Marriage, Entrepreneurship and Female Labor Force Participation in the US *

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Abstract

The United States has experienced a remarkable decline in the rate of firm entry and the share of entrepreneurs since the 1980s. I document that entrepreneurship is more prevalent in married households and among men, and that these groups went through a greater decline in entrepreneurship. I document that changes in the number of married households and the increase in female labor force participation account for over 40 percent of the overall fall in entrepreneurship since 1980s. To understand the relationship between demographic composition factors and entrepreneurship, I develop a model with an occupation choice for individuals of different marital status, college skills, and gender. The model takes into account important features of the data, including the extent of marital sorting, the skill premium, the gender wage gap, and the gender business income gap. My results indicate that changes in the demographic composition (share of married households, fraction of skilled individuals, marital sorting) account for 76% of the decline in entrepreneurship, 68.4% of the fall in married entrepreneurs, and 70.5% of the decrease in male entrepreneurs. Moreover, considering all changes account for 82.8% of the observed fall in entrepreneurship.

Keywords: Marriage, Entrepreneurship, Demographics, Female Labor Force Participation, Gender Business Income Gap, Gender Wage Gap

JEL Codes: J10, J24, M13

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1 Introduction

The U.S. economy has witnessed a decline in business formation, the share of entrepreneurs, and the firm entry rate since the 1980s (Akcigit and Ates (2019), Decker et al. (2016)). The substantial role of entrepreneurs in job creation, economic activity, capital accumulation and economic growth, exacerbates its significance of these long-term trends and their implications for the economic environment.[1] Previous studies offer different mechanisms in these trends, such as changes in the growth rate of the labor supply (Karahan et al. (2019), Hopenhayn et al. (2018)), the impact of population aging on decreasing the demand for new varieties (Bornstein et al. (2018)) and the unwillingness to start new businesses among the older workforce (Engbom et al. (2019)). Additionally, Salgado (2020), Jiang and Sohail (2023) and Kozeniauskas (2018) study the effect of skill-biased technological change on the decline in the share of high-skilled entrepreneurs.

This paper presents a new perspective on the decline in entrepreneurship in the United States, focusing on the impact of changes in the demographic composition of adult population (number of married households, marital sorting and number of skilled-people) as well as in female labor force participation. I document that entrepreneurship is more prevalent among married households and male groups, which, have experienced a higher decline in entrepreneurship over time. Specifically, share of married entrepreneurs declined by more than one-third, from 8.3% to 5.2%, while share of male entrepreneurs decreased by almost 40% , from 8.2% to 5%, between 1980 and 2020. During the same period, the share of married households also decreased from 74% to 60% and share of male group in the labor force declined from 60% to 54% between 1980 and 2020. Given the substantial decrease in the share of married households and males in the labor force, one would expect that the overall share of entrepreneurs would also decline. Decomposing these channels through data reveals that over 40% of the decline in entrepreneurship is attributed to the these two factors.

In line with existing literature, my analyses show significant changes in key variables over the past few decades. Specifically, the skill-premium, which measures the relative wage income of college graduates compared to non-college graduates, experienced a notable increase from 37% to 60% between 1985 and 2020. Simultaneously, the gender wage gap, measuring the relative wage income of male workers compared to female workers, decreased from 45% to 28% over the same period, even after accounting for differences in occupational choices. However, my research goes beyond these well-established facts and uncovers a previously overlooked aspect—the decline in gender business income. This metric gauges the ratio of

[1] For more information, see Quadrini (2000), Cagetti and De Nardi (2006), Luttmer (2011), Haltiwanger et al. (2013), Akcigit and Kerr (2018), and Acemoglu et al. (2018).

male entrepreneur's income to female entrepreneur's income. In 1985, male entrepreneurs earned 55% more than their female counterparts, but by 2020, this differential decreased to 35%. The observed trends in skill-premium, gender wage gap, and gender business income have significant implications for female labor market participation and their entrepreneurial decisions.[2] Moreover, I document a correlation between being married and being an entrepreneur that has remained relatively constant since 1980. Focusing on married households, the correlation between having a college degree and being an entrepreneur is lower than the correlation between having a college-educated spouse and being an entrepreneur. These findings emphasize the importance of considering the role of marital status changes and their interplay with the changes in skill composition of the labor force in understanding the patterns of entrepreneurship.

To explore the potential mechanisms underlying the observed trends in a unified framework, I develop an economic model that incorporates an occupation choice. In this model, agents are differentiated based on their skill-level, gender, and marital status. Unmarried individuals, both male and female, make their occupation choice at the end of each period, just before experiencing idiosyncratic labor and entrepreneurial ability shocks. Upon realization of these shocks, entrepreneurs demand high-skill and low-skill labor to produce the final good. The production process uses decreasing returns to scale, with constant elasticity of substitution (CES) production technology. If the individual is worker, he/she supplies labor based on his/her skill level inelastically. On the other hand, married households engage in a joint decision-making process. They collectively determine whether the male member chooses to be a worker or an entrepreneur and whether the female member becomes a worker, an entrepreneur, or remains outside the labor force. In the case of joint work, households incur disutility costs to account for various factors, including leisure time, childcare, home production, and other household activities. To reflect the real-world observations, there exists a gender wage gap between female workers and male workers, as well as a business income gap between female entrepreneurs and male entrepreneurs. The model incorporates the role of the government, which levies taxes on both business income and labor income from households in a progressive manner. Similar to Quadrini (2000) and Cagetti and De Nardi (2006), there exist a corporate sector in this environment, producing the same final good using the CES production function.

In this model, being part of a married household brings a potential additional income to the household and provides insurance against idiosyncratic risks. For two males with the

[2] Kaygusuz (2010) studies the effect of gender wage gap, skill-premium and tax changes on the married female labor force participation without occupation choice. Here, I specifically consider that married female can choose whether to be a worker or entrepreneur.

same skill level, for instance, entrepreneurship is higher for those who are married. This difference depends on the skill-type of the married female, her entrepreneurial and labor abilities, and disutility costs. In this context, a decline in the share of married households would imply a reduction in this spousal income, subsequently leading to a decrease in the share of entrepreneurs. Furthermore, a rise in the skill-premium would affect both unmarried males and females in the same way, increasing the opportunity cost of being an entrepreneur and transitioning them to become workers in the skilled group. However, for married females, this rise can increase labor force participation for the high-skilled and low-skilled individuals. On the other hand, a decline in tax progressivity, along with a rise in the gender wage gap and gender business income gap, can lead to an increase in married female labor force participation for both skill types, but their effects on occupation choice differ. Specifically, a fall in the gender wage gap rises the share of workers in the economy, while a decline in the gender business income gap enhances the potential ability of female entrepreneurs, resulting in higher entrepreneurship rates.

I parametrize the model under the assumption that demographic composition, skill distribution and tax structure are in line with the 1985 US economy. Through this parametrization, I calibrate the benchmark economy to match crucial aspects of the US, such as the share of entrepreneurs, the skill-premium, non-linear shape of taxation, and transition rates into entrepreneurship. Then, I explore the impact of potential channels, including gender gaps, taxation, the skill-premium, and demographic composition changes, to accounting for the observed changes in entrepreneurship and married female labor force participation.

My results reveal that demographic composition changes (marital sorting, skill-distribution, share of married households) account for 76.4% of the decline in the overall entrepreneurship. Considering the skill-premium, gender business income gap, gender wage gap, and tax changes, the model explains a big portion of the increase in the married female labor force participation rate. In particular, the model predicts that 88% of the observed increase in the married female labor force participation is accounted by these channels. Furthermore, these changes explain 82.8% of the fall in entrepreneurship, 74.5% of the decline in the number of married entrepreneurs, 88.3% of the decrease in the number of skilled-entrepreneurs, and 77.9% of the fall in male entrepreneurs in the US.

The estimation of the skill and gender premia plays a crucial role in the findings of the model. My quantitative results indicate that when imposing the skill and gender premia parameters from the estimation procedure without contolling for occupation choice, the decline in the entrepreneurship rate increases. In particular, by imposing all changes, including demographic compositions, tax structure, gender gaps, and skill premia, to 2017 level, the model suggests that the share of entrepreneurs is 3.1% which is lower than the data counterparts at 3.4%. Moreover, allowing for endogenous male labor force participation shows that all changes account for the 87.4% of the decline in entrepreneurship, 77.2% of the fall in married entrepreneurs and 92.7% of the decrease in college graduate entrepreneurs in the US.

This paper makes three significant contributions. First, it documents that the decline in the entrepreneurs is more pronounced in male and married groups, which has not been mentioned in the literature. Salgado (2020), Jiang and Sohail (2023) and Kozeniauskas (2018) show that the decline is more pronounced in high-skill group while I document that this trend is not observed for female group. Second, this paper shows that demographic composition is key factor for the decline in entrepreneurship. Although the share of entrepreneurs declined more in married households, college graduates and males, their overall share in the economy significantly changes. The model reveals that demographic composition alone explains 76% of the decline in entrepreneurship, 68.4% of the fall in married entrepreneurs and 70.5% of the decrease in male entrepreneurs. Third, this paper studies the effect of each mechanism on the married female labor force participation and their occupation choice, considering both the individual and her spouse. The model shows that spousal labor force participation can increase entrepreneurship for married group, but this impact depends on female's skill and abilities.

The paper is organized as follows. Section 2 presents the related papers in the literature. Section 3 expresses the empirical findings in the United States. Section 4 describes the model while Section 5 illustrates the calibration procedure and benchmark economy. Section 6 shows the main results of the paper, and Section 7 discusses the importance of gender and skill premia parameters, and the significance of endogenous male labor force participation on the model results. Section 8 concludes the paper.

2 Related Literature

This paper is related to several strands of recent literature, including the decline in business dynamism, entrepreneurship across different genders and marital status, married female labor force participation, gender gaps, and taxation in the US. Similar to this paper, Salgado (2020) study the decline in entrepreneurship and find that skill-biased technological change, accompanied with decline in the price of capital, explains three-quarters of the decline in entrepreneurship. Additionally, Jiang and Sohail (2023) demonstrate that the rise in skill premia explains a small portion of the decline, while 70% of the decline is due to skill-neutral technological change and the rising share of college graduates. Kozeniauskas (2018) argues that, in addition to skill-biased technological change, rising entry costs and outsized productivity gains by the large non-entrepreneurial sector can drive in the fall in the firm entry rate, the size of entrepreneurs and their share. In another perspective, Hopenhayn et al. (2018) reveal that a decline in population growth lowers the firm entry rate leading to an increase the firm-age distribution toward older ones. They find that this mechanism can fully account for the decline in the start-up rate with the perfectly elastic supply of entrants assumption. Similarly, Karahan et al. (2019) show that 60% of the decline in start-ups is originated from the decline in labor supply growth. They argue that the effect of labor supply growth is lower than Hopenhayn et al. (2018) because of the imperfectly elastic supply of entrants assumption that gives closer results relative to data in the short-run. In this paper, however, I stress the importance of demographic composition changes, particularly the share of married households, marital sorting, the share of college graduates, and female labor force participation in this decline. These demographic composition shifts are examined in conjunction with the effects of skill-biased technological change and changes in gender gaps. By considering these factors, I aim to contribute to a comprehensive understanding of the complex dynamics underlying the decline in business formation and entrepreneurship.

This paper is also related to gender differences in entrepreneurship and business formation. Robb and Coleman (2010) and Robb and Watson (2012) evaluate the gender disparities in firm financing, profit, and business growth in the US. Additionally, Morazzoni and Sy (2022) document that female entrepreneurs are more likely to be rejected from their loan applications and have a higher average product of capital in the US. They show that eliminating gender-driven capital misallocation leads to increased output and reduced capital misallocation. Similarly, Chiplunkar and Goldberg (2021) examine the impact of gender barriers for female entrepreneurs in India and demonstrate that eliminating gender-specific distortions results in productivity and welfare gains. Bento et al. (2021) document that female entrepreneurs are overrepresented in poor countries and underrepresented in richer countries, a phenomenon attributed to the time devoted to non-market responsibilities, emphasizing the significance of childcare policies and societal norms on entrepreneurship.

The significance of marital status, marital sorting, female labor supply, and taxation has been widely studied in the literature. Guner et al. (2014) and Borella et al. (2022) estimate effective tax functions by marital status for a cross-section of US households in 2000 using micro data from the US Internal Revenue Service and for each wave of the Panel Study of Income Dynamics from 1969 to 2016, respectively. Kaygusuz (2010) examines the effect of tax reforms, gender wage gaps and skill-premium on married female labor-force participation in the US while Greenwood et al. (2016) evaluate the effect of the decline in the wage gap, skill-premium changes, and the fall in the price of home production on income inequality. Furthermore, Guner et al. (2012), find that tax reforms that change the unit of taxation from households to individuals have crucial implications for labor supply and output.

This paper is connected with marital status and its influence on entrepreneurial choices. Using policy reform on marriage policy in New South Wales, Australia, Zhang (2018) reveals that marriage significantly increases the likelihood of becoming an entrepreneur, leading to an 8% increase for men and a 1.2% increase for women. Moreover, using Canadian administrative data, da Fonseca and Berubé (2020) point out that while married individuals may be less likely to initiate a business venture, married entrepreneurs tend to establish larger and more productive firms. Using Panel Study of Income Dynamics, Ozcan (2011) reveals that being married is a significant determinant for both genders when transitioning into entrepreneurship, whereas cohabitation appears to be less supportive of such entrepreneurial transitions for both genders. This indicates that marriage plays a particularly important role in encouraging entrepreneurship among individuals in the US. In this paper, I document that the correlation between being married and being an entrepreneur is significant and constant over time which supports the idea that marriage is supportive for being an entrepreneur.

