinants of black entrepreneurship, for example Blanchflower et al. (2003); Cavalluzzo and Cavalluzzo (1998); Fairlie (1999); Fairlie and Robb (2007), and Asiedu et al. (2012). Two notable exceptions are Becker (1971) and Borjas and Bronars (1989), who use theoretical models to consider how consumer discrimination can impact black entrepreneurship. They find a preference for goods and services from non-black firms lowers demand for black-owned businesses, resulting in less entrepreneurship and lower entrepreneurial income for black participants. Relative to these studies, we contribute by allowing for additional distortions related to doing business, and by focusing on how these barriers change over time.[6] This paper is the first (to our knowledge) to examine the quantitative impact of observed trends over time in black entrepreneurship on aggregate output and the welfare of black and non-black participants in the labor market. We argue that to make inferences about the impact of trends in black entrepreneurship on aggregate output and welfare, one must be careful to measure the trends relative to labor force participation and relative to non-black entrepreneurs. In particular, the most informative measures for our purposes are differential rates of entrepreneurship for black and non-black participants, the average size of black- versus non-black-owned businesses, the average revenue product of labor of black- versus non-black-owned businesses, and differential capital-labor ratios. The method we use to infer barriers to entrepreneurship from the data generates four composite measures that are meant to capture the strength of all barriers facing black-owned businesses. Our method has the unfortunate implication that we can not speak to particular observed barriers, but the comprehensive measures we end up with allow us to estimate the impact of all barriers, including those that are unobserved or difficult to quantify.

The theoretical model we use to interpret the data is similar to that used by Bento (2020) to quantify the impact of observed trends in female entrepreneurship in the U.S., and has similarities with the model developed by Chiplunkar and Goldberg (2021) to infer gender-specific barriers from Indian data. At its root, the model is based on Hopenhayn (1992), but extended to allow for important aspects of firm decisions in the context of black entrepreneurship and black-specific barriers

[4] Hsieh et al. (2019) also consider the evolution of barriers to women.

[5] Hsieh et al. (2019) calculate effective wage taxes for white women, black women, and black men, each relative to white men. We use their results to obtain an effective tax for all black workers relative to all non-black workers by calculating an average tax by group, weighted by incomes. We infer relative labor productivity by assuming relative wages reflect relative productivity after controlling for the effective tax. In Hsieh et al. (2019), differences in productivity are the result of differences in human capital accumulation, selection into employment, and selection into occupations, all affected by the effective wage tax, barriers to human capital accumulation, and differential returns to human capital across occupations.

[6] Productivity and demand are isomorphic in the class of model we use. As a consequence, the barrier to productivity investment we infer from the data can alternatively (or also) be interpreted as a barrier to investing in demand.

to entrepreneurship. For example Hurst and Pugsley (2011) document that about 54 percent of all new entrepreneurs identify non-monetary reasons for becoming entrepreneurs, a neglected aspect of entrepreneurship in Hopenhayn (1992) and extensions thereof. We compliment their analysis by considering black and non-black entrepreneurs separately, finding that black entrepreneurs are 22 percent more likely to cite non-pecuniary considerations as their primary reason for starting a business.[7] This evidence is consistent with reports from other less-representative surveys, for example Kauffman Foundation (2020), that report black entrepreneurs as more likely to cite flexibility of hours, 'being my own boss', and other non-monetary reasons as being very important for self-employment decisions. This is therefore a potentially important aspect of black entrepreneurship when estimating the welfare impact of evolving barriers to black-owned firms, so we allow for non-monetary gains to entrepreneurship that differ by group. We also allow for differences in black vs. non-black employment between black-owned and other firms, driven by differences in preferences and wage costs for different employees. The Characteristics of Business Owners Survey for 1992 reports that minority workers make up at least half of the employees at almost 80 percent of black-owned businesses (with employees), while only 20 percent of non-black-owned businesses report the same. Our model accounts for these differences when we infer how different barriers to entrepreneurship change over time.

Several factors that may have contributed to changes in labor-market participation in recent decades are not explicitly addressed by the model we use to interpret entrepreneurship data. For example, the marriage rate for the black population has fallen faster than that for the white population, while divorce rates (conditional on marriage) have increased faster for the white population. The number of children per household (with children) has fallen faster for black families, while the incarceration rate has increased faster for the white population.[8] An important identifying assumption for the analysis in the present paper is that these factors may have affected labor-market participation rates, but not the decision to become an entrepreneur conditional on choosing to engage in market work. To the extent this assumption is violated, these factors may affect the model's inferred barrier to starting a black-owned business. For example, if lower marriage rates raise the opportunity cost of entrepreneurship (say, because married people have access to a second income and are less averse to risk), then our measured decline in the entry cost for black entrepreneurship may in part be due to lower marriage rates for black labor-market participants, relative to non-black.

The paper proceeds as follows. In the next section, we describe the data and document trends in black entrepreneurship over time. In Section 3 we describe a model of entrepreneurship that can be used to interpret the data. In Section 4 we infer barriers to black-owned businesses and report how they change over time, and Section 5 uses the model to infer how the evolution of these barriers affected welfare and aggregate output per worker. Section 6 concludes.

2. Black-owned businesses 1982–2012

We use firm data from the Survey of Business Owners, for census years from 1982 to 2012.[9] Data is available for the number of firms and total revenue, by race and industry, for several revenue-size bins. Employment data is from the Current Population Survey (CPS), by race and industry, and measures the total employed civilian non-institutional population.

Public corporations are not included in the data, and so we ignore them in our analysis, although we emphasize most corporations are not public and are still accounted for in the data. The universe of businesses included in the data changed in 1997, so we make adjustments to earlier data as follows.[10] As part of the 1997 publication, 1992 data is recalculated under the new methodology. For 1992 we therefore use the recalculated data. For earlier years we multiply the reported value of each variable by the adjustment factor implied for the same variable in 1992 (adjusted/reported).

Fig. 1(a) illustrates how the fraction of firms belonging to black men and women changed from 1982 to 2012 across the entire economy. This fraction increased steadily from 2.4 percent in 1982 to 9.5 percent by 2012, a 4-fold increase. These decades also saw an increase in the number of black people in the labor force (from 9 to 11 percent of aggregate employment), which may partially account for the surge in black-owned firms. Fig. 1(b) controls for this, showing how the number of firms relative to the number of people employed (what we call the entrepreneurship rate) changed over time. These decades saw a dramatic rise in the total number of firms per person (Bento and Restuccia, 2021b), and Fig. 1(b) shows that the black entrepreneurship rate contributed to this. The black entrepreneurship rate increased dramatically from 3.5 percent in 1982 to 16.3 percent in 2012, an almost 5-fold increase. The analogous rate for non-black participants increased less, from 14.5 to 19.4 percent. These trends are not merely the result of structural change in the U.S. economy. Fig. 1(c) and d show how the black-owned share of firms and the black entrepreneurship rate grew from 1982 to 2012 for nine sectors of the economy (those for which data is available by sector and comparable over time). Note the ninth sector 'other' aggregates all industries not included in the other eight sectors.[11] In every sector, growth in the black-owned share of

[7] Bento (2020) documents similar evidence for female entrepreneurs, relative to male.

[8] These statements are based on data from the Current Population Survey and National Prisoner Statistics (U.S. Bureau of Justice Statistics). Incarceration statistics are based on State and Federal prisoners.

[9] These data are published as 'Survey of Minority-Owned Business Enterprises' (1982–1997), 'Black-Owned Firms' (2002), and available online in digital form from 2007 onwards.

[10] Prior to 1997 Subchapter C corporations were not included.

[11] For sector-level data from 1982, we make the same adjustments to the data as for the aggregate data, described above. Note the sectoral measures of black-owned firms in 1982 include large public corporations that are excluded from the aggregate numbers. This should result in only a small discrepancy in the 1982 'share of all firms' numbers in Fig. 1(a), as the number of large public corporations is insignificant relative to the total number of firms.

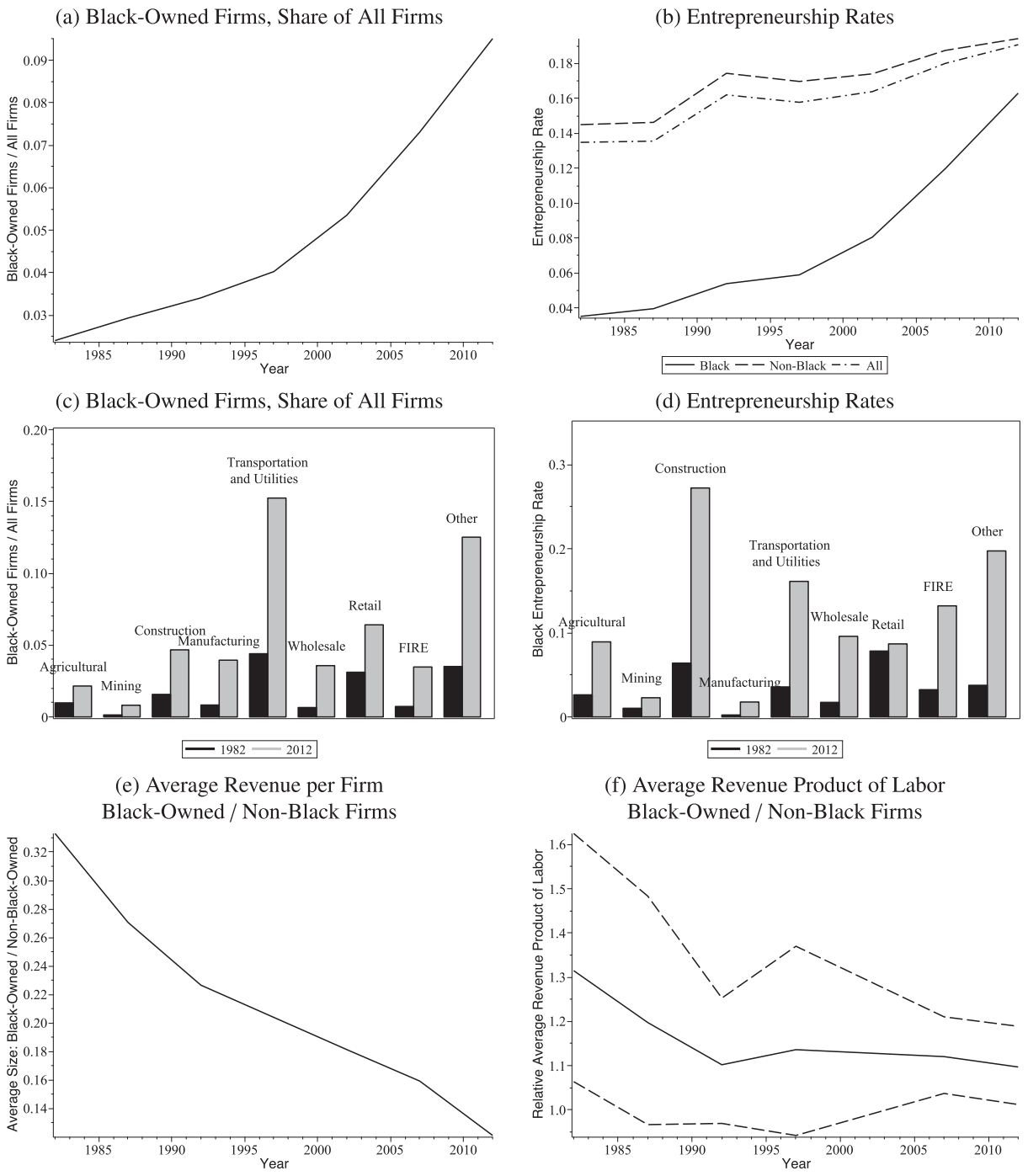

Fig. 1. Black-owned businesses over time. *Notes:* Entrepreneurship Rate calculated as number of firms relative to employed population (by race). 'FIRE' refers to Finance, Insurance, and Real Estate.

firms is substantial. And while the black entrepreneurship rate in Retail increased only slightly, in every other sector black entrepreneurship rates increased significantly. Although not shown in Fig. 1, we note that changes in the black-owned share of firms is not related to changes in average firm size across sectors, where average size is proxied by the inverse of the total entrepreneurship rate (workers per firm by sector). Further, the black-owned share of firms is not related to average size across sectors in 2012, nor in 1982. These observations suggest that racial differences in the choice of industry to compete in and in the type of firm to start within an industry remain relatively constant over time. This is comforting in the context of our analysis, as the unavailability of some sector-specific data in early years means we cannot explicitly account for

Table 1
Firm growth by race.

Dependent variable:	logged average revenue per firm in 2012		
born:	1980–1990	1990–2000	2000–2007
Black	−0.01	−0.55*	−0.07
	(0.19)	(0.31)	(0.17)
Ln (average revenue) in 2007	0.88	1.04	0.77
	(0.24)	(0.27)	(0.07)

Notes: All regressions control for industry. Robust standard errors in parentheses. * represents statistical significance level of 10%.

differences in barriers across sectors. In the framework we develop in the next section we model a one sector economy with some exogenous differences in the constraints faced by black and non-black entrepreneurs, where we assume these differences are constant over time and not the result of race-specific barriers.

Fig. 1(e) shows that the average revenue size of black-owned firms (relative to non-black) follows a very different trend than relative entrepreneurship rates. While entrepreneurship rates show strong convergence over our sample period, average revenue for black-owned firms dropped from 33 to 12 percent of that for non-black firms.

Hsieh and Klenow (2009) use a structural model similar to the one we build on to show differential production-based barriers on labor inputs can be inferred by comparing average revenue products across firms. If firms competing within an industry face a common price for variable labor inputs, then profit maximization implies an equalized revenue product of labor across firms. To the extent average revenue products are higher for black-owned firms, we can (under some assumptions) infer that black entrepreneurs face a higher effective 'tax' when hiring labor. One can think of this inferred tax as capturing a higher cost of acquiring short-term credit to finance labor costs due to credit-market discrimination, or the cost of compensating workers who dislike black owners with additional fringe benefits or at-work amenities. To investigate this possibility, we calculate the average revenue product of labor for black- and non-black-owned firms from 1982 to 2012. We then test whether average products differed by race and observe whether this difference changed over time. To control for any differences in the composition of employees across firms, we use the wage bill as a human-capital-weighted measure of employment (Hsieh and Klenow, 2009). The equation we estimate for each year is;

$$\ln(\text{average product})_{r,s,i} = \alpha + \beta_0 \cdot \text{black} + \beta_1 \cdot \ln(\text{size})_{r,s,i} + \epsilon_{r,s,i},$$

where 'average product' is revenue over wage bill for firms in group r in size bin s and industry i *relative to* total output over the wage bill for the same industry i, 'size' is average revenue per firm for the same observation relative to average revenue per firm for industry i, 'black' is a variable equal to 1 for black-owned firms and 0 otherwise, and each observation is weighted by the number of firms represented. Data is reported by size bin, where size is defined as revenue per firm. There are up to 9 revenue ranges in the data, from "less than $5000" to "more than $1 million." It is important to control for size, as data for intermediate inputs are not available and the share of intermediates in revenue is systematically related to firm size. As a result calculated average products are not very meaningful, but differences in average products across firms controlling for size can be used to infer relative production-based barriers. In the 1982–1997 industry-level data, public corporations are included in the 'all firms' counts by industry. We therefore exclude 'all firms' within the largest size bin (revenue over $1 million) for these years. Finally, industry-level data for black-owned firms are not reported by size in 1982. We therefore estimate the difference in average revenue products between 'black-owned' and 'all firms' (still controlling for industry and size), transform this difference into one relating black-owned firms to non-black-owned firms using total numbers of each in 1982, and recalculate standard errors.

Fig. 1(f) reports estimates for the average product of labor for black-owned firms relative to non-black (β_0), with dashed lines representing 95 percent confidence bounds. Data for 2002 by industry and revenue size is not available, so for that year Fig. 1(f) reports the average of 1997 and 2007 estimates. The point estimates suggest black-owned firms faced high barriers to hiring labor in 1982 which dropped significantly by 1992 and stayed relatively constant thereafter.

In addition to differences in entrepreneurship rates and average revenue per firm, it would be useful for our analysis to know whether black-owned businesses grow at different rates after entry. Unfortunately data on the age of businesses by race is only available for 2007 and 2012. But we can at least consider whether black-owned businesses grew faster or slower than comparable non-black businesses from 2007 to 2012. To do this we categorize businesses in both 2007 and 2012 by race, date of birth, and industry. For this analysis we can identify firms born between 1980-1990, between 1990-2000, and between 2000-2007. Further, firms are categorized as belonging to one of twenty NAICS industries. Table 1 reports the resulting coefficients when we regress (logged) average revenue per firm in 2012 on average revenue in 2007, with dummy variables included for industry and race. For the oldest and youngest cohorts, the average growth rates of black- and non-black-owned firms are statistically indistinguishable from each other. For those born between 1990 and 2000, black-owned firms grew slower than non-black firms, but the point estimate of the difference in growth is only marginally statistically different than zero. Although evidence for our entire sample period would be ideal, we interpret these results as suggesting that any quantitatively important differences between black- and non-black-owned firms are determined at entry and are persistent over the life-cycles of these firms.

It is worth noting that the measures of firm growth by race used in Table 1 are averages conditional on firm survival. Given that Business Dynamics Statistics data (for example) show a clear positive relationship between the size/age of a firm and its annual probability of survival, the relatively small average size of black-owned firms illustrated in Fig. 1(e) suggests they should experience a lower probability of survival on average, relative to other firms. Indeed Fairlie (1999) and others have documented a higher transition rate out of self-employment for black entrepreneurs before the 1990s.[12] Unfortunately our data does not include measures of exit or survival, so we can not properly account for this in our framework. But in Appendix 10 we discuss how robust our results are to different survival rates. We identify which measures of barriers are likely to absorb any underlying differences in survival rates, and argue that our estimates of the net impacts of barriers over time should be robust to allowing for these differences.

We consider how preferences for entrepreneurship differ between black and non-black labor-market participants by looking at data from the Panel Study of Entrepreneurial Dynamics II (PSED). The PSED data reflects a nationally representative cross-section of individuals who were surveyed in 2005 to identify those who were about to start new firms ('nascent entrepreneurs'). In 2006, those who had actually started firms and generated positive revenue were surveyed about their reasons for starting a firm. Using this data, Hurst and Pugsley (2011) report that of the 602 entrepreneurs surveyed, 53.9 percent cited non-pecuniary reasons for starting their firm.[13] Splitting these respondents by race, we find that 63.2 percent of the 57 black entrepreneurs cited non-pecuniary reasons, compared to only 52 percent of the 534 non-black entrepreneurs.[14] These numbers suggest that black participants give greater weight to factors like independence and flexibility of hours than non-black, consistent with other evidence such as Kauffman Foundation (2020). As the PSED surveys are replicated over time, we will gain a better understanding of how these preferences might change and how they might depend on other factors.

3. A model of entrepreneurship

3.1. Environment

Here we describe the model we use to interpret the trends reported in Section 2 and infer how barriers to black entrepreneurship in the U.S. have changed over time. Consider a one-sector model economy consisting of L^B black and L^{NB} non-black workers, with N_b and N_{nb} of them working as entrepreneurs.[15] Worker productivity is homogenous within population groups, but we allow for differences across groups due to differences in average human capital, and allow for these differences to change (exogenously) over time.[16] We further assume black workers are paid a fraction $1-\tau_W$ of the non-black wage per effective unit of labor w. Following Hsieh et al. (2019), we assume τ_W exactly compensates non-black business owners for hiring a black worker, and so they perceive their marginal cost of black labor (per effective unit) to be equal to w. We assume black owners are indifferent with respect to the race of their workers, and so perceive black workers as costing less than other workers per effective unit of labor. L^B and L^{NB} are exogenous, as are levels of human capital.

Although the model economy has only one sector, goods produced by black-owned firms are imperfect substitutes for those produced by non-black-owned firms. We assume a stylized representative final-good firm which produces a final consumption good (also the numéraire) using the output of black- and non-black-owned firms as intermediate inputs according to;

$$Y = \left[Y_b^{\frac{\sigma-1}{\sigma}} + Y_{nb}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \tag{1}$$

where Y_b is total intermediates demanded from black-owned firms, Y_{nb} is the same demanded from other firms, and $\sigma > 1$ is the constant elasticity of substitution between the two types of goods. The representative final-good firm takes all prices as given and chooses intermediates to maximize $Y - P_b Y_b - P_{nb} Y_{nb}$.