3 Data & Empirical Findings

In this section, I present a comprehensive analysis focusing on several crucial aspects of the US economy. Firstly, I show the well-documented fact that there has been a decline in the share of married households over the three decades, concurrent with an increase in the proportion of females in the full-time employed population. Secondly, I document the overall decline in entrepreneurship, with a particular emphasis on disentangling its differential impact across gender and marital status. Continuing the analysis, I undertake a thorough examination of the changes in skill-premium, gender wage gap, and gender business income gap. These critical labor market indicators provide essential insights into the evolving dynamics of entrepreneurship and labor force participation. Additionally, I conduct a characterization of the correlation between being an entrepreneur and being married as well as their evolution over time. Lastly, I document that having a college graduate spouse is correlated with being an entrepreneur and this correlation is stronger than being an entrepreneur and being a college graduate oneself.

Data Description: The primary data source for this study is the CPS IPUMS dataset, with a specific focus on the Annual Social and Economic Supplement (ASEC) spanning the years 1980 to 2021. To ensure data consistency and relevance to the research objectives, the sample is restricted to respondents aged between 25 and 65, who possess positive income (either from labor or business activities). The sample is further refined to include individuals whose employment status is classified as *"at work"* and who have worked for at least 30 hours in the non-agriculture, non-military sector in the previous year. For the purpose of defining entrepreneurs, an individual is categorized as such if they work as self-employed in either an incorporated or unincorporated sector, on a full-time basis.[3] In this paper, a *"married household"* is defined as a household where the individual is married, and their spouse is either present or absent from the household. Conversely, households consisting of individuals who are separated, divorced, widowed, or single are classified as *"unmarried households."*

3.1 Demographics Changes

Panel A of Figure A.7 illustrates a significant decline in the share of married households over three decades. Specifically, the data shows that in 1980, approximately 74% of households were classified as married, while in 2021, this figure declined to 60%. The primary driver of this decline is attributed to the rise in the proportion of single households.[4] The observed shift may be associated with several potential factors, such as changes in home production dynamics, an increase in female labor force participation, and a rise in the college premium, as discussed in the literature (Greenwood et al. (2016)). However, this paper will not delve into the underlying reasons for the decline in married households; rather, the focus lies on investigating its impact on entrepreneurship.

Panel B of Figure A.7 presents a notable decline in the share of males within the full-time employed population over the period 1980-2020. This is because there has been a significant increase in the proportion of females in the sample. For instance, in 1980, only 38% of the full-time employed individuals were females, while this figure rose to 46% in 2021. This rise in the representation of females can be driven by several contributing factors, including the rise in the college premium, the decline in the gender wage gap, and the reduction in the tax burden of individuals (Kaygusuz (2010)). These factors have collectively influenced both married and unmarried female labor force participation, resulting in the observed increase in the share of females in the full-time employed population over time.

3.2 The Decline in the Entrepreneurship

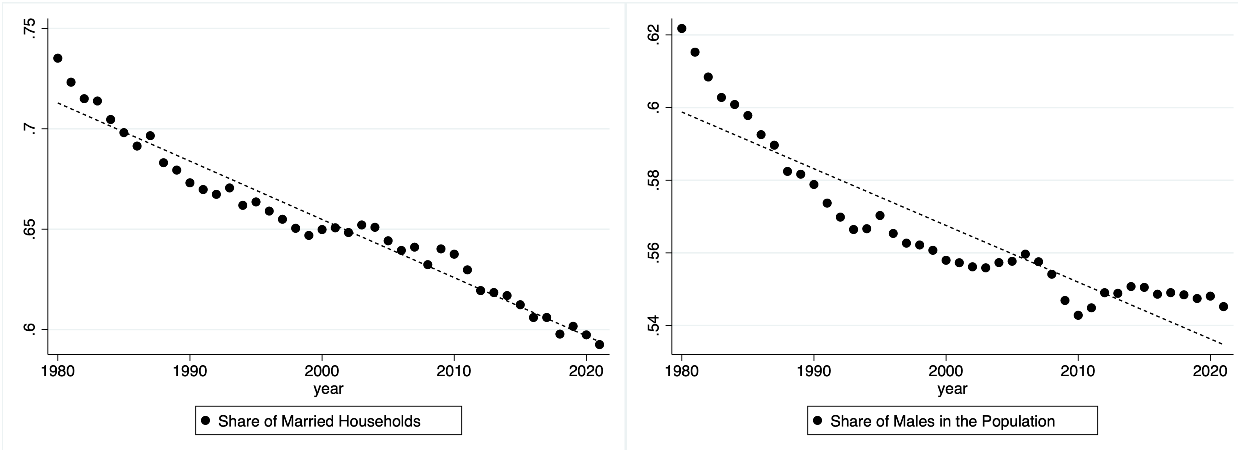
Figure A.10, Panel A presents a detailed analysis of the share of entrepreneurs for married and unmarried individuals in the full-time employed population. Notably, the share of married entrepreneurs is found to be significantly higher than that of unmarried households. However,

[3] In the Appendix section, alternative definitions of entrepreneurship are explored, drawing inspiration from Salgado (2020).

[4] There is not much change in widowed, divorced or seperated households since 1980.

Figure 1: Demographic Changes

(a) *Share of Married Households* **(b)** *Share of Males*



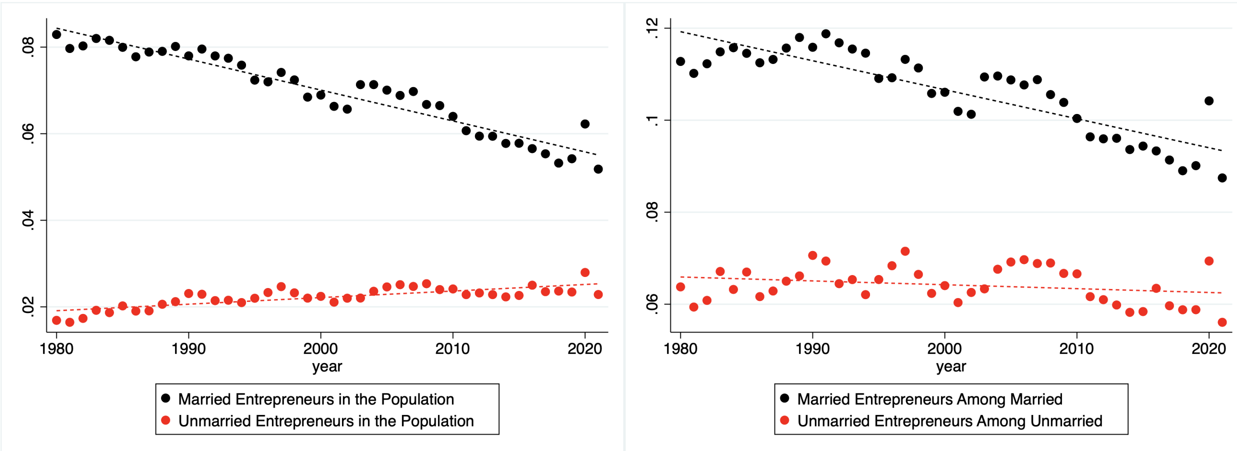
Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.7 shows the share of married households in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-65 across time in the US. Panel B expresses the share of males in the same sample.

it is essential to note that this share has experienced a decline over time. This decline in the share of married entrepreneurs can be attributed to two primary reasons: (i) There has been a decrease in the number of married households in 2021 compared to earlier years, which, in turn, affects the overall proportion of married entrepreneurs(*"Marriage Margin"*). (ii) Lower entrepreneurship within married groups relative to 1980 causes a lower married entrepreneurs in 2021. To provide a more comprehensive perspective for the second channel, Panel B of Figure A.10 focuses on illustrating the entrepreneurship specifically within married households and unmarried households. The data highlights that entrepreneurship among married households was significantly larger than that within unmarried households for all the years analyzed. However, intriguingly, the share of entrepreneurs within married households has experienced a significant decline over time. In fact, the share of entrepreneurs fell by 3 percentage points between 1980 and 2021 within the married group. In contrast, the share of entrepreneurs remained relatively steady during the same period within the unmarried group.

Furthermore, I examine entrepreneurship patterns based on gender. Panel A of Figure A.13 provides a comparative analysis of male and female entrepreneurs. Noticeably, the number of male entrepreneurs is significantly higher than that of female entrepreneurs. However, there has been a decline in the share of male entrepreneurs since 1980. This decline can be driven by two primary factors: (i)There has been a reduction in the number of male individuals in 2021 compared to previous years, which has implications for the overall

Figure 2: Entrepreneurship By Marital Status

(a) *In The Population* **(b)** *In Their Group*



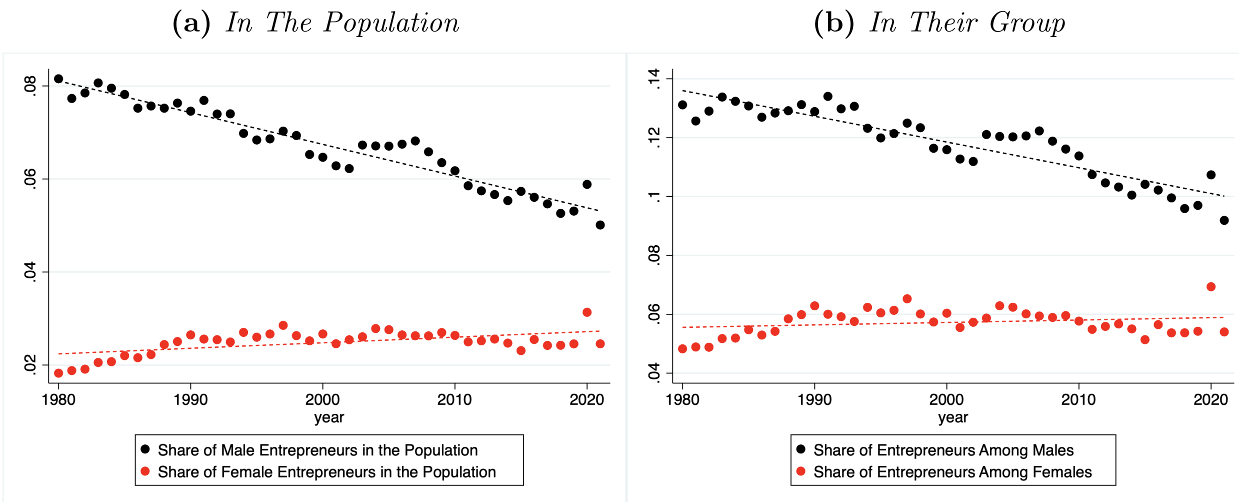
Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.10 shows the share of married and unmarried entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-65 across time in the US. Panel B expresses the entrepreneurs within the married and unmarried groups in the same sample.

proportion of male entrepreneurs(*"Gender Margin"*). (ii) There has been a decline in the entrepreneurship within males in 2021 relative to earlier periods. To gain further insights into the entrepreneurship patterns among males and females, Panel B of Figure A.13 depicts the share of entrepreneurs specifically among males and females. The data reveals that entrepreneurship among males has consistently been larger than among females for all the years analyzed. However, the share of male entrepreneurs has experienced a substantial decline over time. Especially, within the male group, the share of entrepreneurs fell by 3.5 percentage points between 1980 and 2021. On the other hand, within the female group, the share of entrepreneurs remained relatively steady during the same period.

Decomposing the Marriage Margin: To examine the effects of the marriage margin on the share of entrepreneurs, I compute the counterfactual entrepreneurship in the US for 1980, assuming that the entrepreneurship rates among married households and unmarried households remain at the 1980 levels. This allows me to analyze the impact of changes in the number of married households on the overall proportion of entrepreneurs in the economy. More precisely, the share of married entrepreneurs can be written as:

$$\widehat{Married}\ SE_{2021} = (Marriage\ Rate)_{2021} \times (SE\ Among\ Married\ Households)_{1980} \quad (1)$$

Figure 3: Entrepreneurship By Gender



Sources: CPS March Supplement *Notes:* Panel A of Figure A.13 shows the share of male and female entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-65 across time in the US. Panel B expresses the entrepreneurs within the male and female groups in the same sample.

where $\widehat{Married}\, SE_{2021}$ represents the counterfactual share of married entrepreneurs in the population. By applying Equation (1), the counterfactual share of married entrepreneurs is calculated to be 6.71%. In other words, if the entrepreneurship among married households had remained constant at the 1980 level, the implied share of married entrepreneurs would be 6.71%.[5] Following the same method, the counterfactual share of unmarried entrepreneurs is estimated to be 2.59%, implying a counterfactual entrepreneurship rate of 9.3% in 2021. Given that the actual share of entrepreneurs was 7.9% in 2021, the marriage margin accounts for

$$Marriage\ Margin = \frac{SE_{1980} - \widehat{SE}_{2021}}{SE_{1980} - SE_{2021}} = \frac{9.98 - 9.3}{9.98 - 7.47} = \frac{0.68}{2.51} = 27.1\%$$

27.1% of the decline in entrepreneurship in the US.