Within each group $i \in \{b, nb\}$, firms produce a homogenous good using the following decreasing-returns-to-scale technology;

$$y = (AA_i \varphi z)^{1-\gamma} \left(\ell^{1-\alpha} k^{\alpha} \right)^{\gamma}, \quad \gamma \in (0,1), \ \alpha \in (0,1),$$

where k is capital, A is a productivity term common to all firms in the economy, A_i represents the human capital of entrepreneurs in group i, φ is an endogenous firm-specific productivity term established when a firm enters, and z is another

[12] From 1968 to 1989, Fairlie (1999) finds the average probability of leaving self-employment is almost doubled for black entrepreneurs.

[13] This result is reported in their Table 9, with percentages weighted by sampling weights. Entrepreneurs were asked, "Why did you want to start this new business?" and were allowed up to two responses in their own words. We thank Erik Hurst and Benjamin Pugsley for making their code and data available.

[14] We ignore the small number of observations in the PSED data that are not categorized by race.

[15] We use superscripts to denote the race of workers, and subscripts to denote the race of firm owners.

[16] Hsieh et al. (2019) model differences in labor productivity (our measure of human capital) as being driven by direct barriers to human capital investment, indirectly from lower returns to human capital due to other barriers, and also from dispersion in barriers to entry across occupations that distort the returns to comparative advantage. We treat 'human capital' as exogenous, taking any changes in the underlying labor market distortions as given (as with τ_W).

firm-level productivity term which is related to the entrepreneurial ability of the firm's owner and grows over time. ℓ represents the following CES combination of black and non-black workers employed by the firm;

$$\ell = \left[\eta\left(A_b^{1-\gamma}\ell^B\right)^{\rho} + \left(A_{nb}^{1-\gamma}\ell^{NB}\right)^{\rho}\right]^{\frac{1}{\rho}}, \tag{2}$$

where $(1-\rho)^{-1} > 1$ represents the elasticity of substitution between black and non-black workers, and η is a weight on black workers. We assume human capital $A_i^{1-\gamma}$ is the same for entrepreneurs and workers within group i. Assuming a CES production function with respect to different workers is a standard way to allow for differences across firms in the composition of employment. For example, see Chiplunkar and Goldberg (2021) who allow for differing combinations of female and male workers. One can interpret the CES function as reflecting differences across workers that are not captured by differing labor productivity, accounting for differences in the relative demand for workers of a particular race across different types of businesses.

Producers take output prices P_i and input prices w and r as given. Black-owned firms must pay a proportional tax τ_L on their wage bill. One can think of τ_L as a simple way of capturing a higher cost of acquiring short-term credit to finance labor costs due to credit-market discrimination, or the cost of compensating workers who dislike black owners with additional fringe benefits or at-work amenities. Similarly, black-owned firms must pay a proportional tax τ_K on the rental price of capital. We assume labor and capital markets are otherwise frictionless. Operating profit for an entrepreneur from group i with productivity z is therefore;

$$\pi_i = P_i(AA_iz)^{1-\gamma}\left(\ell_i^{1-\alpha}k^{\alpha}\right)^{\gamma} - w_i(1+\tau_L)\ell_i - r(1+\tau_K)k, \tag{3}$$

where τ_L and τ_K should be understood to apply only to black-owned firms. w_i represents the total wage per unit of composite labor ℓ_i, as perceived by a business owner in group i. The subscript on w represents the fact that black and non-black owners have different preferences for black workers, and will therefore choose different racial compositions of employment. The subscript on ℓ reflects the same.

All workers are potential entrepreneurs, and know their ability (which we assume is their initial productivity at entry) before deciding whether to start a business. Idiosyncratic entrepreneurial ability is denoted by $z_0^{1-\gamma}$, and we assume the distribution of $z_0 \in (1,\infty)$ across the black population is identical to that across the non-black population, described by a Pareto distribution with shape parameter $\xi > 1$. Starting a firm requires an entrepreneur to incur a group-specific entry cost and productivity investment cost. We specify these costs in terms of the numèraire, but we assume they scale up with the wage.[17] To enter, non-black entrepreneurs must first incur a cost equal to $w \cdot c_{E,nb}$, while black entrants must incur a cost equal to $w \cdot c_{E,b}$, $c_{E,b} \equiv \hat{c}_{E,b} \cdot (1+\tau_E)$. τ_E is effectively a 'tax' faced by black entrants, representing any barriers or social norms impacting the perceived cost of starting and running a black-owned firm that are fixed in nature. In addition entrants must make a costly investment decision to determine φ, part of their initial productivity, specified in the following way;

$$wc_{A,i}A_i\left(\frac{z_0}{\mathbb{E}_i(z_0)}\right)\varphi^{\theta}, \quad c_{A,i} > 0, \quad \theta > 1, \tag{4}$$

where $c_{A,b} = \hat{c}_{A,b}(1+\tau_A)$. As with entry costs, the cost of productivity investment is in terms of goods but scales up with the wage. It is also assumed to scale up with z_0A_i. This is similar to the specifications in (for example) Atkeson and Burstein (2010) and Bento and Restuccia (2021a), who note this specification is consistent with evidence that shows no relationship between initial firm size and subsequent investment in a dynamic context (Gibrat's Law). For both entry and productivity investment costs, we allow for 'real' differences between black and non-black entrepreneurs ($\hat{c}_{E,b}$ vs. $c_{E,nb}$ and $\hat{c}_{A,b}$ vs. $c_{A,nb}$) due to differences in the types of firms across groups. This complements our assumption that black-owned and other firms are imperfect substitutes for each other. Analogous to τ_E, τ_A is an effective 'tax' representing barriers to productivity investment faced by black entrepreneurs, similar in spirit to the human capital investment barrier modeled in Hsieh et al. (2019).

After incurring entry and productivity investment costs, entrants start production immediately, and all producers face an exogenous probability of exit each period after production equal to λ. The productivity z of every producer grows deterministically by a factor $(1+g)^{1-\gamma}$ each period after entry, conditional on survival. If a firm exits, its entrepreneur is free to start a new firm immediately with productivity z reset to their entrepreneurial ability z_0, again incurring entry and investment costs. We assume entrepreneurs do not use up their labor when running a firm, and so they continue to earn the market wage.[18] To capture the possibility that people have non-pecuniary reasons for becoming entrepreneurs, we assume the preferences of every person in group i attach a weight $X_i \in (0,1)$ to net income from entrepreneurship, and $1-X_i$ to wage income.

[17] Having entry and other non-production costs scale up with the wage is consistent with Bollard et al. (2016). For example, if the entry cost were a fixed goods cost, then a growing economy would reduce the entry cost relative to firm profits. With exponential economic growth and free entry, the number of firms would explode. Specifying these costs in terms of the final good (rather than in terms of labor) simplifies the exposition.

[18] One can think of owners of larger firms paying themselves a wage, and owners of very small (low-productivity) firms working part-time for other firms. U.S. data suggests most entrepreneurs (especially those without employees) continue to work for other firms while running their own business. For example in 2017 only about one third of all entrepreneurs identified self-employment as their main occupation according to Current Population Survey data.

Every person in the economy has linear preferences for consumption (subject to preferences for the source of income), supplies one unit of labor inelastically, and discounts the future using an exogenous interest rate of R. We assume a representative competitive financial intermediation firm borrows capital from the rest of the world, paying the rental rate r, and rents out this capital to entrepreneurs in each period. This intermediary charges $r(1+\tau_K)$ to black-owned firms and r to other firms, but perceives the rate it receives to be equal to r in all cases. Assuming capital depreciates at rate $\delta \in (0,1)$, and given the exogenous interest rate, the rental rate on capital r must be such that the real return on capital investment is equal to the interest rate, $r-\delta = R$. Note that under these assumptions, perceived profits for the financial intermediary are zero. We focus on the steady-state equilibrium of the economy, in which aggregate variables, prices, the number of black-owned and other firms, the number of black and other entrants, and the cross-sectional distributions of productivity across i-firms are all invariant over time. When we use the model to interpret the data we assume the economy is in a new steady state in each observed period, and so we implicitly assume here that all decision makers always believe they exist in an unchanging economy.[19]

3.2. Production

We start by characterizing each producer's optimal racial composition of employees. For a given level of composite labor ℓ_b, a black entrepreneur chooses ℓ_b^B and ℓ_b^{NB} to minimize $w\cdot[A_{nb}^{1-\gamma}\ell_b^{NB}+(1-\tau_W)A_b^{1-\gamma}\ell_b^B]$, resulting in the following optimal composition;

$$\frac{\ell_b}{\ell_b^B} = \frac{A_b^{1-\gamma}\left[(1-\tau_W)^{\frac{\rho}{1-\rho}}+\eta^{\frac{1}{1-\rho}}\right]^{\frac{1}{\rho}}}{\eta^{\frac{1}{1-\rho}}}, \tag{5}$$

$$\frac{\ell_b^B}{\ell_b^{NB}} = \left(\frac{A_{nb}}{A_b}\right)^{1-\gamma}\left(\frac{\eta}{1-\tau_W}\right)^{\frac{1}{1-\rho}}. \tag{6}$$

Non-black entrepreneurs face a similar decision, but perceive the same marginal cost w for all workers. Their optimal composition can be characterized as;

$$\frac{\ell_{nb}}{\ell_{nb}^B} = \frac{A_b^{1-\gamma}\left[1+\eta^{\frac{1}{1-\rho}}\right]^{\frac{1}{\rho}}}{\eta^{\frac{1}{1-\rho}}}, \tag{7}$$

$$\frac{\ell_{nb}^B}{\ell_{nb}^{NB}} = \left(\frac{A_{nb}}{A_b}\right)^{1-\gamma}\eta^{\frac{1}{1-\rho}}. \tag{8}$$

Note that the ratio of black to non-black workers in black-owned firms, relative to that in other firms, is simply $(1-\tau_W)^{\frac{1}{\rho-1}}$. We use this in Section 4 to obtain a value for ρ.