Decomposing the Gender Margin: To assess the impact of the gender margin on the share of entrepreneurs, I compute the counterfactual entrepreneurship rate in the US for 1980, assuming that the entrepreneurship rates among males and females remain at the 1980 levels. The counterfactual share of male entrepreneurs in the population is calculated

[5]The actual share of married entrepreneur households in 2021 was observed to be 5.2%. The marriage margin, i.e. the decline in entrepreneurs among married households, accounts for **51.13%** of the decline in the share of married entrepreneur households. Estimation can be found in the Appendix.

as follows:

$$\widehat{Male\ SE}_{2021} = (Share\ of\ Male)_{2021} \times (SE\ Among\ Male)_{1980} = 54.28\% \times 13.11\% = 7.12\% \tag{2}$$

Similarly, the counterfactual share of female entrepreneurs in 2021 is estimated to be 2.21%. This suggests that if the entrepreneurship rates among males and females had remained constant, the overall share of entrepreneurs would be 9.33% in 2021. To understand the extent to which this accounts for the decline in entrepreneurship, the gender margin is computed using the following equation:

$$Gender\ Margin = \frac{SE_{1980} - \widehat{SE}_{2021}}{SE_{1980} - SE_{2021}} = \frac{9.98 - 9.33}{9.98 - 7.47} = \frac{0.65}{2.51} = 25.9\%$$

These findings highlight the significant role played by the decline in the proportion of males in contributing to the overall decrease in entrepreneurship in the US, explaining **25.9%** of the decline. Considering the decline in the proportion of married households jointly, I find that they collectively account for **43.8%** of the drop in the share of entrepreneurs in the US.[6] The combined effect of these factors underscores the importance of gender dynamics and marital status in influencing entrepreneurship trends.

3.3 Changes in Skill & Gender Premia

In this section, I estimate the skill-premium, and gender income gaps, and discuss their potential impact on the entrepreneurship. The skill-premium is defined as the ratio of wages earned by college graduates to those earned by non-college workers. The gender wage gap is measured as the ratio of wages earned by male workers to those earned by female workers, while the gender business income gap is defined as the ratio of profits earned by male entrepreneurs to those earned by female entrepreneurs, controlling for individual characteristics.

To estimate the gender wage gap and skill-premium, I focus on workers aged between 25 and 65, employed full-time in non-army, non-agriculture sectors, and earning a weekly wage higher than $142 in 2010 dollars.[7] Following the approach of Valetta (2016), I estimate log-weekly wage equations for each year using the following regression form:

$$ln(w_i) = \beta Gender_i + \gamma College_i + \mu X_i + \epsilon_i$$

[6] The detailed calculations can be found in the Appendix.

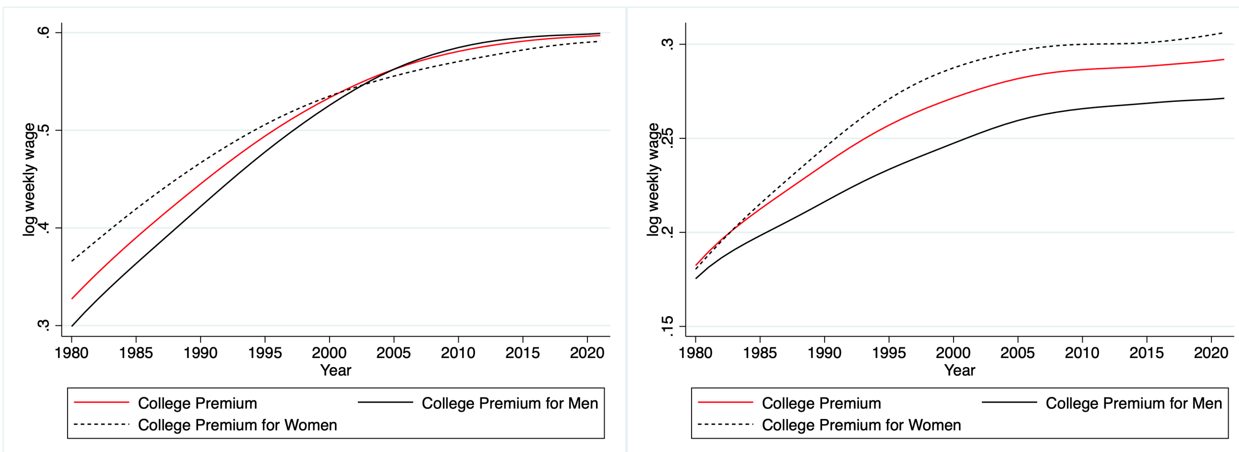
[7] For the definition of full-time, I adopt criteria used by (Author et al., 2008), where a full-time worker is one who worked 30 hours or more last week, worked usually 30 hours or more last year, and worked at least 40 weeks within the year.

where the variable *College* is binary and equals 1 if an individual possesses a college degree or higher, and 0 otherwise. The regression also includes individual characteristics X_i, comprising age, age squared, and occupation. Moreover, I estimate the coefficient of *College* separately within each gender group.

Panel A of Figure 4 presents the estimated skill-premium for a worker, while Panel B displays the same parameter while controlling for occupation. The skill-premium of a worker

Figure 4: Skill-Premium for Worker

(a) *Without Occupation* **(b)** *With Occupation*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on log wages while Panel B expresses the same coefficient controlling occupations.

has increased from 33% in 1980 to 60% in 2020. However, this rise is less pronounced when considering the occupation of individuals as a control variable.[8] Specifically, when controlling for occupation, the skill-premium of a worker only rose from 17% to 29% during the same period. Furthermore, the increase in the skill-premium is more pronounced among male workers, but once we control for occupation, the rise becomes more evident among female workers. These observed trends hold robustly when correcting for Heckman selection bias using the Mincer regression approach.[9]

Similarly, I estimate the gender business income and skill-premium for entrepreneurs. In this context, I define entrepreneurial income as the sum of business income and labor

[8]Controlling occupation in the literature considered as to be a bad control because occupation decision may create heterogeneity. Although, in this paper, I use both parameter in the calibration, I use the parameter from Panel B as there is no occupation differences in the model.

[9]To account for Heckman selection bias, the population equation of labor income assumes that log wages of females depend on variables such as college degree, age, and age squared. For the selection equation, the probability of female participation in the labor market is assumed to depend on variables like marital status, race, and the variables from the population equation.

income as Jiang and Sohail (2023).[10] Hence, I estimate the log-weekly entrepreneurial income equations of the following form regression form for each year:

$$ln(\pi_i) = \beta Gender_i + \gamma College_i + \mu X_i + \epsilon_i$$

where $College$ is a categorical variable denoting whether an individual has a college degree or more, and X_i represents the control variables for age, age squared, and occupation.

Figure 5: Gender Gaps

(a) *Wage Gap* **(b)** *Business Income Gap*

Sources: CPS March Supplement *Notes:* Panel A of Figure 5 shows the regression coefficient for being a male on log wages while Panel B expresses the regression coefficient for being a male on log profits.

Figure 5, Panel A presents the gender wage gap for workers, while Panel B shows the gender business income gap for entrepreneurs. The results demonstrate a significant reduction in the gender wage gap over time, even after controlling for occupations. For example, in 1980, male workers earned 50% more than their female counterparts, whereas this gap decreased to 28% in 2020. Similarly, the gender business income gap exhibited a substantial decline during the same period. In 1980, male entrepreneurs made a profit that was 58% higher than that of females, whereas this difference decreased to 35% by 2020. This decline in the gender business income gap may be attributed to factors such as a reduction in time, human, or social constraints that previously limited female entrepreneurs' ability to grow their businesses.

These substantial changes can have implications for individual entrepreneurship decisions. Specifically, the rise in worker skill-premium may encourage individuals to choose

[10] I also define entreprenurial income as only business income. Additionally, I control firm size of the businesses that the individual operates. These results can be found in the appendix.

employment over entrepreneurship.[11] Furthermore, the increase in skill-premium may lead to greater participation of skilled females in the labor force, thereby affecting the overall representation of females in the economy. The gender gaps also influence female participation, but their effect on the choice of occupation varies; one set of gender gaps can increase the likelihood of choosing entrepreneurship, while another gap can increase the likelihood of choosing employed worker.

3.4 Empirical Characterization

In this section, I investigate the relationship between marital status and entrepreneurship and analyze the influence of married couples' education on entrepreneurial choices. To explore the association between being married and being an entrepreneur, I employ a linear regression model with the following specification:

$$Entrepreneur_{i,t} = \beta_0 + \beta_1 married_{i,t} + \beta_2 bachelor_{i,t} + \beta_3 (married_{i,t} * bachelor_{i,t}) + \beta_4 X_{i,t} + \alpha_t \tag{3}$$

where $Entrepreneur_{i,t}$ is a binary variable that takes a value of 1 if the individual is an entrepreneur and 0 if they are a worker, $married_{i,t}$ is an indicator variable that equals 1 if the individual is married, $bachelor_{i,t}$ is a binary variable that equals 1 if the individual has a college degree, $X_{i,t}$ represents a set of individual characteristics, including age, age^2, sex, and race. α_t denotes year fixed effects to control for time-specific factors that may influence entrepreneurship.

Table 1: Linear Probability Model

	(1)	(2)	(3)
Married	.042***	.023***	.021***
	(79.6)	(41.7)	(38.7)
College	.017***	.016***	.018***
	(21.5)	(20.7)	(23.1)
Married × College	−.002**	−.005***	−.005***
	(−2.5)	(−5.44)	(−4.6)
Controls	No	Yes	Yes
Year Fixed Effects	No	No	Yes
Observations	2,325,812	2,325,783	2,325,783

Notes: Parentheses refer to t-statistics where $***p < 0.01$. Model 1 precludes the covariates, while Model 2 includes control variables, and Model 3 additionally includes year fixed effects.

[11] In the appendix, I provide evidence that the skill-premium for entrepreneurs has not experienced a similar increase.

Table 1 illustrates the regression results for different models. In particular, focusing on Column III, we observe a strong positive correlation between being married and being an entrepreneur. Specifically, being married is associated with a 2% increase in the likelihood of being an entrepreneur, while having a college degree is associated with a 1.8% increase. Notably, their interaction term is negative, indicating that the joint effect of being married and having a college degree is less than the sum of their individual effects. However, despite this negative interaction, being both married and having a college degree is still associated with a 3.5% rise in the likelihood of being an entrepreneur. This combined effect is significantly higher compared to being only married or having only a college degree. The observed positive correlation between being married and being an entrepreneur could be attributed to various factors. Marriage may provide a certain level of financial security through spousal income, which could reduce the financial risks associated with entrepreneurship. Additionally, having a college degree can be associated with higher skills and qualifications, which could contribute to the success of entrepreneurial activities. This can be supported by the fact that college graduate entrepreneurs earns 50% more than their counterparts without college degree, as depicted in Figure A.14.

Furthermore, I examine how these correlations change over time by estimating the same regression model for each year separately. The time trends of the coefficients are assessed with the following equation:

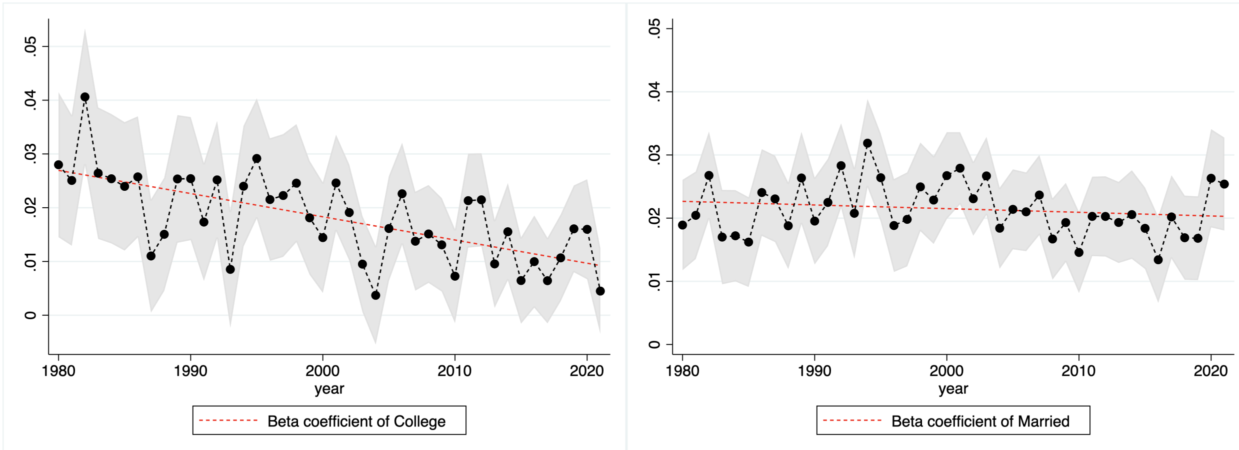
$$Entrepreneur_i = \beta_0 + \beta_1 married_i + \beta_2 bachelor_i + \beta_3 (married_i * bachelor_i) + \beta_4 X_i$$

Panel A of Figure 6 presents the estimated coefficients for *College* while Panel B illustrates the coefficients for *Married*. Findings reveal that the effect of having a college degree has been decreasing over time indicating that the importance of college graduates in the entrepreneurship has become less significant. Conversely, the effect of being married on entrepreneurship remains relatively constant over time. It is worth noting that the decline in the coefficient for *College* is statistically significant at a 95% confidence interval, while the change in the coefficient for *Married* is not statistically significant. This suggests that although the effect of being married is still important, the declining share of married households over time has contributed to the decline in married entrepreneurship in the US.

In order to investigate the spousal effect on an individual's likelihood of being an entrepreneur, I focus on a specific sample of married individuals who are the head of their households, along with their spouses. I construct the following regression model to explore

Figure 6: Regression Coefficients

(a) *College* **(b)** *Married*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

this relationship:

$$Entrepreneur_{i,t} = \beta_0 + \beta_1 college_{i,t} + \beta_2 collegespouse_{i,t} + \beta_3 collegespouse_{i,t} \times college_{i,t} + \beta_4 X_{i,t}$$

where *college* and *collegespouse* are dummy variables that take a value of 1 if the main respondent has a college degree or if their spouse has a college degree, respectively. The regression includes a set of individual control variables, such as age, age^2, sex, race and number of children of the main respondent.