To characterize the composite wage for black-owned firms w_b, we first observe the following identity;

$$w_b\ell_b \equiv w\cdot\left[A_{nb}^{1-\gamma}\ell_b^{NB}+(1-\tau_W)A_b^{1-\gamma}\ell_b^B\right].$$

Using Eqs. (5) and (6), we can solve for w_b as a function of the non-black wage w;

$$\frac{w_b}{w} = (1-\tau_W)\left[(1-\tau_W)^{\frac{\rho}{1-\rho}}+\eta^{\frac{1}{1-\rho}}\right]^{\frac{\rho-1}{\rho}}. \tag{9}$$

The corresponding composite wage for non-black firms is;

$$\frac{w_{nb}}{w} = \left[1+\eta^{\frac{1}{1-\rho}}\right]^{\frac{\rho-1}{\rho}}. \tag{10}$$

It will be useful to calculate a firm's actual (rather than perceived) wage bill, as a function of $w_i\ell_i$. For black-owned firms, who are indifferent with respect to the race of workers, the actual wage bill is simply $w_b\ell_b$. For other firms we use Eqs. (7), (8), and (10) to obtain;

$$wage\ bill_{nb} = w\cdot[A_{nb}^{1-\gamma}\ell_{nb}^{NB}+(1-\tau_W)A_b^{1-\gamma}\ell_{nb}^B] = \frac{w_{nb}\ell_{nb}\left[1+(1-\tau_W)\eta^{\frac{1}{1-\rho}}\right]}{\left[1+\eta^{\frac{1}{1-\rho}}\right]} \tag{11}$$

[19] This last assumption follows Hsieh et al. (2019) and simplifies the analysis.

A producer from group i with productivity z chooses composite labor ℓ_i to maximize operating profit (3), taking all prices as given. This leads to the following optimal demand for labor, demand for capital, output, and operating profit, all as functions of z;

$$\ell_i(z,\varphi) = AA_i\varphi z\left[\frac{\gamma P_i}{(1+\tau_K)^{\alpha\gamma}(1+\tau_L)^{1-\alpha\gamma}}\left(\frac{1-\alpha}{w_i}\right)^{1-\alpha\gamma}\left(\frac{\alpha}{r}\right)^{\alpha\gamma}\right]^{\frac{1}{1-\gamma}}, \tag{12}$$

$$k_i(z,\varphi) = \ell_i(z,\varphi)\frac{1+\tau_L}{1+\tau_K}\left(\frac{w_i}{1-\alpha}\right)\left(\frac{\alpha}{r}\right), \tag{13}$$

$$y_i(z,\varphi) = AA_i\varphi z\left[\frac{\gamma P_i}{(1+\tau_K)^{\alpha}(1+\tau_L)^{1-\alpha}}\left(\frac{1-\alpha}{w_i}\right)^{1-\alpha}\left(\frac{\alpha}{r}\right)^{\alpha}\right]^{\frac{\gamma}{1-\gamma}}, \tag{14}$$

$$\pi_i(z,\varphi) = (1-\gamma)P_i y_i(z,\varphi), \tag{15}$$

where r is the rental rate for capital, and τ_L and τ_K are again understood to apply only to black-owned firms.

Average revenue product of labor Combining Eqs. (11), (12), and (14), the average revenue product of labor (defined as revenue over the wage bill, as in Section 2) for a black-owned firm relative to a non-black-owned firm is;

$$\frac{P_b y_b}{w_b \ell_b}\left(\frac{P_{nb}y_{nb}}{wage\ bill_{nb}}\right)^{-1} = (1+\tau_L)\left[\frac{1+\eta^{\frac{1}{1-\rho}}(1-\tau_W)}{1+\eta^{\frac{1}{1-\rho}}}\right]. \tag{16}$$

Note that average revenue products are independent of productivity, output prices, and the capital 'tax.' Using the above expression, we can interpret observed average revenue product ratios in Fig. 1(f) to infer values for τ_L.

Capital-labor ratio We calculate capital-labor ratios for black-owned and other firms using Eqs. (5)–(8), (12), and (13);

$$\frac{k_b}{\ell_b^B + \ell_b^{NB}} = \left(\frac{1+\tau_L}{1+\tau_K}\right)(1-\tau_W)\Delta\frac{\left[(1-\tau_W)^{\frac{\rho}{1-\rho}} + \eta^{\frac{1}{1-\rho}}\right]}{\left[\eta^{\frac{1}{1-\rho}} + \left(\frac{A_b}{A_{nb}}\right)^{1-\gamma}(1-\tau_W)^{\frac{1}{1-\rho}}\right]}, \tag{17}$$

$$\frac{k_{nb}}{\ell_{nb}^B + \ell_{nb}^{NB}} = \Delta\frac{\left[1+\eta^{\frac{1}{1-\rho}}\right]}{\left[\eta^{\frac{1}{1-\rho}} + \left(\frac{A_b}{A_{nb}}\right)^{1-\gamma}\right]}, \tag{18}$$

$$\Delta \equiv \left(\frac{w}{r}\right)\left(\frac{\alpha}{1-\alpha}\right)A_b^{1-\gamma}.$$

We note that capital labor ratios are also independent of productivity and output prices. The above expressions can be used to infer a value for τ_K from data on capital-output ratios for black-owned and other firms.

3.3. Entrants

The value of a firm for an entrepreneur from group i with ability z_0 that has chosen to enter is;[20]

$$V_i(z_0|\varphi) = \pi_i(z_0\cdot\varphi\cdot A_i)\cdot\left(\frac{1+R}{1+R-(1-\lambda)(1+g)}\right) - wc_{E,i} - wc_{A,i}\left(\frac{z_0}{\mathbb{E}_i(z_0)}\right)A_i\varphi^{\theta}.$$

Each entrant chooses φ to maximize $V_i(z_0|\varphi)$, resulting in the following characterizations of optimal φ_i;

$$wc_{A,i}A_i\left(\frac{z_0}{\mathbb{E}_i(z_0)}\right)\varphi_i^{\theta} = \frac{\pi_i(z_0,\varphi_i)}{\theta}\cdot\left(\frac{1+R}{1+R-(1-\lambda)(1+g)}\right), \tag{19}$$

and

$$\varphi_i^{\theta-1} = \frac{\pi_i(\mathbb{E}_i(z_0),1)}{\theta wc_{A,i}A_i}\cdot\left(\frac{1+R}{1+R-(1-\lambda)(1+g)}\right). \tag{20}$$

Clearly, optimal investment for all entrants is the same fraction $(1/\theta)$ of the present value of a firm's expected life-time operating profits. Further, optimal φ differs by ownership but is constant across entrants within the same group.

The value of starting a firm for a potential entrepreneur from group i with ability z_0 is;

$$V_i(z_0) = \pi_i(z_0,\varphi_i)\cdot\left(\frac{\theta-1}{\theta}\right)\left(\frac{1+R}{1+R-(1-\lambda)(1+g)}\right) - wc_{E,i}.$$

[20] Since X_i applies to entrepreneurial income net of costs and entrepreneurs continue to earn a wage, X_i does not affect decisions. We therefore ignore it here.

Free entry then implies a threshold $z^*_{0,i}$ such that potential entrepreneurs in group i start firms if and only if $z_0 \geq z^*_{0,i}$. This threshold for each group is characterized by the following expression;

$$wc_{E,i} = \pi_i(z^*_{0,i}, \varphi_i) \cdot \left(\frac{\theta - 1}{\theta}\right)\left(\frac{1+R}{1+R-(1-\lambda)(1+g)}\right). \tag{21}$$

Together, Eqs. (20) and (21) imply the following final characterization of equilibrium φ_i;

$$\varphi_i^{\theta} = \frac{c_{E,i}(\theta - 1)}{c_{A,i}A_i}\left(\frac{\xi}{\xi - 1}\right), \tag{22}$$

where $\xi/(\xi - 1)$ is equal to the ratio $\mathbb{E}_i(z_0)/z^*_{0,i}$. For entrants from group i, equiibrium φ is higher when c_A and A_i (ie., investment costs) are lower. φ is increasing with c_E, as higher entry costs are associated with fewer entrants and therefore higher profits conditional on entry.

Note that since black- and non-black-owned businesses exit and grow at the same rates, average productivity across all i-firms as a function of average productivity across i-entrants is;[21]

$$\mathbb{E}_i^{all}(z) = \mathbb{E}_i^{ent}(z_0) \cdot \left(\frac{\lambda}{1-(1-\lambda)(1+g)}\right),$$

where the expectations operator here is used to signify an average. This in turn implies that the average z of black entrants relative to non-black entrants is equal to the average z of all black producers, relative to other producers;

$$\frac{\mathbb{E}_b^{all}(z)}{\mathbb{E}_{nb}^{all}(z)} = \frac{\mathbb{E}_b^{ent}(z)}{\mathbb{E}_{nb}^{ent}(z)} = \frac{\mathbb{E}(z_0 \mid z_0 > z^*_{0,b})}{\mathbb{E}(z_0 \mid z_0 > z^*_{0,nb})} = \frac{z^*_{0,b}}{z^*_{0,nb}}, \tag{23}$$

where the Pareto distribution of ability implies $\mathbb{E}(z_0 \mid z_0 > z^*_{0,i}) = z^*_{0,i} \cdot \xi \cdot (\xi - 1)^{-1}$.

Entry costs Combining Eqs. (14), (15), (21), and (23), the following relationship between the cost of entry for black and non-black entrepreneurs must hold;

$$\frac{c_{E,b}}{c_{E,nb}} = \left(\frac{P_b}{P_{nb}}\right)^{\frac{1}{1-\gamma}} \frac{A_b\varphi_b z^*_{0,b}}{A_{nb}\varphi_{nb}z^*_{0,nb}}\left[(1+\tau_K)^{\alpha}(1+\tau_L)^{1-\alpha}\left(\frac{w_b}{w_{nb}}\right)^{1-\alpha}\right]^{\frac{-\gamma}{1-\gamma}} = \frac{\mathbb{E}(P_b y_b)}{\mathbb{E}(P_{nb}y_{nb})}. \tag{24}$$

This expression tells us that relative entry costs are equal to average revenue per black-owned firm relative to the same for other firms. Equivalently, relative entry costs must be equal to the present value of expected life-time profits for the marginal black entrant ($z_0 = z^*_{0,b}$), relative to the marginal non-black entrant. To see the intuition here, imagine something happens to make black-owned firms more profitable for any given z_0, relative to other firms. If entry costs remain unchanged, this reduces the threshold $z^*_{0,b}$ required to justify entry, encouraging more (less productive) black entrepreneurs to enter and reducing relative average revenue until Eq. (24) holds once again. A decrease in relative profits in equilibrium therefore implies that the relative cost of entering for black entrepreneurs must have decreased. Since revenue per firm decreased from 1982 to 2012 for black-owned firms relative to other firms, the cost of becoming an entrepreneur must similarly have declined for black entrepreneurs relative to others. Assuming $\hat{c}_{E,b}/c_{E,nb}$ has remained constant over time, we therefore infer that the entry cost 'tax' for black entrepreneurs $1 + \tau_E$ decreased by 64% from 1982 to 2012.

3.4. Final-good firm

The final-good firm demands Y_b and Y_{nb} to maximize profit each period, given prices P_b and P_{nb}. This implies the following relationships between the price, total output, and total revenue of black-owned firms relative to that of other firms;

$$P_i = \left(\frac{Y_i}{Y}\right)^{-\frac{1}{\sigma}},$$

$$\left(\frac{P_b}{P_{nb}}\right)^{\sigma-1} = \frac{P_{nb}Y_{nb}}{P_bY_b} = \frac{N_{nb}}{N_b} \cdot \frac{\mathbb{E}(P_{nb}y_{nb})}{\mathbb{E}(P_by_b)}, \tag{25}$$

where the number of i-firms N_i is equal to the number of people in group i with ability above $z^*_{0,i}$. With a Pareto distribution of ability, this is equal to;

$$N_i = L^i \cdot \left[1 - F(z^*_{0,i})\right] = L^i \cdot (z^*_{0,i})^{-\xi}. \tag{26}$$

[21] With a constant number of i-firms in steady state, the fraction of firms that are entrants must be equal to the fraction that exit, λ. With each firm's z growing at rate g, average z across firms is therefore equal to average z_0 multiplied by $\lambda \cdot \left[1 + (1-\lambda)(1+g) + (1-\lambda)^2(1+g)^2 + \ldots\right]$.

Productivity φ and τ_K Combining Eqs. (24) and (25), the following must hold;

$$\left(\frac{\mathbb{E}(P_b y_b)}{\mathbb{E}(P_{nb} y_{nb})}\right)^{1+\frac{1}{(\sigma-1)(1-\gamma)}} = \frac{\left(\frac{N_{nb}}{N_b}\right)^{\frac{1}{(\sigma-1)(1-\gamma)}} \frac{A_b z^*_{0,b}}{A_{nb} z^*_{0,nb}}}{\left[\mathcal{T}_{KA}(1+\tau_L)^{\gamma(1-\alpha)}\left(\frac{w_b}{w_{nb}}\right)^{\gamma(1-\alpha)}\right]^{\frac{1}{1-\gamma}}}, \tag{27}$$

$$\mathcal{T}_{KA} \equiv (1+\tau_K)^{\alpha\gamma}\left(\frac{\varphi_{nb}}{\varphi_b}\right)^{1-\gamma}. \tag{28}$$

Given relative average revenue, the number of firms, employment, τ_L, τ_K, and parameter values, the above expression can be used to infer φ_b/φ_{nb} in 2002. The evolution of the composite term $\mathcal{T}_{KA}$, relative to its 2002 value, can also be inferred using the same expression. We make use of this in Section 4.

3.5. Equilibrium

We now solve for the steady-state equilibrium of the model, allowing us to evaluate the impact of changing barriers on aggregate output and the welfare of both groups. We start by imposing labor market clearing separately for black and non-black workers. Using Eqs. (5)–(10), (12), (14), and (24), labor market clearing for black workers implies;

$$\begin{aligned} L^B &= N_b \cdot \mathbb{E}(\ell_b) \cdot \frac{\ell^B_b}{\ell_b} + N_{nb} \cdot \mathbb{E}(\ell_{nb}) \cdot \frac{\ell^B_{nb}}{\ell_{nb}} \\ &= \frac{\gamma(1-\alpha)\mathbb{E}(P_b y_b)}{w_b} \cdot \frac{\ell^B_b}{\ell_b} \cdot \left[\frac{N_b}{(1+\tau_L)} + N_{nb}(1-\tau_W)\left(\frac{c_{E,nb}}{c_{E,b}}\right)\left(\frac{(1-\tau_W)^{\frac{\rho}{1-\rho}} + \eta^{\frac{1}{1-\rho}}}{1+\eta^{\frac{1}{1-\rho}}}\right)\right]. \end{aligned} \tag{29}$$

Similarly, labor market clearing for non-black workers implies;

$$\begin{aligned} L^{NB} &= N_b \cdot \mathbb{E}(\ell_b) \cdot \frac{\ell^{NB}_b}{\ell_b} + N_{nb} \cdot \mathbb{E}(\ell_{nb}) \cdot \frac{\ell^{NB}_{nb}}{\ell_{nb}} = \frac{\gamma(1-\alpha)\mathbb{E}(P_b y_b)}{w_b} \cdot \frac{\ell^{NB}_b}{\ell_b} \\ &\cdot \left[\frac{N_b}{(1+\tau_L)} + \frac{N_{nb}}{(1-\tau_W)^{\frac{\rho}{1-\rho}}}\left(\frac{c_{E,nb}}{c_{E,b}}\right)\left(\frac{(1-\tau_W)^{\frac{\rho}{1-\rho}} + \eta^{\frac{1}{1-\rho}}}{1+\eta^{\frac{1}{1-\rho}}}\right)\right]. \end{aligned} \tag{30}$$

Average revenue across all black-owned firms can be characterized in the following way;

$$\mathbb{E}(P_b y_b) = w_b A A_b \varphi_b \mathbb{E}^{all}_b(z)\left[\frac{\gamma^\gamma(1-\alpha)^{\gamma(1-\alpha)} P_b}{(1+\tau_K)^{\alpha\gamma}(1+\tau_L)^{\gamma(1-\alpha)} w_b^{1-\alpha\gamma}}\left(\frac{\alpha}{r}\right)^{\alpha\gamma}\right]^{\frac{1}{1-\gamma}}, \tag{31}$$

with φ_b given by Eq. (22). Using Eqs. (1), (24), and (25), P_b is equal to;

$$P_b = \left[1+\left(\frac{Y_{nb}}{Y_b}\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{1}{\sigma-1}} = \left[1+\frac{N_{nb}\mathbb{E}(P_{nb}y_{nb})}{N_b\mathbb{E}(P_b y_b)}\right]^{\frac{1}{\sigma-1}} = \left[1+\frac{N_{nb}}{N_b}\left(\frac{c_{E,nb}}{c_{E,b}}\right)\right]^{\frac{1}{\sigma-1}}. \tag{32}$$

Eqs. (15), (21), and (29) imply the following relationship between N_b and N_{nb};

$$\begin{aligned} &\frac{N_b c_{E,b}}{1+\tau_L} + N_{nb} c_{E,nb}(1-\tau_W)\left(\frac{(1-\tau_W)^{\frac{\rho}{1-\rho}} + \eta^{\frac{1}{1-\rho}}}{1+\eta^{\frac{1}{1-\rho}}}\right) = \Psi \cdot L^B, \\ &\Psi \equiv \left(\frac{w_b}{w}\right)\left(\frac{\ell_b}{\ell^B_b}\right)\left(\frac{\theta-1}{\theta}\right)\left(\frac{\xi-1}{\xi}\right)\frac{(1-\gamma)(1+R)}{\gamma\lambda(1-\alpha)}\left[\frac{1-(1-\lambda)(1+g)}{1+R-(1-\lambda)(1+g)}\right], \end{aligned} \tag{33}$$

The above equation can also be used to infer the value of $c_{E,b}$, given N_b, N_{nb}, Eq. (24), and values for other exogenous variables and parameters. We make use of this in Section 5. Combining (24), (25), and (26) results in a second expression relating N_b and N_{nb};

$$\frac{N_b}{N_{nb}} = \left(\frac{A_b z^*_{0,b}}{A_{nb} z^*_{0,nb}}\right)^{(\sigma-1)(1-\gamma)}\left(\frac{c_{E,nb}}{c_{E,b}}\right)^{\gamma+\sigma(1-\gamma)} \cdot \left[\mathcal{T}_{KA} \cdot (1+\tau_L)^{\gamma(1-\alpha)}\left(\frac{w_b}{w_{nb}}\right)^{\gamma(1-\alpha)}\right]^{1-\sigma}.$$

or

$$\left(\frac{N_b}{N_{nb}}\right)^{1+\frac{(\sigma-1)(1-\gamma)}{\xi}} = \left(\frac{L^B}{L^{NB}}\right)^{\frac{(\sigma-1)(1-\gamma)}{\xi}}\left(\frac{A_b}{A_{nb}}\right)^{(\sigma-1)(1-\gamma)}$$

$$\cdot\left(\frac{c_{E,nb}}{c_{E,b}}\right)^{\gamma+\sigma(1-\gamma)}\left[\mathcal{T}_{KA}(1+\tau_L)^{\gamma(1-\alpha)}\left(\frac{w_b}{w_{nb}}\right)^{\gamma(1-\alpha)}\right]^{1-\sigma}. \tag{34}$$

Together, Eqs. (33) and (34) characterize N_b and N_{nb} (or $z^*_{0,b}$ and $z^*_{0,nb}$) as functions of exogenous variables and parameters.