Table 2: Linear Probability Model for Married Sample

	(1)	(2)	(3)
College	.013**	.008**	.01**
	(13.4)	(8.2)	(11.1)
College Spouse	.025**	.025**	.03**
	(22.2)	(22.0)	(25.6)
College × College Spouse	−.018**	−.015**	−.016**
	(−11.3)	(−9.9)	(−10.6)
Controls	No	Yes	Yes
Year Fixed Effects	No	No	Yes
Observations	1,522,021	1,522,021	1,522,021

Notes: Parentheses refer to t-statistics where $**p < 0.01$. Model 1 precludes the covariates, while Model 2 includes control variables, and Model 3 additionally includes year fixed effects.

Table C.3 shows the regression results for three different models. In particular, focusing on column III, having a college degree is associated with a 1% rise in being an entrepreneur while having a spouse with a college degree is associated with a 3% increase. This indicates that the effect of having a college-educated spouse is larger than being a college graduate oneself, suggesting that marriage may bring additional financial insurance. For instance, married couples may benefit from economies of scale within the household, allowing them to share public goods and reduce their per capita expenditures. This can result in additional income and provide some level of financial insurance, potentially influencing the decision to take the risk of becoming an entrepreneur. On the other hand, the joint impact of having a college degree and a spouse with a college degree is 2.4%, which is lower than the effect of not having a college degree but having a college-educated spouse (3%). This finding suggests that spousal insurance is more significant for individuals without a college degree when considering the decision to become an entrepreneur. Overall, the presence of a college-educated spouse appears to play a significant role in increasing the likelihood of becoming an entrepreneur, potentially offering both financial and non-financial support in the entrepreneurial activity.

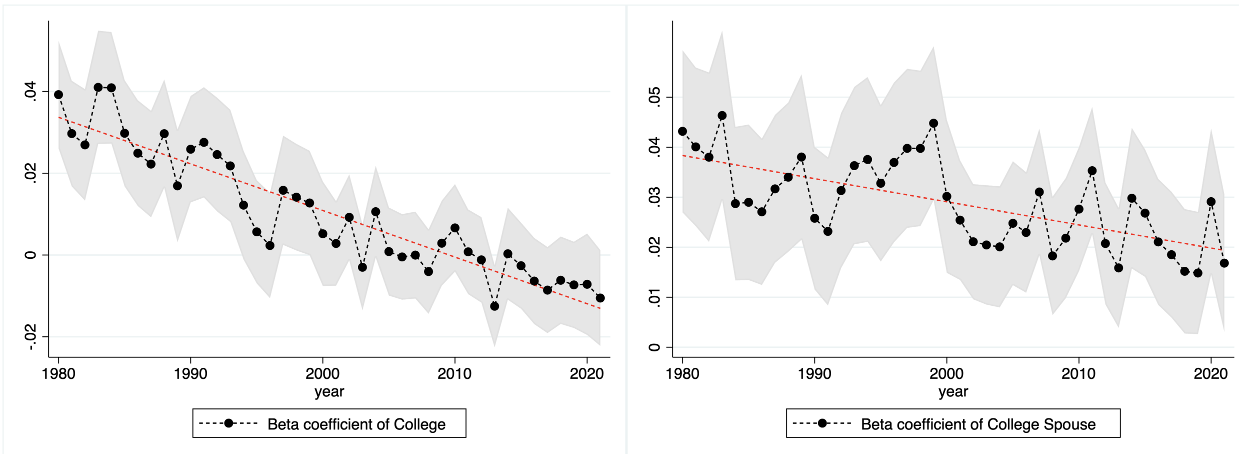
To examine how the effects of having a college degree and a college-educated spouse on entrepreneurship change over time, I estimate the following regression for each year:

$$Entrepreneur_i = \beta_0 + \beta_1 college_i + \beta_2 collegespouse_i + \beta_3(collegespouse_i * college_i) + \beta_4 X_i$$

Panel A of Figure 7 presents the estimated coefficients for *College* while Panel B illustrates the coefficients for *College Spouse*. The results suggest that the effect of both ollege and college spouse decline significantly over time. This imply that the importance of college degree is insignificant after 1995, while the effect of having a spouse with college degree declines but still significant. This decline can be attributed to the rise in the skill-premium for workers which attracts the college graduate entrepreneurs to become a worker and results in the decline in the having a college degree on being an entrepreneur. This shift in preference contributes to the decrease in the effect of having a college degree on the likelihood of becoming an entrepreneur. On the other hand, the impact of *College Spouse* is still significant even though it diminishes over time. The decline in gender wage gap and gender business income gap may partially reduce the effect of having a college-educated spouse on an individual's decision to become an entrepreneur because these gaps allow unskilled spouse may provide insurance.

Figure 7: Regression Coefficients for Married Sample

(a) *College* **(b)** *College Spouse*



Sources: CPS March Supplement *Notes:* Panel A of Figure 7 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for having a college-graduate spouse on being an entrepreneur. Gray area represents the 95% confidence intervals.

4 Model

In Section 3, I discuss several empirical facts regarding the significance of demographic changes, skill premia, gender gaps, and marital status on entrepreneurship. To capture these findings in a comprehensive framework, I develop a dynamic growth model that incorporates various dimensions such as marital status, gender, and skill abilities, building upon the work of Quadrini (2000), Cagetti and De Nardi (2006), Guner et al. (2012), Salgado (2020) and Jiang and Sohail (2023).

4.1 Demographics

Economy is populated by a continuum of males and females, denoted by $g = \{m, f\}$. Individuals born as high-skilled ($s = h$) or low-skilled ($s = l$) implying that at each period t, there exist fractions H_t^g and L_t^g of high-skilled and low-skilled individuals within each gender group. Individuals also differ in terms of their marital status: they are born as either unmarried or married, and their marital status does not change over time.

4.2 Preferences

Each unmarried individual has a specific utility function, $u(c) = log(c)$, and she discounts future utility at the rate β where $\beta < 1$. In contrast, for married households, their utilities is the sum of the utility of each member. To account for the potential disutility arising from joint work, such as childbearing or the inconvenience of sharing leisure time within the household, a cost parameter q is introduced, drawn from a finite set $\mathcal{Q} \subset \mathbb{R}{++}$. This cost parameter is incurred when the female member of a married household works. The initial draw of the utility cost depends on the skill type of the husband. Specifically, let $\eta(q|s)$ denote the probability that the cost of joint work is q, and it is assumed that $\sum q \in \mathcal{Q}\eta(q|s) = 1$.

4.3 Technology

Each individual, both male and female, has two abilities, labor ability ($\epsilon_{g,t}$), and entrepreneurial productivity ($\kappa^s z_{g,t}$) where $g = \{m, f\}$. Entrepreneurial productivity is composed of two parameters, a level parameter for skill-type, κ^s ($s = h$ for high-skilled, $s = l$ for low-skilled), and entrepreneurial ability, $z_{g,t}$. Both labor ability and entrepreneurial ability are idiosyncratic, positively autocorrelated following independent $AR(1)$ processes with gender specific transition functions $\mathcal{F}_g(z, z')$ for entrepreneurial ability and $\mathcal{G}_g(\epsilon, \epsilon')$ for labor ability. In each period, unmarried individuals can choose to either work as employees or become entrepreneurs. For married households, the husband can either work as an employee or an entrepreneur, while the wife has the additional option of being out of the labor force.

Male workers supply labor inelastically and receive income of $\epsilon_{m,t} w_t^s$ where w_t^s represents the efficiency unit of wage for skill type s in the economy. Similarly, female workers supply labor inelastically but receive income of $\phi_t \epsilon_{f,t} w_t^s$ where $\phi \in [0, 1]$ represents the gender wage gap between male and female workers. An individual with an entrepreneurial ability, z_t, has production technology:

$$f\left(z_g, n_l, n_h\right) = h(z_g)\kappa^s\left[(\theta_l n_l)^\sigma + (\theta_h n_h)^\sigma\right]^{\frac{\gamma}{\sigma}} \tag{4}$$

where γ is the span of control parameter (Lucas Jr (1978)), σ captures the elasticity of substitution between skilled and unskilled labor, θ_l and θ_h govern the productivity of low-skill and high skill labor, respectively. The precise form of the function $h(z_g)$ is as follows:

$$h\left(z_g\right) = \begin{cases} \Psi z_f^{1-\gamma}, & \text{if } g = f \\ z_m^{1-\gamma}, & \text{if } g = m \end{cases} \tag{5}$$

where $\Psi \in [0, 1]$ represents the gender business income gap between male and female.

There is also production from the corporate sector, as introduced in Quadrini (2000) and Cagetti and De Nardi (2006). Both sectors produce the single good of the economy. The corporate sector is populated by a large number of firms that have CES production technology:

$$F(L_l, L_h) = [(\theta_l L_l)^{\sigma} + (\theta_h L_h)^{\sigma}]^{\frac{1}{\sigma}} \tag{6}$$

where σ captures the elasticity of substitution between skilled and unskilled labor and θ_l and θ_h represent the productivity of low-skill and high skill labor, respectively.

4.4 Government

To finance its expenditures, the government collects taxes from workers and entrepreneurs. The income tax function for individuals, as introduced in Benabou (2002) and Heathcote et al. (2017), is given by:

$$T^k(y) = y - \lambda_y y^{1-\tau_y}$$

where y is the income, λ_y determines the average tax rate, and τ_y determines the progressivity of income tax for $k = \{UM, M\}$. The advantage of this tax function is that when $\tau_y = 0$, tax rates are the same for all income levels and have the same average tax rate of $(1 - \lambda_y)$. For $\tau_y > 0$, the average tax rate increases with income level, meaning that high earners are subject to higher tax levels.

4.5 Households

Unmarried Household's Problem In each period, the unmarried individual's skill s, entrepreneurial ability, $z_{g,t}$, and labor productivity, $\epsilon_{g,t}$, are known with certainty. Each young individual faces a choice between becoming an entrepreneur or becoming a worker before realizing their idiosynratic productivity shocks. In other words, based on today's abilities, individual make an occupation choices for the next period. The problem of being a worker for gender g and skill s is as follows :

$$V^s_{w,g}(z_g, \epsilon_g, \Omega) = u(c) + \beta \max\{E(V^s_{w,g}(z'_g, \epsilon'_g, \Omega')), E(V^m_{e,g}(z'_g, \epsilon'_g, \Omega')\}) \tag{7}$$

subject to

$$\begin{aligned} c &= w^s \epsilon_m - T^{UM}(w^s \epsilon_m) && \text{for } g = m \\ c &= \phi w^s \epsilon_f - T^{UM}(\phi w^s \epsilon_f) && \text{for } g = f \end{aligned}$$

where z_g and ϵ_g are the state variables, $\Omega = \{H^m_t, H^f_t, \phi_t, \Psi_t\}$ are aggregate state variables, $V^s_{w,g}(z_g, \epsilon_g, \Omega)$ is the value function of being a worker, and $V^m_{e,g}(z_g, \epsilon_g, \Omega)$ is the value function of being an entrepreneur for gender g, skill s. The expectation of the value function is taken with respect to z' and ϵ' conditional on first-order Markov Process transition functions of $\mathcal{F}_g(z, z')$ and $\mathcal{G}_g(\epsilon, \epsilon')$ separately. The worker chooses the occupation choice today for tomorrow subject to budget constraints. $w\epsilon_m$ and $\phi w\epsilon_f$ are the labor income for male and female, respectively, while the second term on the right hand side is taxes on labor income that are paid to the government.

If the unmarried individual is entrepreneur, the value function for gender g and skill s is:

$$V^s_{e,g}(z_g, \epsilon_g, \Omega) = u(c) + \beta \max\{E(V^s_{w,g}(z'_g, \epsilon', \Omega')), E(V^m_{e,g}(z'_g, \epsilon'_g, \Omega')\}) \tag{8}$$

subject to

$$\begin{aligned} c &= \pi(z_m) - T^{UM}(\pi(z_m)) && \text{for } g = m \\ c &= \pi(z_f) - T^{UM}(\pi(z_f)) && \text{for } g = f \end{aligned}$$

where z_g and ϵ_g are the state variables, $\Omega = \{H^m_t, H^f_t, \phi_t, \Psi_t\}$ are aggregate state variables, $V^s_{w,g}(z_g, \epsilon_g, \Omega)$ is the value function of being a worker, and $V^m_{e,g}(z_g, \epsilon_g, \Omega)$ is the value function of being an entrepreneur. An individual discounts the expected value of future value function by β, which is maximum value of expected value of being worker and entrepreneur. The expectation of the value functions are taken with respect to z' and ϵ' conditional on transition functions, similar to the worker's problem (7). The right hand side of the budget constraints consists of business income for male,$\pi(z_m)$, or female, $\pi(z_f)$, respectively, and the second term on the right hand side is taxes on business income that are paid to the government. The profit maximization problem of an entrepreneur, $\pi(z_g)$, is as below:

$$\pi(z_g) = \max_{n_l, n_h} h(z_g)\kappa^s \left[(\theta_l n_l)^\sigma + (\theta_h n_h)^\sigma\right]^{\frac{\gamma}{\sigma}} - w_l n_l - w_h n_h - C$$

The profit maximization problem for an entrepreneur consists of several components. The first term represents the gross output, which depends on gender g and entrepreneurial ability z. The second and third terms capture the costs of hiring skilled and unskilled labor, respectively. The last term represents the overhead costs required to run the business. It is essential to recognize that these costs act as financial constraints for individuals who are considering becoming an entrepreneur. In other words, individuals must ensure that their expected profits from entrepreneurship exceed the associated costs in order to decide to become an entrepreneur.

Married Household's Problem In each period, the married household consists of a married male with skill s, entrepreneurial ability, $z_{m,t}$, and labor productivity, $\epsilon_{m,t}$, and a married female with skill $\tilde{s}$, entrepreneurial ability, $z_{f,t}$, and labor productivity, $\epsilon_{f,t}$. Both abilities for each gender are known with certainty. The married male faces a choice between becoming an entrepreneur or a worker while the married female faces a choice of being out of labor force, an entrepreneur or a worker. Households member make these joint occupation decisions before realizing their idiosynratic productivity shocks. In other words, based on today's abilities, households decide the occupation choices for tomorrow. The problem of a married household where male and female are worker is the following :

$$W^{s\tilde{s}}_{ww}(\Theta, q; \Omega) = \max_{o'} 2log(c) - q \tag{9}$$

$$+\beta \max \Bigg\{ \underbrace{E(W^{s\tilde{s}}_{ee}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female entrepreneur}}}, \underbrace{E(W^{s\tilde{s}}_{we}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female entrepreneur}}}, \underbrace{E(W^{s\tilde{s}}_{ew}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female worker}}}$$

$$\underbrace{E(W^{s\tilde{s}}_{ww}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female worker}}}, \underbrace{E(W^{s\tilde{s}}_{en}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female not in LF}}}, \underbrace{E(W^{s\tilde{s}}_{wn}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female not in LF}}} \Bigg\}$$

subject to

$$c = w^s \epsilon_m + \phi w^{\tilde{s}} \epsilon_f - T^M (w^s \epsilon_m + \phi w^{\tilde{s}} \epsilon_f)$$

where $\Theta = \{z_m, \epsilon_m, z_f, \epsilon_f\}$ are state variables, $\Omega = \{H^m_t, H^f_t, \phi_t, \Psi_t\}$ are aggregate state variables, $W^{s\tilde{s}}_{ee}(\Theta', q; \Omega')$ is the value function of being a entrepreneur for both male and female, $W^{s\tilde{s}}_{we}(\Theta', q; \Omega')$ is the value function for male worker female entrepreneur, $W^{s\tilde{s}}_{ew}(\Theta', q; \Omega')$ is the value function for male entrepreneur female worker, $W^{s\tilde{s}}_{ww}(\Theta', q; \Omega')$ is the value function of being a worker for both male and female, $W^{s\tilde{s}}_{en}(\Theta', q; \Omega')$ is the value function for male entrepreneur and female not in labor force, and $W^{s\tilde{s}}_{wn}(\Theta', q; \Omega')$ is the value function for male worker and female not in labor force, for skill of male $s = \{h, l\}$ and female $\tilde{s} = \{h, l\}$. The expectation of the value functions are taken with respect to z' and ϵ' conditional on first-order Markov Process transition functions of $\mathcal{F}_m(z, z')$, $\mathcal{G}_m(\epsilon, \epsilon')$, $\mathcal{F}_f(z, z')$ and $\mathcal{G}_f(\epsilon, \epsilon')$, separately. Here, as both members work there is a disutility by q from disjoint work. The maximization problem is subject to budget constraints where right hand side consists of the labor income from male and female members and taxes on household income that are paid to the government. Other value functions are left to Appendix.

Corporate Sector's Problem The problem of the corporate sector is

$$\max_{L_h, L_l} [(\theta_l L_l)^{\sigma} + (\theta_h L_h)^{\sigma}]^{\frac{1}{\sigma}} - w_h L_h - w_l L_l \tag{10}$$

where L_h and L_l are demand for high-skilled and low-skilled labor efficiency in the corporate sectorw_h is the rental rate of high-skill labor and w_l is the wage rate for low-skill labor.

4.6 Equilibrium

Given the model specified above, the equilibrium is defined in the following way. At the steady-state equilibrium, the aggregate state of the economy and equilibrium prices are constant over time. Households solve their problem by taking prices and government policies as given. Similarly, given prices and government policies, the corporate sector chooses the factor demands. In the equilibrium, the high-skill labor market clears. Specifically, the aggregate skilled labor demanded by corporate sector, married entrepreneurs(including skilled, unskilled, female and male) and unmarried entrepreneurs are equal to aggregate high-skill labor supplied by the households. The high-skill labor is supplied by married skilled male workers, married skilled female workers, unmarried skilled female workers and skilled male workers in the economy.

Similarly, in the equilibrium, low-skill labor market clears. The aggregate low-skill labor demanded by corporate sector, married entrepreneurs(including skilled, unskilled, female and male) and unmarried entrepreneurs are equal to aggregate low-skill labor supplied by the households. The low-skill labor is supplied by married unskilled male workers, married unskilled female workers, unmarried unskilled female workers and unskilled male workers in the economy.

Equilibrium condition assures that corporate sector makes zero profits and prices are competitive:

$$w_h = \left[\left(\theta_l L_l^C\right)^{\sigma} + \left(\theta_h L_h^C\right)^{\sigma}\right]^{\frac{1}{\sigma}-1} \theta_h^{\sigma} \left(L_h^C\right)^{\sigma-1}$$

$$w_l = \left[\left(\theta_l L_l^C\right)^{\sigma} + \left(\theta_h L_h^C\right)^{\sigma}\right]^{\frac{1}{\sigma}-1} \theta_l^{\sigma} \left(L_l^C\right)^{\sigma-1}$$

The formal definition of the competitive equilibrium is left to Appendix E.

5 Parametrization

In this section, I present the parametrization of the quantitative model, where the economy is calibrated to the 1985 US economy. The model consists of two sets of parameters. The first set is taken directly from the literature or calculated from the data, while the second set of parameters is chosen jointly with the model to match important features of the US economy. The model period is assumed to be one year. Table 3, Panel A, shows the fixed parameters, and Panel B reports the calibrated parameters used in the paper.

The discount factor is set to 0.96 in order to match the annual interest rate of 4% observed in the US, similar to Jiang and Sohail (2023). The elasticity of substitution parameter is chosen to be 1.41, which corresponds to a CES parameter of 0.29. The span of control parameter is set at 0.8, a value derived from the study by Guner et al. (2008).

Labor productivity is assumed to follow the first-order autoregressive process in logarithm, characterized by persistence ρ_ϵ, and a standard deviation of innovations with σ_ϵ:

$$\log \epsilon_t = \rho_\epsilon \log (\epsilon_{t-1}) + \varepsilon_\epsilon \tag{11}$$

where ε_ϵ is independently and identically distributed with a mean of zero and a variance of σ_ε^2. In order to discretize the AR(1) process, I use Rouwenhorst (1995) method. The annual persistence parameter for the autoregressive process is fixed at 0.95, while the standard deviation of ε is set to 0.1225, as estimated by Storesletten et al. (2004). For the benchmark economy, I assume that both males and females share the same labor productivity process.

In the parametrization, I assume that the tax function does not depend on marital status. The model adopts the average income tax function $T(y) = 1 - \lambda_y y^{-\tau_y}$, as introduced by Benabou (2002). The progressive parameter $\tau_y = 0.149$ is used in the model, which was estimated by Dyrda and Pugsley (2019) for the years 1983-1985. The estimation of the progressivity parameter was conducted using data on the average marginal income tax on wages, salaries, and entrepreneurial income provided by Mertens and Montiel Olea (2018), in combination with IRS data.[12]. Hence, the chosen progressive parameter is equal to 0.149.

The gender wage gap and gender business income gap parameters are estimated using data from CPS ASEC, while controlling for individuals' characteristics, including occupation. The estimation results reveal that females earn 26% less than males on average. Consequently, the gender wage gap parameter is set to 0.74, indicating that females earn approximately 74% of what males earn. Similarly, the estimation suggests that female entrepreneurs earn 33% less than male entrepreneurs. Therefore, the gender business income gap parameter is chosen to be 0.67, implying that female entrepreneurs' income is approximately 67% of male entrepreneurs' income. Lastly, for the distribution of households in 1985, I use the data from CPS and set the parameters as shown in Table C.5 and Table C.6.

The rest of the parameters are chosen such that the stationary equilibrium of the model

[12] The estimated progressivity parameter includes both average marginal individual income tax rate (AMIITR) and average marginal payroll tax rate(AMPTR).

Table 3: Parameters of the Model

Parameter		Value
A. Fixed Parameters		
Discount Factor	β	0.96
CES Parameter	σ	0.29
Span of Control	γ	0.8
Autocorrelation of ϵ_t^m	ρ_ϵ^m	0.95
Standard Dev. of $\varepsilon_{\epsilon^m,t}^m$	σ_ε^m	0.1225
Autocorrelation of ϵ_t^f	ρ_ϵ^f	0.95
Standard Dev. of $\varepsilon_{\epsilon^f,t}^f$	$\sigma_{\varepsilon^f}^f$	0.1225
Gender Wage Gap	ϕ	0.74
Gender Business Income Gap	Ψ	0.67
B. Calibrated Parameters		
Labor Productivity of High-skill Labor	θ_h	0.088
Autocorrelation of z_t^m	ρ_z^m	0.93
Standard Dev. of $\varepsilon_{z^m,t}^m$	$\sigma_{\varepsilon_z^m}^m$	0.2583
Autocorrelation of z_t^f	ρ_z^f	0.9
Standard Dev. of $\varepsilon_{z^f,t}^f$	$\sigma_{\varepsilon_z^f}^f$	0.19
High-skill Entr. Productivity	ζ_h^m	1.82
Overhead Costs	C	0.113
Shape Parameter of High Skill	k_H	2.065
Shape Parameter of Low Skill	k_L	1.8
Scale Parameter of High Skill	θ_H	0.46
Scale Parameter of Low Skill	θ_L	0.6
Average Tax	λ_y	0.799

Notes: Table 3 Panel A illustrates the fixed parameters and Panel B indicates the calibrated parameters.

matches key features of the US economy in 1985: (i) skill-premium (ii) share of entrepreneurs, (iii) transition rate, (iv) share of female entrepreneurs, (v) transition rate for female (vi) share of high skill entrepreneurs, (viii) share of married entrepreneurs (ix) married female labor force participation for different skill groups, (x) income tax revenue to output. Table 3, Panel B illustrates the value of the calibrated parameters determined jointly with the equilibrium of the model.

As calculated in Section 3, high-skilled workers earn 22% higher wages than low-skilled workers. To calibrate the productivity parameter θ_h for high-skilled workers, I normalize θ_l and set θ_h to match the estimated skill-premium. Furthermore, entrepreneurial productivities for male and female are assumed to follow a logarithmic form of a first-order autoregressive process. Specifically for each gender $g = \{m, f\}$, the process is given by:

$$\log z_{g,t} = \rho_{z,g} \log (z_{t-1}) + \varepsilon_{z,g} \tag{12}$$

where $\rho_{z,g}$ is the persistence of the autoregressive process for entrepreneurial ability, and ε_{z_g} is i.i.d shock with mean zero and variance $\sigma^2_{z_g}$. To calibrate the persistence parameters, I set $\rho_{z,m}$ to match the transition rate for male entrepreneurs, which is estimated to be equal to 1.5% based on data from the Panel Study of Income Dynamics (PSID). Similarly, the persistence parameter for female entrepreneurs, $\rho_{z,f}$, is calibrated to match the estimated transition rate of 0.4%. Moreover, I set the standard deviation of $\varepsilon_{z,m}$ to match the share of entrepreneurs, which is approximately 7.7 percent, as computed by the PSID using the definition of entrepreneurs from Salgado (2020).[13] For female entrepreneurs, I choose $\varepsilon_{z,f}$

Table 4: Distribution of Married Households

	Female		
Male	Non-college	College	Total
Non-college	68.3	5.2	73.5
College	13.2	13.3	26.5
Total	81.5	18.5	

*Source:*CPS ASEC *Notes:* The distribution of households are estimated similar to Guner et al. (2012) for ages between 25-65.

to match the share of female entrepreneurs, which is approximately 0.5 percent in 1985. Additionally, the overhead costs of entrepreneurs are calibrated to match the share of married households, which is estimated to be 6.3% in the US. By normalizing $\kappa^l = 1$, I set κ^h to match the high-skill entrepreneurs in the US.

Following Guner et al. (2012), the distribution of q follows a gamma distribution, with parameter k_s and θ_s conditional on husband's skill type as below:

$$q \sim \eta(q \mid s) \equiv q^{k_s - 1} \frac{\exp(-q/\theta_s)}{\Gamma(k_s)\, \theta_s^{k_s}}$$

where $\Gamma(.)$ is the gamma distribution, that I approximate on a discrete grid. Using the 1985 CPS data, I estimate the female labor force participation for each group as shown in Table C.6. In this paper, I specifically define the labor force participation as married female who works more than or equal to 30 hours as a worker or entrepreneur in non-agriculture non-military sector ages between 25-65. The last parameter, λ_y is targeted to the income

[13] Salgado (2020) uses the definition of entrepreneurs as the one who is self-employed, has an active management role, and own or share ownership in any privately held businesses in a managerial or professional occupation.

tax revenue to the output ratio. Here, income tax revenue is calculated by considering only federal income tax revenue using National Income and Product Accounts. The parametrization reveals that the persistence level is higher in labor productivity than in entrepreneurial ability ($\rho_\epsilon > \rho_z$), and the standard deviation of innovations for entrepreneurial ability is higher than the standard deviation of innovations for labor productivity ($\sigma_{\varepsilon_z} > \sigma_{\varepsilon_\epsilon}$) for both genders. This implies that being an entrepreneur is riskier than being a worker.