The following characterization of the wage paid to non-black workers w can be derived using (15), (21), and (31);

$$w^{1-\alpha\gamma} = \left(\frac{AA_b\varphi_b z^*_{0,b}}{c_{E,b}}\right)^{1-\gamma}\frac{P_b\Psi'}{(1+\tau_K)^{\alpha\gamma}(1+\tau_L)^{\gamma(1-\alpha)}}, \tag{35}$$

$$\Psi' \equiv \gamma^{\gamma}\left[\left(\frac{w}{w_b}\right)(1-\alpha)\right]^{\gamma(1-\alpha)}\left(\frac{\alpha}{r}\right)^{\alpha\gamma}\left[\left(\frac{\theta-1}{\theta}\right)(1-\gamma)\left(\frac{1+R}{1+R-(1-\lambda)(1+g)}\right)\right]^{1-\gamma}.$$

Aggregate output per worker can be derived as a function of w using (1), (15), and (21);

$$\frac{Y}{L} = \frac{N_b}{L}\left(\frac{\mathbb{E}(P_b y_b)}{P_b}\right)\left[1+\frac{N_{nb}}{N_b}\left(\frac{c_{E,nb}}{c_{E,b}}\right)\right]^{\frac{\sigma}{\sigma-1}} = w\cdot\left[\frac{c_{E,b}N_b + c_{E,nb}N_{nb}}{L}\right]$$

$$\cdot\left(\frac{\theta}{\theta-1}\right)\frac{\lambda}{(1-\gamma)(1+R)}\left(\frac{\xi}{\xi-1}\right)\left[\frac{1+R-(1-\lambda)(1+g)}{1-(1-\lambda)(1+g)}\right]. \tag{36}$$

Our overall measure of welfare by race is equivalent to the present value of expected average income by race from work and entrepreneurship, adjusted for differences in preferences for entrepreneurship, entrepreneurs' preferences for the race of employees, and the preferences of workers with respect to where they work. In Appendix 7 we show welfare for group i can be expressed in the following way;

$$U_i = w(1-X_i)(1-\tau_W)A_i^{1-\gamma}\left(\frac{1+R}{R}\right) + wX_i\left(\frac{N_i}{L^i}\right)c_{E,i}\left(\frac{\lambda}{R}\right)\left(\frac{\theta}{\theta-1}\right)$$

$$\cdot\left[\left(\frac{\xi}{\xi-1}\right)\left(\frac{1+R-(1-\lambda)(1+g)}{1-(1-\lambda)(1+g)}\right) - (1+R)(\theta-1)\right], \tag{37}$$

where τ_W applies only to black participants. We go on to show in Appendix 7 that our measure of welfare does not depend on how each barrier is interpreted, as long as black entrepreneurs are not literally facing race-specific taxes (which could be modeled as being transferred back to consumers through lump-sum subsidies).[22] For comparison in Appendix 7, we also calculate the average present value of *actual* consumption by race. This measure differs from that of welfare in two ways. First, τ_L is included as part of consumption for workers at black-owned firms. Second, the actual profits of non-black entrepreneurs reflect the actual (rather than perceived) wage bill from Eq. (11).

Comparative statics We have focused our discussion above on how various barriers to black entrepreneurship can be inferred from the data. We conclude our description of the model by summarizing how these barriers (along with the quantity of labor) affect steady-state outcomes. Eq. (33) shows that a proportional decrease in all entry costs, $c_{E,b}$ and $c_{E,nb}$, results in a proportional increase in black- and non-black-owned firms, leaving $c_{E,i}N_i$ constant. Mechanically, this leads to lower average productivity across all entrepreneurs, both due to selection and lower φ. From (22) and (26) we can see that the ratio $\varphi_b z^*_{0,b}/c_{E,b}$ increases iff $\xi(\theta-1)-\theta>0$. This same condition applies for the wage and aggregate output per worker. Relative average revenue remains unaffected.

If barriers to starting a black-owned firm (τ_E) decrease, then (33) and (34) show that entry by black-owned firms will increase, while the number of other firms will contract in response to higher wages and lower profits. Now the lower average ability of black entrepreneurs results in lower average revenue for black- relative to non-black-owned firms.

All else equal, a decrease in τ_L, the effective tax rate on payments to labor in black-owned firms, increases labor demanded, revenue, and profits for a black-owned firm with a given level of productivity. But this encourages entry by black entrepreneurs and discourages entry by other entrepreneurs such that relative average revenue remains unchanged (Eqs. (33) and (34)). For a given distribution of firms, a lower τ_L reduces the misallocation of labor, encouraging labor to flow from non-black- to black-owned firms. The wage increases as a result, but aggregate output can still decrease due to a decrease in the total number of firms. A decrease in τ_K propagates similarly through the economy, but with the further effect of encouraging a higher stock of capital. This makes an increase in aggregate output much more likely. A decrease in τ_A lowers the cost of investing in productivity for black entrants, which results in higher productivity φ and encourages more entry from black entrepreneurs. The end result is similar to that from a lower τ_L – a higher black entrepreneurship rate and lower non-black entrepreneurship, with fewer firms overall.

[22] That our measure of welfare is robust to differing interpretations of our barriers is in part a consequence of our assumption that utility is linear in consumption.

Table 2
Parameter values.

Parameter	Value	Target
γ	0.8	literature
α	1/3	literature
σ	6.5	literature
R	0.05	literature
λ	0.1	literature
g	0.05	literature
ξ	1.022	revenue distribution
θ	1.39	Bento and Restuccia (2021a)
ρ	0.964	racial composition of workers at black-owned/other firms
η	0.910–0.915	L^B/L^{NB}

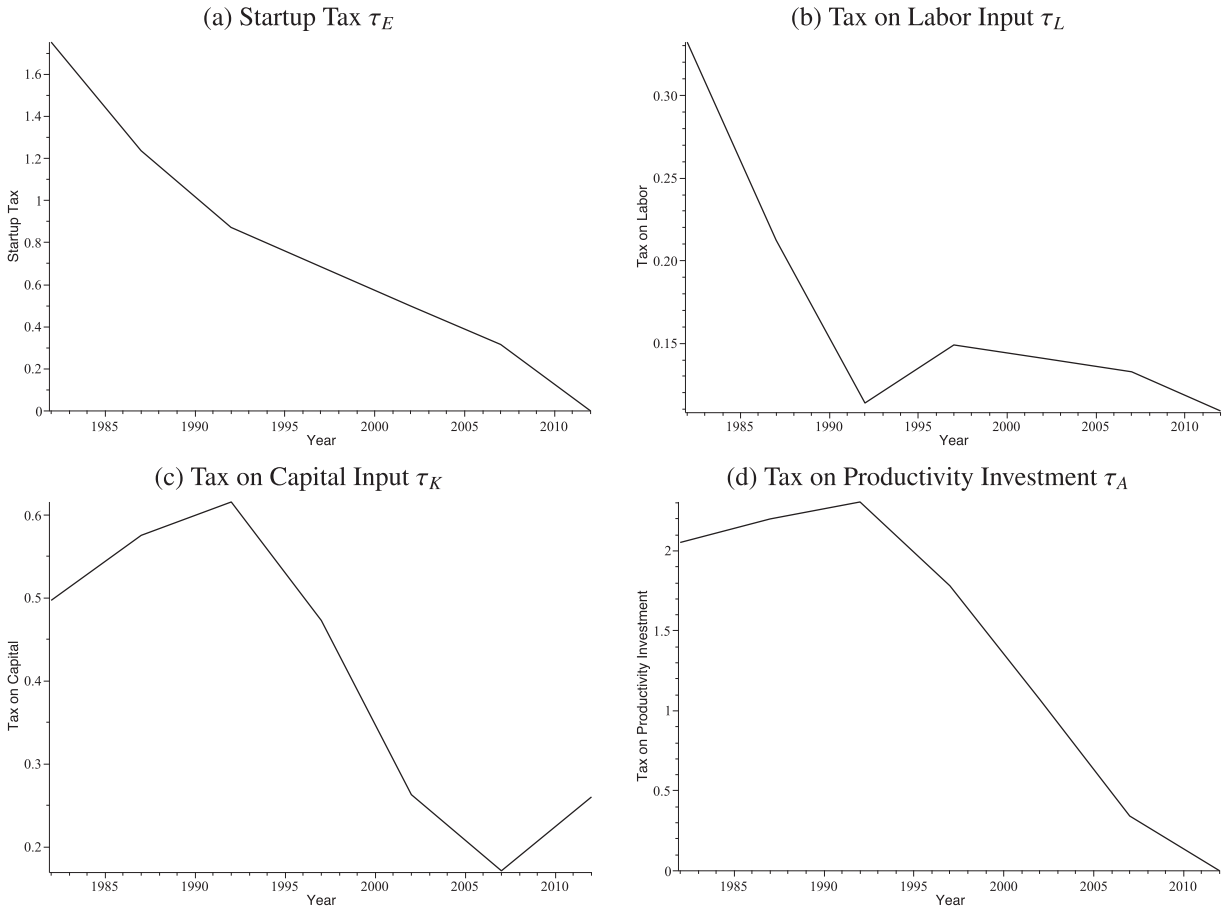

Fig. 2. Barriers to black entrepreneurship over time. *Notes:* Panels (a), (b), (c), and (d) calculated using Eqs. (16), (17), (18), (22), (24), (27), and (28).

4. Barriers faced by black-owned businesses

Before documenting the barriers faced by black-owned businesses we need values for seven parameters: γ, α, σ, ξ, θ, ρ, and η. In Appendix 8 we describe how we obtain these values. Table 2 summarizes these values and the data targets from which they are inferred. Also included are parameters needed for the next section. In Appendix 10 we discuss the robustness of our findings to different values for these parameters.

We now infer how differences in the labor-input tax, the startup tax, the productivity investment tax, and the capital-input tax changed between 1982 and 2012 using Eqs. (16), (17), (18), (22), (24), (27), and (28). These are illustrated in Fig. 2.

As discussed in Section 3, we cannot separately identify τ_E and $\hat{c}_{E,b}/c_{E,nb}$ for any given year. We therefore assume that $\hat{c}_{E,b}/c_{E,nb}$ is constant and $\tau_E = 0$ in 2012. Our choice of $1 + \tau_E = 1$ in 2012 is innocuous with respect to our calculation of the impact of these barriers over time, since only the proportional change in $1 + \tau_E$ is relevant for this calculation. But

since we assume no barrier to entry exists in 2012, our calculation below of the scope for further gains can arguably be considered a conservative one. Two features related to Fig. 2(a) are worth highlighting. First, the inferred entry tax for black entrants consistently declined over time. Over the whole time period, black startup costs dropped 64 percent relative to non-black startup costs. Second, although not shown in Fig. 2(a), the inferred 'real' startup cost $\hat{c}_E$ for black entrants is only one eighth of the cost for other entrants. This last point suggests black entrepreneurs are operating firms with much lower startup and/or operating costs. Could this itself be an endogenous response to other barriers? In principle, yes. But if this were the case, then we would also expect black entrepreneurship to differ across industries according to how fixed costs differ across industries. Proxying differences in fixed costs by average firm size across industries, we do not observe a relationship between the black-owned share of firms and average firm size in Fig. 1(c). Nor do we observe a relationship between changes in average firm size and the black-owned share across industries over time. The choice of industry (across industries identified in the data, and sub-industries within identified industries) is likely an important one to understand, but we leave this for future research.

Fig. 2(b) shows a clear decrease in τ_L over time, down from 33 percent in 1982 to 11 percent in 2012, with the largest decline observed from 1982 to 1992. This suggests that black-owned businesses paid higher non-wage costs for labor than other businesses in all years. Again, this may be due to a higher cost of obtaining short-term credit to pay wages, a need to offer higher non-pecuniary benefits or work-place amenities to attract workers, or some combination of these and other related reasons. By 2012, differences in labor costs between black- and non-black-owned businesses were smaller but still present.