5.1 The Benchmark Economy

Table 5 presents the moments targeted by the model and their corresponding model counterparts. The model exhibits a remarkable fit with critical features of the US economy. Specifically, the skill premia, share of of female entrepreneurs, share of married entrepreneurs, share of high-skilled entrepreneurs are perfectly generated by the model. The model also closely matches the share of entrepreneurs, overall married female labor force participation rate and by skill.

Table 5: Model & Data

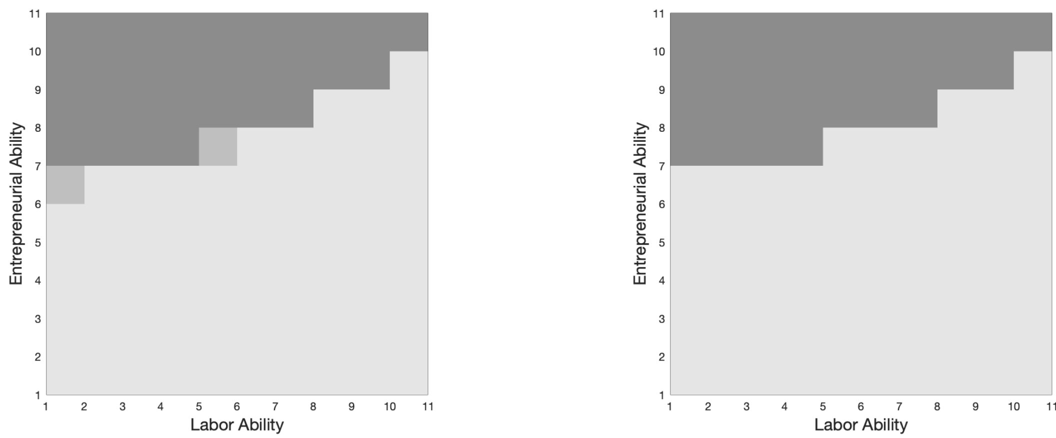
Statistic	Model	Data	Source
Skill Premia	0.22	0.22	CPS
Share of Entrepreneurs (%)	7.9	7.7	PSID
Transition Rate (%)	1.6	1.5	PSID
Share of Female Entrepreneurs (%)	0.5	0.5	PSID
Transition Rate for Female (%)	0.5	0.4	PSID
Share of High skill Entrepreneurs (%)	3.7	3.7	PSID
Share of Married Entrepreneurs (%)	6.4	6.3	PSID
Married Female LFP (%)	50.9	51.1	CPS
Married Skilled Female LFP (%)	57.5	60.0	CPS
Married Unskilled Female LFP (%)	49.4	49.1	CPS
Tax Revenue to Output (%)	7.5	7.8	NIPA

Notes: Table 5 illustrates the moments targeted with their counterparts.

The Role of Marital Status on Entrepreneurship In the benchmark economy, when two males have the same skill level, married individuals are more inclined to become entrepreneurs rather than workers. This preference for entrepreneurship is due to the fact that spousal income mitigates the financial costs and insures against idiosyncratic risks, making it easier for married males to transition into entrepreneurship. The additional income from the spouse allows for economies of scale within the household, enabling married males to more easily pay the overhead costs associated with entrepreneurship. As the occupation

Figure 8: Occupation Choice for High-skilled Married Male vs Unmarried Male

(a) *Lowest Disutility Cost* **(b)** *Highest Disutility Cost*



Notes: Panel A of Figure 8 illustrates the optimal occupational choice of married high-skilled male where female member has the highest labor and entrepreneurial ability and disutility costs takes the lowest value and unmarried high-skilled male while Panel B shows optimal occupational choice of the same group where disutility costs is the highest value. Note that white region represents that both married and unmarried male are worker while black region indicates that both married and unmarried male are entrepreneur. The gray area is where married male is entrepreneur while unmarried male is worker due to the income and insurance channel.

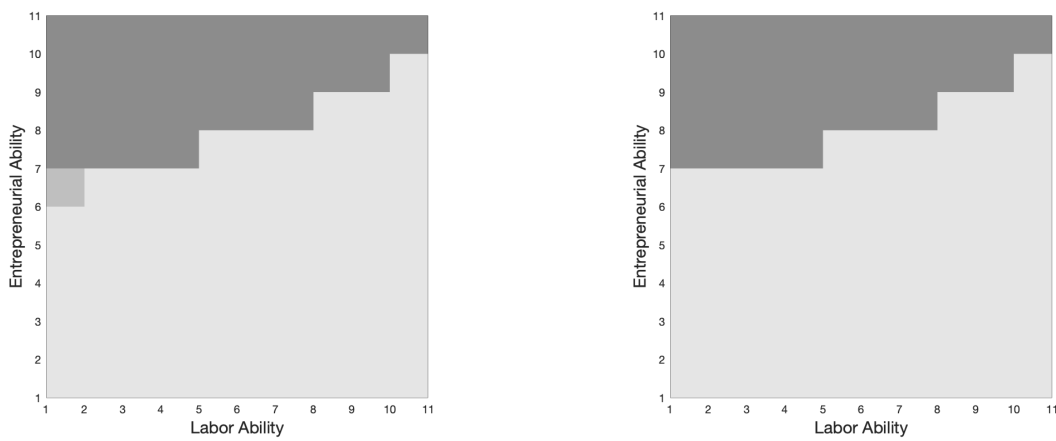
decision takes place before realizing productivity shocks, married households can use the option of having the female spouse participate in the labor force to insure against idiosyncratic risks. To illustrate the spousal insurance effect for married males, I compare the occupation decisions of a married couple consisting of a high-skilled male and a high-skilled female, where the female has the highest entrepreneurial and labor abilities relative to an unmarried high-skilled male. Panel A of Figure 8 shows the optimal occupation choices for married males and unmarried males. The white region represents situations where both married and unmarried males choose to be workers, while the black region indicates situations where both married and unmarried males choose to be entrepreneurs. The gray area is where the married male becomes an entrepreneur while the unmarried male becomes a worker due to the income and insurance channels provided by the female spouse. However, if the disutility costs of joint work are high, as shown in Panel B of Figure 8, both channels are eliminated because the female does not participate in the labor force. As a result, the occupation choice for both high-skilled males becomes the same in this case.[14]

[14]The corresponding occupation choice for the married female member is to be a worker for the lowest disutility cost and not to participate in the labor force if the cost is the highest one.

The Role of Spouse's Skill on Entrepreneurship The skill level of spouse is important for the potential income of the married couples because high-skill workers on average earn 22% more than low-skill workers and high skill entrepreneurs are more productive than low-skill entrepreneurs. To understand the impact of skill differences on the married male's entrepreneurship, Panel A of Figure 9 shows the occupation choices of a married couple with both high-skilled male and high-skilled female, relative to an unmarried high-skilled male while Panel B illustrates the occupation choices of a married couple with high-skilled male and low-skilled female, relative to an unmarried high-skilled male.[15]

Figure 9: Occupation Choice for High-skilled Married Male vs Unmarried Male

(a) *High Skill Female* **(b)** *Low Skill Female*



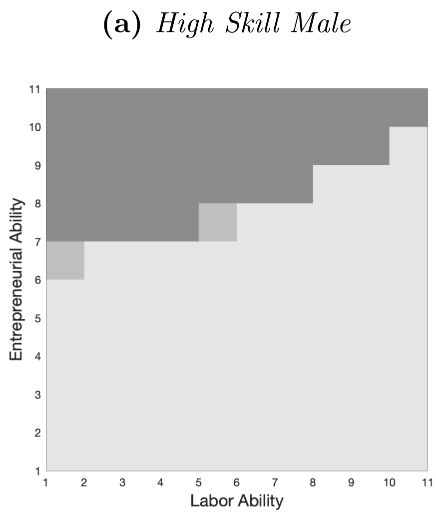
Notes: Panel A of Figure 9 illustrates the optimal occupational choice of married high-skilled male and female and unmarried high-skilled male while Panel B shows optimal occupational choice of the same group where female is low-skilled. Note that white region represents that both married and unmarried male are workers while black region indicates that both married and unmarried male are entrepreneurs. The gray area is where married male is entrepreneur and unmarried male is worker.

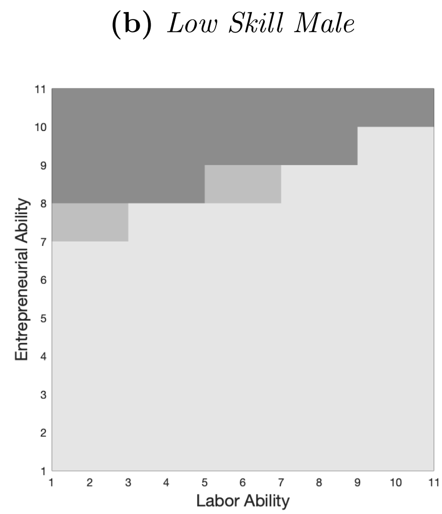
Being a high-skilled female not only provides higher labor income through the skill premia but also higher business income due to skill parameter, κ^h. This results in the high-skilled married females to participate relatively more than low-skilled females in the labor force, which in turn affects their husband's occupation choice. For instance, the gray area in Panel A of Figure 9 illustrates that when a high-skilled male is coupled with a high-skilled female, married male chooses entrepreneurship, while the married male decides to be a worker when the high-skilled male is coupled with a low-skilled female. This difference rationalizes the idea that entrepreneurship is more prevalent in married households, where the presence of a high-skilled spouse can encourage the other spouse to enter the entrepreneurship, driven by

[15]Note that the values of disutility cost and entrepreneurial ability of married females differ from those in Figure 8.

the additional income provided by the high-skilled partner.

Figure 10: Occupation Choice for High-skilled Male vs Low-skilled Male





Notes: Panel A of Figure 10 illustrates the optimal occupational choice of married high-skilled male where female member has the highest labor and entrepreneurial ability and disutility costs takes the lowest value and unmarried high-skilled male while Panel B shows optimal occupational choice of the same group except married male is low-skilled. Note that white region represents that both married and unmarried male are worker while black region indicates that both married and unmarried male are entrepreneur. The gray area is where married male is entrepreneur while unmarried male is worker.

The Role of Skill on Entrepreneurship The skill of the indvididuals is also a crucial determinant of occupational choice. Given that high-skill males have 82% higher productivity in the calibration, entrepreneurship is more prevalent among skilled individuals. However, when the male is low-skilled, the potential income from spouse gains importance, especially if he is inclined to become an entrepreneur. Figure 10 illustrates the optimal choice for two identical households, except for their skills: low skill in Panel A and high skill in Panel B. The black area indicates that both married and unmarried males are entrepreneurs. Since the high-skill male has higher entrepreneurial ability, entrepreneurship is more prevalent among high-skilled males. Additionally, being married increases the entrepreneurship rate among their group relative to being unmarried. However, the spousal income is more critical for low-skilled married males. This is because low-skill entrepreneurs face more constraints due to the overhead costs and idiosyncratic risks. With the spousal income, low skill married male can overcome from these financial constraints and insure themselves against idiosyncratic risks, leading to increase entrepreneurial activities more relative to the high skill married males.

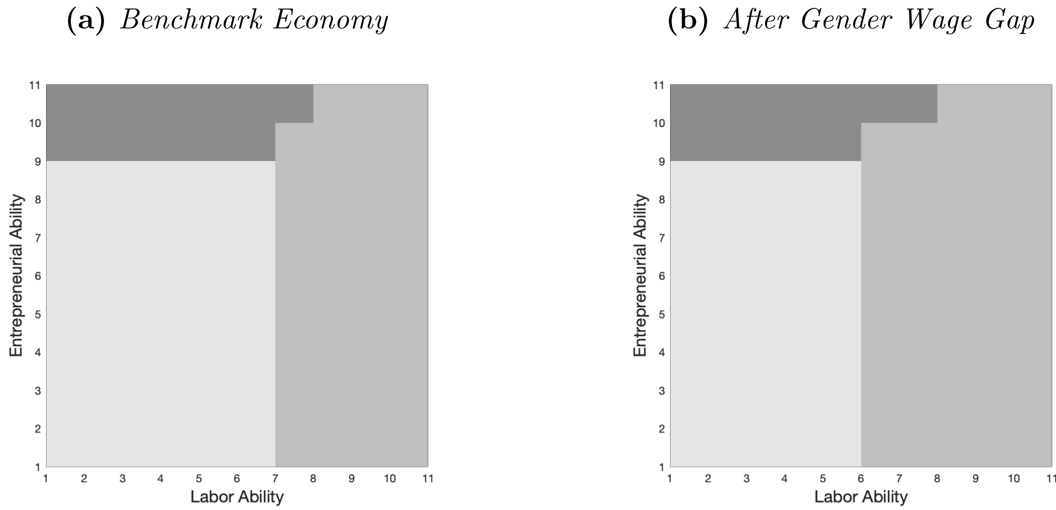
6 Quantitative Findings

In this section, I analyze the importance of different channels in explaining entrepreneurship and married female labor force participation. First, I consider the economy in the equilibrium at the 1985 level. Then, I compare steady states by evaluating the stationary equilibrium for the gender wage gap and gender business income gap, considering their values at the 2017 level. To understand the impact of demographic changes, I account for the changes in the distribution of households in 1985, including marital sorting, the share of married households, and the share of high-skill individuals. Lastly, I examine the effects of skill-premium and tax changes on entrepreneurship and married female labor force participation. By exploring these factors, I aim to provide a comprehensive understanding of the drivers behind the decline in the entrepreneurship and the rise in the labor force participation of married females in the economy.