Eqs. (17) and (18) allow us to infer a value for τ_K using capital-labor ratios for black-owned relative to other firms. Fairlie et al. (2020) estimate this ratio for 2004, controlling for industry as well as owner and firm characteristics, and report that black-owned startups in 2004 use 39.5% less capital on average than comparable white-owned startups with the same level of employment. We treat their estimate as data for 2002, and infer a value of $\tau_K = 26.3$ percent. Using (27) and (28), we infer $\varphi_b/\varphi_{nb} = 0.01$ in 2002. Capital-labor ratios by race are not available for other years, so we use Eq. (27) to infer how $\mathcal{T}_{KA}$ – a combination of τ_K and φ_b/φ_{nb} – evolves over time relative to 2002. The available data does not allow us to separately identify τ_K and φ_b/φ_{nb} in these years, so we assume their changes over time contribute proportionately to changes in $\mathcal{T}_{KA}$.[23]

Given that τ_A and $\hat{c}_{A,b}/c_{A,nb}$ also can not be separately identified, we assume $\tau_A = 0$ in the last year of our sample, as we do with τ_E. This implies that any difference between $c_{A,b}$ and $c_{A,nb}$ in 2012 is due to a real difference in the type of firms started by black and non-black entrepreneurs, similar to our assumption about 'real' entry costs above. Again, we emphasize that this assumption does not affect the implied impact of changing τ_A over time. With these assumptions in hand, we use our values for φ_b/φ_{nb} and Eq. (22) to infer values for τ_A. Fig. 2(c) and d show how τ_K and τ_A evolve over time. Fig. 2(c) shows black-owned firms faced a cost of using capital much higher than that of other firms in 1982, and that this difference decreased by 2012, from 50 to 26 percent. The significant difference still persisting in 2012 suggests that black entrepreneurs still face barriers to financing capital expenditures relative to other entrepreneurs. This is consistent with Robb (2018), who documents evidence that differences in available credit and rates between black and non-black entrepreneurs still persist in 2014. See also Mills and Battisto (2020) who report a disproportionate impact on black-owned firms from the COVID-19 pandemic and pandemic-related policies, due in part to persistent differences in access to credit and access to the federal government's Paycheck Protection Program. Our inferred measure of τ_A shows an increase from 1982 to 1992, but a persistent decline thereafter. Overall, we infer black entrants faced a large effective tax on productivity investment τ_A in 1982, but saw $1 + \tau_A$ decline dramatically by two-thirds over the following three decades, similar in magnitude to the drop in entry costs.

5. Impact over time

We now use the model developed in Section 3 to calculate the impact of the barriers from Section 4 on aggregate output per worker and the welfare of black and non-black labor-market participants. For this we need the preference parameters for entrepreneurship X_f and X_m. For X_s we assign values equal to the fraction of entrepreneurs by race from the PSED survey who cited non-pecuniary reasons for starting a firm. As reported in Section 2, we use $X_b = 0.63$ and $X_{nb} = 0.52$.

For the benchmark economy, given the barriers derived in Section 4, we assume the entry cost for non-black entrants $c_{E,nb}$ in each reported year is equal to the value required to match the number of black-owned and other firms in that year (Eq. (33)). This implies a non-black entry cost that decreased by 25 percent from 1982 to 2012. Note that after accounting for all implied changes to entrepreneurship due to barriers to black (relative to non-black) entrepreneurship, the model attributes any residual changes in observed entrepreneurship rates to proportional changes in both entry costs. The implied drop in the non-black entry cost should therefore be interpreted as a catch-all for any trends in the economy that led to higher entrepreneurship across the board but not to differential changes in black and non-black entrepreneurship. Similarly, any change over time in U.S. aggregate output per worker not otherwise generated by the model is attributed to exogenous changes in A.

Total net impact We start by answering the following question: How would outcomes have differed over time if barriers facing black entrepreneurs had remained at their 1982 levels? To answer this we calculate outcomes in each year under the

[23] See Appendix 9 for details.

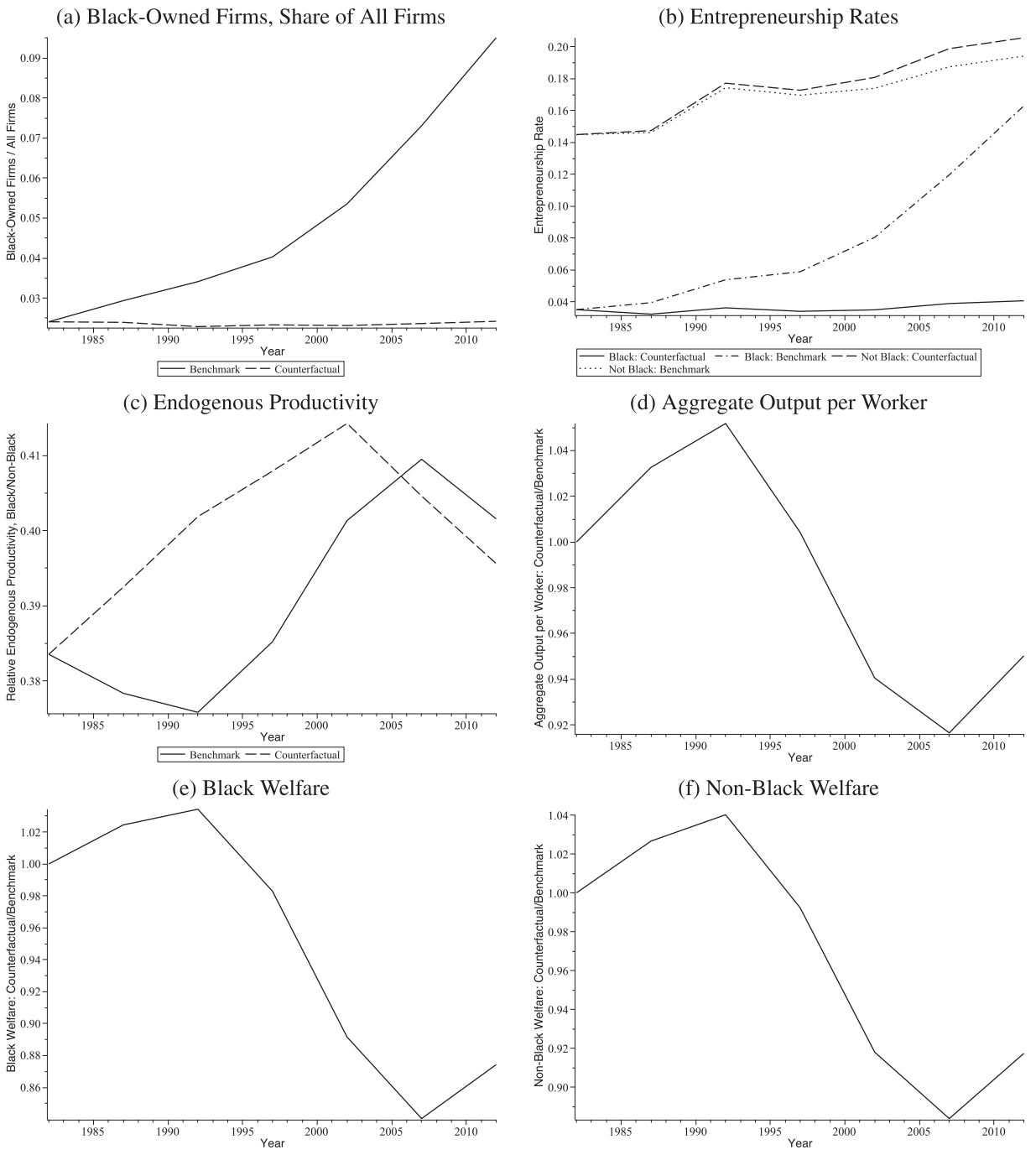

Fig. 3. Counterfactual outcomes. *Notes:* Panel (a) calculated using (33) and (34). Panel (b) calculated using (26). Panels (c) and (d) calculated using Eqs. (22) and (36). Panels (e) and (f) calculated using Eq. (37).

assumption that τ_E, τ_L, τ_K, and τ_A remain constant at 1982 levels while $\hat{c}_{E,b}$, $c_{E,nb}$, $\hat{c}_{A,b}$, $c_{A,nb}$, τ_W, L^B, L^{NB}, A_b, A_{nb}, and A change as in the benchmark. Fig. 3 illustrates how the black-owned share of firms and revenue, entrepreneurship rates, aggregate output per worker, and the welfare of black and non-black participants would have behaved under this counterfactual, compared to benchmark outcomes.[24]

[24] These outcomes are calculated using (22), (26), and (33) through (37).

Table 3
Contribution of each barrier.

	Fixed barrier				
	τ_E	τ_L	τ_K	τ_A	*all*
output per worker	0.968	1.029	0.924	1.026	0.950
black consumption	1.042	0.990	0.906	0.966	0.894
non-black consumption	0.992	1.008	0.918	1.007	0.925
black welfare	1.053	0.969	0.903	0.958	0.874
non-black welfare	1.000	1.001	0.916	1.001	0.917
average welfare	1.002	1.000	0.916	0.999	0.915

Notes: Each column (except the last) reports outcomes in 2012 when only one barrier is fixed at its 1982 level. The last column reports outcomes when all barriers are fixed at 1982 levels. All outcomes are reported relative to benchmark where all barriers change over time.

If barriers facing black entrepreneurs had stayed at their 1982 levels, Fig. 3(a) shows the share of firms that are black-owned would have decreased slightly over time before returning to its initial level in 2012, due to offsetting impacts from the relative increase in black labor-market participants, the decline in τ_W, and the decline in relative human capital (Eq. (34)). With no change in τ_E, relative average revenue per firm would remain unchanged. Together, these imply the same trend over time in the aggregate revenue share of black-owned firms, compared to the 54 percent increase observed in the data. The counterfactual black entrepreneurship rate would have increased to only 4.1 percent by 2012, rather than the observed 16.3 (Fig. 3(b)). Without a large increase in black entrepreneurship, the non-black entrepreneurship rate would have increased more, to 20.6 rather than 19.4 percent. In total, the number of firms would have been 1.8 percent lower than the observed number in 2012. Relative endogenous productivity $(\varphi_b/\varphi_{nb})^{1-\gamma}$ would have increased by only 3.1 percent in the counterfactual, compared to 4.7 percent in the benchmark (Fig. 3(c)). Relative to the benchmark, Fig. 3(d) shows aggregate output per worker would have been 5.0 percent lower by 2012.