Changes in The Gender Wage Gap Column II of Table 6 presents the stationary equilibrium results at the 2017 gender wage gap level. The gender wage gap parameter increased from 0.74 to 0.826, indicating that the female labor income was initially 26% lower than that of males and decreased to 18.4%. The findings reveal that the share of entrepreneurs declined to 7.8% in the economy. This decrease in the gender wage gap led both skilled and unskilled married females to participate more in the labor force as workers, particularly among the unskilled individuals. The overall married female labor force participation rate increased by 7% to 54.5%, with a more pronounced effect observed for the unskilled ones. Additionally, within the working pool, the opportunity cost of being a worker increased, causing some female entrepreneurs to switch to become workers instead. Figure 11 illustrates the occupation choice for high-skill married females for a specific set of abilities for males. The white area represents that the married female does not work, the gray area refers to her being a worker, and the black area indicates that she is an entrepreneur. As the gender wage gap decreases, the female labor force participation for this specific group increases, and some entrepreneurs switch to becoming workers. Moreover, with the rise in female labor force participation, the insurance effect emerges for some married males, as shown in Figure 12. However, this insurance channel is dominated by the aforementioned channels. Consequently, the overall share of married entrepreneurs and high-skill entrepreneurs falls by 1%, and the share of female entrepreneurs declines by 9% to 0.48% relative to the benchmark economy.

Changes in The Gender Business Income Gap Column III of Table 6 illustrates the equilibrium of the 2017 gender business gap level. Specifically, gender business income gap parameter increased from 0.65 to 0.752 implying that female business income was 35%

Figure 11: Occupation Choice for High-Skill Married Female



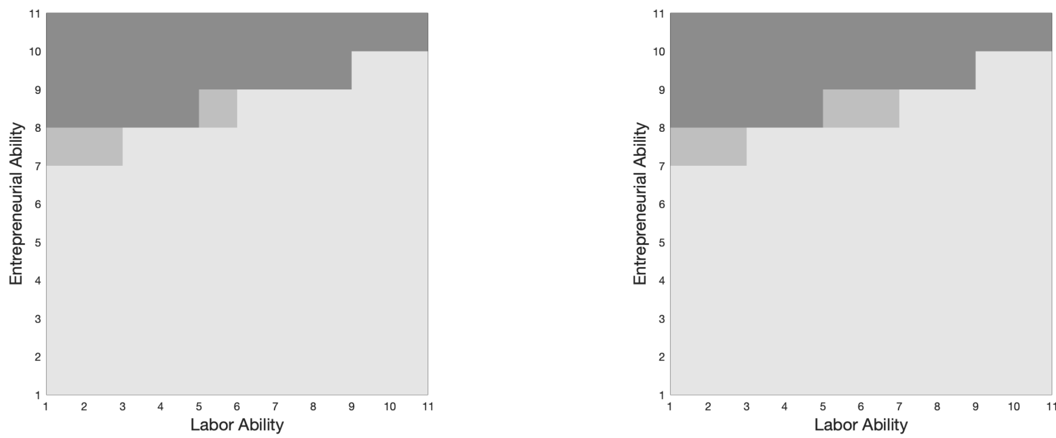
Notes: Panel A of Figure 11 illustrates the optimal occupational choice of married female for benchmark economy while Panel B shows with new gender wage gap. Note that white region represents that married female is out of labor force while black region indicates that married female is an entrepreneur. The gray area is where married female is a worker.

lower than male's and this gap decreased to 25.8%. Results reveal that share of entrepreneurs increases to 8.3% in the model. One of the main channels contributing to this rise is the increase in female labor force participation, which is more pronounced in the skilled group. The decline in the business income gap leads to a rise in the entrepreneurial ability of females, allowing those who were workers or out of the labor force to become entrepreneurs.The diagram illustrating this channel is depicted in Figure 13, where the black area (representing entrepreneurs) has expanded from both the white (non-participant) and gray (workers) areas. Similarly, unmarried females change their occupation decision and become entrepreneurs, which increases entrepreneurship among unmarried households. This leads to an increase in the share of female entrepreneurs by 0.35 percentage points. Another mechanism affecting the entrepreneurship decision is through spousal insurance. Since some of the married males' wives enter the working pool, this helps them insure themselves against idiosyncratic risks, further contributing to the increase in the share of entrepreneurs.

Changes in Demographics Column IV of Table 6 presents the analysis of the stationary equilibrium, where all other elements remain at their 1985 levels, and only the distribution of households is changed to the 2017 level. The results of this analysis highlight the significant impact of demographic changes on the decline in overall entrepreneurship in the United States, accounting for 76.3% of the decrease, while also accounting for 68.4% of the decline in married entrepreneurs. The observed decline in the share of married house-

Figure 12: Occupation Choice for Low-Skill Married Male

(a) *Benchmark Economy* **(b)** *After Gender Wage Gap*



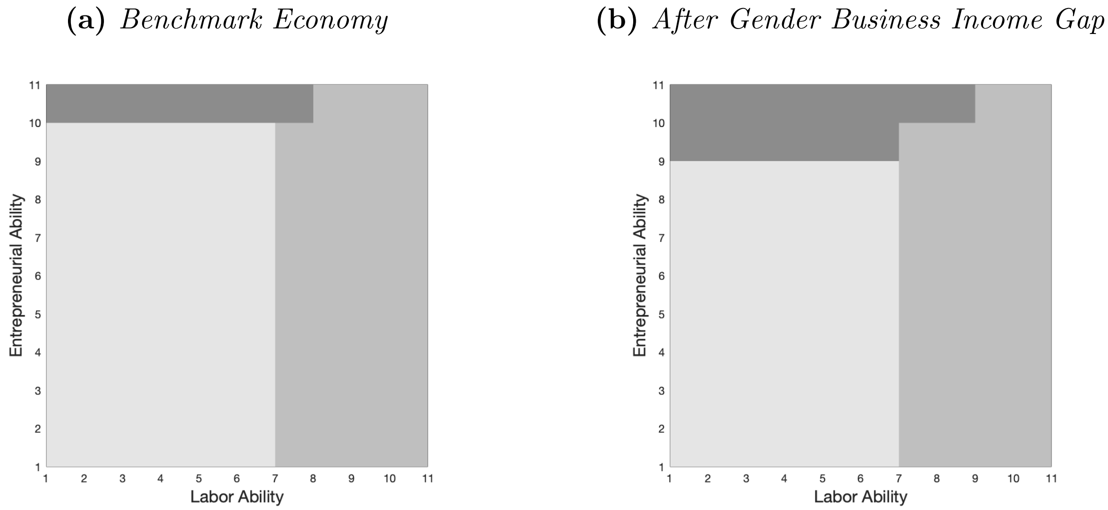
Notes: Panel A of Figure 11 illustrates the optimal occupational choice of married female for benchmark economy while Panel B shows with new gender wage gap. Note that white region represents that both married and unmarried male are worker while black region indicates that both married and unmarried male are entrepreneur. The gray area is where married male is entrepreneur while unmarried male is worker.

holds plays a crucial role in influencing entrepreneurship dynamics. This decline leads to a reduction in spousal insurance within married males, thereby affecting their decision to pursue entrepreneurial activities. As the share of married households decreases, the support and financial security that were available to married males through their spouses' income diminish, impacting their entrepreneurial choices. Additionally, changes in the distribution of educational attainment also contribute to the decline in entrepreneurship. The increase in the share of college graduates in the economy has implications for their relative wages. To maintain the relative wage of college graduates at the 1985 level, the productivity of high-skill individuals is increased. Consequently, the threshold for becoming an entrepreneur increases, causing some college graduates to shift from being entrepreneurs to becoming workers.

Tax Changes Table 6, Column V, shows the results of the counterfactual economy with a new tax level implemented in 2017.[16] The findings indicate a notable increase in entrepreneurship, with a rise of 0.4 percentage points in the overall economy. The decrease in tax progressivity has a significant impact on married female labor force participation, resulting in an overall increase of 6.3%. This rise is more pronounced in unskilled females, with an increase of 3.8 percentage points, compared to skilled females, with a rise of 0.6

[16] In particular, the progressivity parameter (τ_y) is implemented by 0.095 for the 2015 level (Dyrda and Pugsley (2020)).

Figure 13: Occupation Choice for High-Skill Married Female



Notes: Panel A of Figure 13 illustrates the optimal occupational choice of married female for benchmark economy while Panel B shows with new gender business income gap. Note that white region represents that married female is out of labor force while black region indicates that married female is an entrepreneur. The gray area is where married female is a worker.

percentage points. The increase in female labor force participation, particularly among married females, enhances spousal insurance for married males who were previously constrained by the higher tax burden and perceived greater risk. As a result of the improved spousal insurance channel, the number of married entrepreneurs increases by 0.4 percentage points. In contrast, the change in tax policy does not significantly influence the occupation choices of unmarried entrepreneurs. However, due to the rise in the share of married households in the full-time employed population, the share of unmarried entrepreneurs in the overall pool experiences a slight decrease.

Changes in The Skill Premia Table 6 Column VI indicates the stationary equilibrium for 2017 skill-premium, which rose from 22% to 28%. The findings suggest that skill-biased technical change, leading to an increase in the relative wages of skilled workers, accounts for a 14.9% decline in the observed entrepreneurship since 1985. The rise in the skill-premium has implications for entrepreneurship across different groups. Specifically, the share of high-skill entrepreneurs and married entrepreneurs experiences a decline of 0.5 percentage points, while the share of low-skill entrepreneurs and unmarried entrepreneurs decreases by 0.14 percentage points. This decline in entrepreneurship can be attributed to two primary factors. First, there is an intensive margin effect caused by a higher opportunity cost of becoming an entrepreneur due to the increased skill-premium (Salgado (2020) and Jiang and Sohail (2023)). The higher relative wages of skilled workers make entrepreneur-

Table 6: Baseline Results

	1985 US	Gender Wage Gap	Gender Business Income Gap	Demographics	Tax Changes	Skill Premia	2017 Data
Entrepreneurs (%)	7.89	7.79	8.30	4.61	8.28	7.25	3.4
$\frac{\Delta Model}{\Delta Data}$ (%)		**2.3**		**76.3**		**14.9**	
Married Entrepreneurs (%)	6.35	6.30	6.71	3.41	6.76	5.87	2
$\frac{\Delta Model}{\Delta Data}$ (%)		**1.2**		**68.4**		**11.2**	
High skill Entrepreneurs (%)	3.69	3.66	3.91	2.65	3.77	3.23	2.2
$\frac{\Delta Model}{\Delta Data}$ (%)		2		**69.3**		**30.7**	
Female Entrepreneurs (%)	0.53	0.48	0.88	0.28	0.63	0.49	0.5
Share of Male Entrepreneurs (%)	7.36	7.31	7.42	4.33	7.65	6.76	2.9
$\frac{\Delta Model}{\Delta Data}$ (%)		**1.2**		**70.5**		**14.0**	
Married LFP (%)	50.92	54.45	51.14	53.51	54.12	51.01	61.7
$\frac{\Delta Model}{\Delta Data}$ (%)		**33.3**	**2.1**	**24.4**	**30.2**	**1.0**	
Married Skilled LFP (%)	57.48	57.78	57.99	58.58	58.08	57.64	68.8
$\frac{\Delta Model}{\Delta Data}$ (%)		**3.4**	**5.8**	**12.5**	6.8	**1.8**	
Married Unskilled LFP (%)	49.43	53.70	49.58	49.69	53.23	49.51	56.4
$\frac{\Delta Model}{\Delta Data}$ (%)		**58.5**	**2.1**	**3.6**	**52.1**	**1.1**	

Notes: Table 6 illustrates the stationary equilibrium results for each mechanism.Column I expresses the 1985 benchmark economy while Column II shows the economy where gender wage gap changed to 2017 level. Column III indicates the equilibrium where only gender business gap mimics 2017 level while Column IV shows where the economy represent 2017 demographics. Column V illustrates the economy where only skill premia is set to 2017 level while last column depicts the 2017 data. Please note that in each channel skill-premium is at 1985 level except the skill premia.

ship a less attractive option for individuals possessing valuable skills, leading to a reduction in high-skill entrepreneurs. Secondly, the rise in married female labor force participation contributes to this change. More married females are entering the workforce as high-skill workers, which affects the pool of potential entrepreneurs, particularly in the high-skill category. While there is also an impact of spousal insurance on entrepreneurship, its effect is relatively smaller compared to the other two channels discussed above.