How do the above findings compare to aggregate output growth in the data? From 1982 to 2012, gross domestic product (GDP) per worker in the U.S. grew by about 70 percent, suggesting the decline in barriers to black entrepreneurship over time significantly contributed to observed growth (about 5.2 pp).[25] This implication is striking, given that black labor-market participants only accounted for 9–11 percent of aggregate labor throughout this time period.

Fig. 3(e) shows that lower barriers to black entrepreneurship over time increased the welfare of black labor-market participants by 14.4 percent. This increase is in part due to higher associated wages, which increased by 11 percent in response to lower barriers, as the economy became more efficient. The remainder of the increase in welfare is due to a higher level of entrepreneurial income as more black-owned businesses were started and became established. Higher wages due to lower barriers also benefited non-black labor-market participants, while the substitution of black-owned firms for other firms reduced non-black entrepreneurial income (relative to the counterfactual). On net, 3f shows that lower barriers to black entrepreneurship over time increased the welfare of non-black labor-market participants by 9 percent. Although not shown in Fig. 3, we also calculate the present value of average consumption by race when barriers remain at their 1982 levels (derived in Appendix 7). We find that in 2012, lower barriers (relative to 1982) are responsible for an increase in consumption of 11.9 percent for black labor-market participants, and 8.1 percent for non-black participants. These numbers are similar to, though a bit lower than, our results for welfare.

Impact by barrier How much did the drop in each barrier contribute to the increase in output per worker and welfare? We answer this question by calculating counterfactual outcomes when all but one of the barriers change over time as in Section 4. Columns 2–5 in Table 3 report counterfactual outcomes in 2012 when one barrier is kept fixed at its 1982 level, relative to the benchmark. The last column reports outcomes in 2012 when all barriers remain fixed at 1982 levels, corresponding to Fig. 3(e) and (f).

The individual impacts reported in Table 3 are consistent with our discussion of comparative statics in Section 3. By far the most important contributor to the increases in aggregate output and welfare over time is the large decline in τ_K, the effective tax on capital. This has led to capital usage by black-owned firms that is much closer to the efficient level, a reduction in the level of misallocation in the economy, and a higher aggregate stock.

Scope for future gains Section 4 suggests further scope for improvement in the economic environment facing black entrepreneurs. In particular, as of 2012, black-owned firms still face a much higher cost of using capital in production. Given the large impact from the decline in τ_K reported in Table 3, we should expect significant gains if τ_K were to decline further. Of what magnitude are the changes in outcomes we could expect if black entrepreneurs were treated identically to other entrepreneurs? To answer this question, we recalculate outcomes for 2012 under the assumption $\tau_L = \tau_K = 0$.[26] Under these assumptions, we find that aggregate output per worker would increase an additional 8.2 percent. The average welfare of black labor-market participants would increase by an additional 17.6 percent, while welfare for non-black participants

[25] GDP per worker over time is from the Penn World Table v9.0.

[26] We continue to compare this counterfactual to the benchmark where we assume $\tau_E = \tau_A = 0$.

would increase by an additional 12.4 percent. These results suggest substantial gains are still possible in the future for the U.S. economy, more than those made in the previous three decades.

Robustness to alternative assumptions In Appendix 10 we explore the robustness of our results to alternative assumptions. We first consider alternative values for σ, γ, and X_i. We then consider different rates of change for τ_K and τ_D, and also discuss how our interpretation of the data changes if black-owned firms exit at higher rates than other firms. We find that reasonable variations in the assumptions used in Sections 4 and 5 do not significantly affect the implications of the benchmark analysis. Barriers to black entrepreneurship have been large, and have declined somewhat over time. This convergence has led to substantial increases in output per worker and welfare, and there is still scope for further gains in the future.

6. Conclusion

Several measures related to black-owned firms suggest a dramatic increase in the contribution of black entrepreneurship to economic activity in the U.S. over time, both relative to non-black entrepreneurship and relative to the rise in black labor-market participation. In this paper we extend the framework developed by Bento (2020) to interpret these trends over time. This framework extends the Hopenhayn (1992) model of firm dynamics by introducing four distortions faced by black entrepreneurs, relative to non-black entrepreneurs – differential costs of employing labor and capital in production, a differential cost to start a business, and and a differential cost of investing in firm productivity – as well as preferences for entrepreneurship that differ by race. We infer how each of these distortions evolved from 1982 to 2012, showing that in each case conditions facing black entrepreneurs improved at least somewhat over time. The model suggests these changes are responsible for a 5.2 percent increase in GDP per worker from 1982 to 2012, as well as a 14.4 percent increase in the welfare of black labor-market participants and a 9 percent increase in the welfare of other participants. Further, the data suggest opportunities for further gains. If barriers to black entrepreneurship are eliminated entirely, output per capita could increase by an additional 8.2 percent, while black and non-black welfare could increase by an additional 17.6 and 12.4 percent. All of these gains are *in addition to* any changes to output per worker and welfare coming directly from a reduction in labor-market barriers to black workers.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmoneco.2022.10.001

References

Asiedu, E., Freeman, J.A., Nti-Addae, A., 2012. Access to credit by small businesses: how relevant are race, ethnicity, and gender? Am. Econ. Rev. 102 (3), 532–537.

Atkeson, A., Burstein, A.T., 2010. Innovation, firm dynamics, and international trade. J. Polit. Econ. 118 (3), 433–484.

Becker, G.S., 1971. The Economics of Discrimination, second ed. University of Chicago Press.

Bento, P., 2020. Female Entrepreneurship in the U.S. 1982–2012: Implications for Welfare and Aggregate Output. Unpublished manuscript. Texas A&M University.

Bento, P., Restuccia, D., 2021. On average establishment size across sectors and countries. J. Monet. Econ. 117, 220–242.

Bento, P., Restuccia, D., 2021. The Role of Nonemployers in Business Dynamism and Aggregate Productivity.

Blanchflower, D.G., Levine, P.B., Zimmerman, D.J., 2003. Discrimination in the small-business credit market. Rev. Econ. Stat. 85 (4), 930–943.

Bollard, A., Klenow, P.J., Li, H., 2016. Entry Costs Rise with Development. Unpublished manuscript. Stanford University.

Bone, S.A., Christensen, G.L., Williams, J.D., 2014. Rejected, shackled, and alone: the impact of systemic restricted choice on minority consumers' contruction of self. J. Consum. Res. 41 (2), 451–474.

Bone, S.A., Christensen, G.L., Williams, J.D., Adams, S., Lederer, A., Lubin, P.C., 2019. Shaping small business lending policy through matched-pair mystery shopping. J. Public Policy Mark. 38 (3), 391–399.

Borjas, G.J., Bronars, S.G., 1989. Consumer discrimination and self-employment. J. Polit. Econ. 97 (3), 581–605.

Cavalluzzo, K.S., Cavalluzzo, L.C., 1998. Market structure and discrimination: the case of small businesses. J. Money, Credit Bank. 30 (4), 771–792.

Chiplunkar, G., Goldberg, P.K., 2021. Aggregate Implications of Barriers to Female Entrepreneurship. NBER Working Paper.

Cook, L.D., 2012. Overcoming discrimination by consumers during the age of segregation: the example of Garrett Morgan. Bus. Hist. Rev. 86 (2), 211–234.

Fairlie, R.W., 1999. The absence of the African–American owned business: an analysis of the dynamics of self-employment. J. Labor Econ. 17 (1), 80–108.

Fairlie, R.W., Robb, A., Robinson, D.T., 2020. Black and White: Access to Capital among Minority-Owned Startups. NBER Working Paper.

Fairlie, R.W., Robb, A.M., 2007. Why are black-owned businesses less successful than white-owned businesses? The role of families, inheritances, and business human capital. J. Labor Econ. 25 (2), 289–323.

Giuliano, L., Levine, D.I., Leonard, J., 2011. Racial bias in the manager-employee relationship: an analysis of quits, dismissals, and promotions at a large retail firm. J. Hum. Resour. 46 (1), 26–52.

Harper, B., 2018. Montgomery businessman Greg Calhoun has died, family says. Montgomery Advertiser, https://www.montgomeryadvertiser.com/story/news/2018/10/11/greg-calhoun-dies-obituary-montgomery-businessman-has-died-family-says/1600108002/.

Hopenhayn, H.A., 1992. Entry, exit, and firm dynamics in long run equilibrium. Econometrica 60, 1127–1150.

Howard, T., 2019. The State of Black Entrepreneurship in America: Evaluating the Relationship between Immigration and Minority Business Ownership. Technical Report.

Hsieh, C.-T., Hurst, E., Jones, C.I., Klenow, P.J., 2019. The allocation of talent and U.S. economic growth. Econometrica 87 (5), 1439–1474.

Hsieh, C.-T., Klenow, P.J., 2009. Misallocation and manufacturing TFP in China and India. Q. J. Econ. 124 (4), 1403–1448.

Hurst, E., Pugsley, B.W., 2011. What do small businesses do? Brook. Pap. Econ. Act..

Jackson, C. V., 2016. When building your business means hiding that it's black-owned. Chicago Tribune, https://www.chicagotribune.com/business/blue-sky/ct-black-entrepreneurs-downplay-ownership-bsi-20160414-story.html.

Kauffman Foundation, E.M., 2020. Motivations for entrepreneurship. Trends Entrep. 4.

Mills, C. K., Battisto, J., 2020. Double Jeopardy: COVID-19's Concentrated Health and Wealth Effects in Black Communities. Federal Reserve Bank of New York Report August.

Restuccia, D., Rogerson, R., 2017. The causes and costs of misallocation. J. Econ. Perspect. 31 (3), 151–174.
Robb, A., 2018. Financing Patterns and Credit Market Experiences: A Comparison by Race and Ethnicity for U.S. Employer Firms. Small Business Administration, Office of Advocacy, SBAHQ-16-M-0175.
Timmons, E., 2018. More and more jobs today require a license. That's good for some workers, but not always for consumers. Harv. Bus. Rev.. Published on April 26, 2018, available at https://hbr.org/2018/04/more-and-more-jobs-today-require-a-license-thats-good-for-some-workers-but-not-always-for-consumers.