All Changes Together Table 7 indicates the results of combination of demographic changes with other mechanisms while column V shows the equilibrium incorporating all changes. The findings reveal that the joint impact of demographic changes, gender gaps, skill

Table 7: Results with All Changes

	1985 US	Demographics and Skill-Premium	Demographics and Gender Gaps	Demographics and Tax Changes	All Changes	2017 US Data
Entrepreneurs (%)	7.89	4.3	4.84	4.75	4.33	3.4
$\frac{\Delta Model}{\Delta Data}$ (%)		**83.5**	**70.9**	**73**	**82.8**	
Married Entrepreneurs (%)	6.35	3.14	3.60	3.53	3.14	2
$\frac{\Delta Model}{\Delta Data}$ (%)		**74.7**	**64.0**	**65.6**	**74.7**	
High skill Entrepreneurs (%)	3.69	2.38	2.87	2.79	2.38	2.2
$\frac{\Delta Model}{\Delta Data}$ (%)		**87.3**	**54.7**	**60.0**	**87.3**	
Female Entrepreneurs (%)	0.53	0.23	0.38	0.29	0.31	0.5
Male Entrepreneurs (%)	7.36	4.07	4.46	4.46	4.01	2.9
$\frac{\Delta Model}{\Delta Data}$ (%)		**76.5**	**67.4**	**67.4**	**77.9**	
Married LFP (%)	50.92	53.53	56.17	55.95	60.25	61.7
$\frac{\Delta Model}{\Delta Data}$ (%)		**24.6**	**49.5**	**47.5**	**88.0**	
Married Skilled LFP (%)	57.48	58.63	58.84	58.80	61.02	68.8
$\frac{\Delta Model}{\Delta Data}$ (%)		**13.1**	**15.5**	**15.0**	**40.2**	
Married Unskilled LFP (%)	49.43	49.68	54.15	53.81	59.66	56.4
$\frac{\Delta Model}{\Delta Data}$ (%)		**3.4**	**68.8**	**60.0**	**140.1**	

Notes: Table 7 illustrates the stationary equilibrium results for each mechanism.Column I expresses the 1985 benchmark economy while Column II shows the economy where skill premia and demographics changed to 2017 level. Column III indicates the equilibrium where gender gaps and demographics mimic 2017 level while Column IV shows where the economy represent 2017 demographics with tax changes. Column V illustrates the economy where all changes imitates the 2017 level while last column depicts the 2017 data.

premia, and taxes accounts for a substantial 82.8% of the decline in overall entrepreneurship and 74.5% of the decrease in married entrepreneurs since 1985. The model's analysis indicates that these changes have a significant impact on the rise in married female labor force participation, accounting for 88% of the observed increase in the participation rate. However, it is worth noting that the rise in labor force participation is more prominent among unskilled females compared to skilled females. One assumption in the model is that the distribution of disutility costs remains unchanged over time, and it does not differentiate between the costs of being an entrepreneur and those of being a worker. This assumption might not fully capture the evolving dynamics of the disutility associated with entrepreneurship and work, which could influence households' decisions on the change in the female labor force participation rate.

7 Discussion

In this section, I discuss the significance of the skill and gender premia parameters on the entrepreneurship. To do this, I recalibrate the model under the new parameters. Then, I analyze how demographic changes, skill-premium, gender gaps and taxation affect the results. Secondly, I analyze how the baseline model results change if a married male can endogenously choose whether to be out of labor force.

7.1 Importance of Skill & Gender Premia

In this section, I evaluate a counterfactual economy where the gender business income gap, gender wage gap, and skill-premium are estimated without controlling for the six-digit occupation codes of an individual. New parameters indicate a much higher increase in the skill-premium relative to the benchmark economy, while gender gaps decline at a higher rate. According to the new estimations, high-skilled workers earn 37% more than low-skilled workers, and this premium increases to 57% in 2017. These estimations align closely with previous studies by Salgado (2020) and Jiang and Sohail (2023). Based on the new parameters, the model is recalibrated for the 1985 US economy. Column I of Table 8 presents the results of the benchmark economy in the model. The rise in the skill-premium, shown in Column II of Table 8, leads to a decrease in the share of entrepreneurs to 6.4%. This decline is primarily driven by a decrease in the share of high-skill entrepreneurs and an increase in married female labor force participation among high-skilled individuals. The increase in the skill-premium negatively affects unskilled married females, as the rise in skilled workers' productivity outpaces that of unskilled workers. Consequently, the overall labor force participation rate of unskilled married females decreases slightly from 50.7% to 50.5%.

The decline in the gender wage gap and gender business income gap contributes to an increase in overall labor force participation by 3.2 percentage points. This increase is observed among both skilled and unskilled married females, as the gender gaps do not depend on their skill levels. Furthermore, the gender gaps play a role in increasing the share of female entrepreneurs, primarily because the rise in the gender business income gap outweighs the impact of the gender wage gap. The lower income disparity between male and female entrepreneurs motivates more females to pursue entrepreneurship. Additionally, rise in the female labor force participation increases the married entrepreneurship through spousal insurance. However, once accounting for demographic changes, the model overshoots the decline in the entrepreneurship relative to the data. Moreover, the share of female entrepreneurs declines significantly compared to the counterparts in the 2017 data. This suggests that the

Table 8: Results with Alternative Notions of Premia

	1985 US	Skill Premia	Gender Gaps	Skill Premia & Demographics Gender Gaps	All Changes	2017 US Data
Entrepreneurs (%)	7.8	6.4	7.9	3.1	3.1	3.4
Married Entrepreneurs (%)	6.3	5.0	6.4	2.3	2.3	2
High skill Entrepreneurs (%)	3.7	2.9	3.8	1.8	1.8	2.2
Female Entrepreneurs (%)	0.5	0.3	0.7	0.1	0.1	0.5
Married LFP (%)	50.7	50.5	53.9	57.3	60.9	61.7
Married Skilled LFP (%)	57.8	59.4	59.1	63.0	63.6	68.8
Married Unskilled LFP (%)	49.1	48.5	52.7	53.1	58.8	56.4

Notes: Table 8 illustrates the stationary equilibrium results for each mechanism.Column I expresses the 1985 benchmark economy while Column II shows the economy where skill premia changed to 2017 level. Column III indicates the equilibrium where gender gaps mimic 2017 level while Column IV shows the economy with 2017 demographics, gender gaps and skill premia. Column V illustrates the economy where all changes imitates the 2017 level while last column depicts the 2017 data.

model does not fully account for the changes occurring in the real world that are driving increases in entrepreneurship, especially among females. For instance, one interesting fact that I document in the data is that the decline in entrepreneurship is more pronounced among college graduates, but this decline is not observed among females. In fact, the model's inability to differentiate the skill-premium and the skill parameter for entrepreneurial productivity between male and female could be a limiting factor in explaining this phenomenon.

Column V of Table 8 presents the results accounting for all changes, including the impact of taxation. The inclusion of the change in taxation leads to a significant increase in married female labor force participation by 10.2 percentage points, explaining 92% of the rise observed in the data. However, the model does not fully align with the observed data, as it slightly undershoots the rise in skilled married female labor force participation, while overshooting the rise in the unskilled group. One potential explanation for this discrepancy is the assumption that the distribution of disutility costs remains at the 1985 level. In reality, there have been important changes in the cost of childcare and the price of home production, which can significantly influence the labor force participation decisions of married females, especially in different skill groups.

7.2 Endogenous Male Labor Force Participation

The benchmark economy assumes that married male cannot be out of labor force. Consequently, this results in a higher proportion of married females being out of the labor force due to various disutility costs, such as those associated with home production and inappropriate joint leisure time. Consequently, unproductive males have the opportunity to remain employed, while productive females are forced out of the labor force. In order to assess whether

Table 9: Endogenous Male Labor Force Participation

	Baseline Model	Endogenous Male Participation	Endogenous Male Participation & No Gender Gaps
Entrepreneurs (%)	4.33	4.13	4.26
$\frac{\Delta Model}{\Delta Data}$ (%)	**82.8**	**87.4**	**84.4**
Married Entrepreneurs (%)	3.14	3.03	3.11
$\frac{\Delta Model}{\Delta Data}$ (%)	**74.7**	**77.2**	**75.3**
High skill Entrepreneurs (%)	2.38	2.31	2.49
$\frac{\Delta Model}{\Delta Data}$ (%)	**87.3**	**92.0**	**80.0**
Female Entrepreneurs (%)	0.31	0.22	0.46
Male Entrepreneurs (%)	4.02	3.91	3.80
$\frac{\Delta Model}{\Delta Data}$ (%)	**77.9**	**80.2**	**82.8**
Married Female LFP (%)	60.25	64.78	68.28
$\frac{\Delta Model}{\Delta Data}$ (%)	**88.0**	**130.8**	**163.8**
Married Skilled Female LFP (%)	61.02	71.33	78.26
$\frac{\Delta Model}{\Delta Data}$ (%)	**40.2**	**157.4**	**236.1**
Married Unskilled Female LFP (%)	59.66	59.83	60.75
$\frac{\Delta Model}{\Delta Data}$ (%)	**140.1**	**142.5**	**155.1**

Notes: Table 9 illustrates the stationary equilibrium results for policy experiments.Column I expresses the 2017 benchmark economy while Column II shows the economy where married male can be non-participant. Column III indicates the equilibrium where there is no gender between males and females and married male can be non-participant.

there would be a potential change, I investigate an alternative scenario where married males are allowed to be non-participants in the labor force. To analyze this situation, I focus on the 2017 economy as a benchmark, taking into account changes in taxes, demographics, skill-premium, and gender gaps. Then, I concentrate solely on the occupational decisions made by married households in which the married male is permitted to be out of the labor force.

Column II of Table 9 presents the results of the experiment in which married males are allowed to be non-participants in the labor force. The findings reveal that share of entrepreneurs decreases by 0.2 percentage points relative to the benchmark economy. This is due to the fact that with higher college graduates, the skill-premium decreases substantially. By adjusting it to 2017 level, some high-skill entrepreneurs decide to become workers. Additionally, labor force participation for married males falls by 4.9%. In fact, this decrease is primarily driven by unskilled males, as their workforce participation declines by

9.2%. Conversely, the labor force participation for married females overall increases from 60.3% to 64.8%, with a significant portion of this increase attributed to skilled females. In order to gain a more comprehensive understanding of these changes, Table C.7 provides a detailed breakdown of the married female labor force participation rate based on different types of marital sorting, while Table C.8 depicts the corresponding data for married male labor force participation. Importantly, the most significant rise in female labor force participation is observed in couples where the male is non-college-educated and the female is a college graduate. For this specific group, the married female labor force participation rate undergoes a remarkable increase from 64.7% to 98.5%, while the married male participation rate experiences a substantial decrease of 37.4%.

Moreover, there exists an equilibrium effect stemming from the changes in occupation decisions. Specifically, the increase in the share of high-skilled labor supply leads to a corresponding rise in the demand for low-skilled labor, subsequently encouraging non-college-educated married females to participate in the labor force. Upon closer examination, the labor force participation rate for married non-college females, whose husbands are college graduates, increases from 54.5% to 54.8%. Conversely, the increase is comparatively smaller for those whose husbands are also non-college graduates, with their labor force participation rising from 60.7% to 60.9%. Furthermore, there is a noticeable displacement effect resulting from the change in occupation choices. Allowing married males to be non-participants in the labor force results in a greater influx of higher-ability females into the labor pool. This, in turn, displaces lower-ability females, leading to a decrease in their labor force participation rate. For instance, the labor force participation rate for high-skilled females with high-skilled male partners declines to 59.3%.

Column III of Table 9 presents the outcomes of the experiment, wherein married males are allowed to be non-participants, and both the gender wage gap and gender business income gap between males and females are eliminated. The results indicate that in an economy without any gender gaps and with the option for married males to be non-participants, there is a 0.13 percentage point increase in the share of entrepreneurs relative to the equilibrium with endogenous male participation. This increase is primarily attributed to the elimination of gender barriers for female entrepreneurs, encouraging more women to become entrepreneurs. As a result of this shift, some married male entrepreneurs transition to becoming non-participants in the labor force, leading to reductions in both the number of male entrepreneurs and the overall labor force participation rate for married males in the economy. Simultaneously, the labor force participation rate for married females experiences a substantial increase, rising from 60.3% to 68.3%. This increase is largely driven by the higher participation of skilled females in the labor force.

8 Conclusion

I document a striking feature of the US economy that there has been a decline in the married entrepreneurs and male entrepreneurs accompanied by a sharp fall in the share of married households and a rise in the female force participation rate. Additionally, I depict that entrepreneurship within married households and among males has experienced a substantial decline, while entrepreneurship among unmarried households and females remains relatively constant. By decomposing the rise in female participation and the fall in the number of married households, I find that they collectively account for over 40% of the overall decline in entrepreneurship in the US. Furthermore, this paper documents significant changes in the skill-premium, gender wage gap, and gender business income gap,which have notable implications for entrepreneurship and female labor force participation in the economy. Through regression analysis, I show that there is a strong correlation between being married and being an entrepreneur, and this correlation remains constant over time. Furthermore, within married couples, the presence of a college-educated spouse is found to have a stronger correlation with entrepreneurship choices than one's own college degree.

To study the driving forces of the decline in the share of entrepreneurs, I develop an entrepreneurial choice model for different types of agents based on their skill-level, gender and marital status. By considering both entrepreneurs and the corporate sector as producers of the same goods, the model accurately replicates the crucial features of the US, including the share of entrepreneurs, transition rates to entrepreneurship, skill-premium and the married female labor force participation rate, aligned with the 1985 level. Notably, the model provides valuable insights into the insurance channel through spouses, shedding light on the impact of spousal income on entrepreneurship decisions. The findings reveal that the impact of demographic composition changes (marital sorting, share of married entrepreneurs, skill composition) accounts for 76.4% of the decline in the entrepreneurship, 68.4% of the fall in the married entrepreneurs and 70.5% of the decrease in the male entrepreneurs. This implies that the impact of the demographic composition is significant on the decline in the entrepreneurship and business formation. While, the observed decline is alarming the economists and policymakers, the demographic composition changes should not be disregarded.

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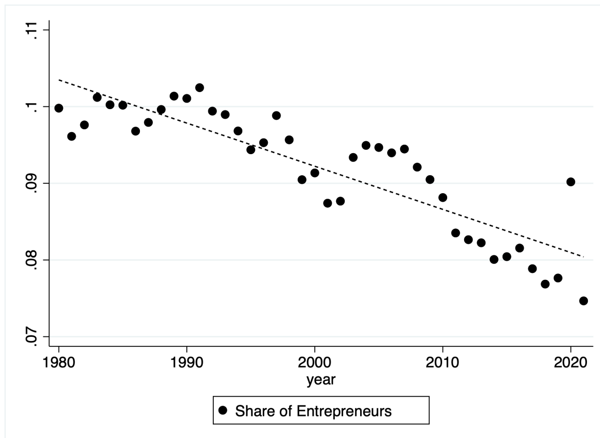
A Figures

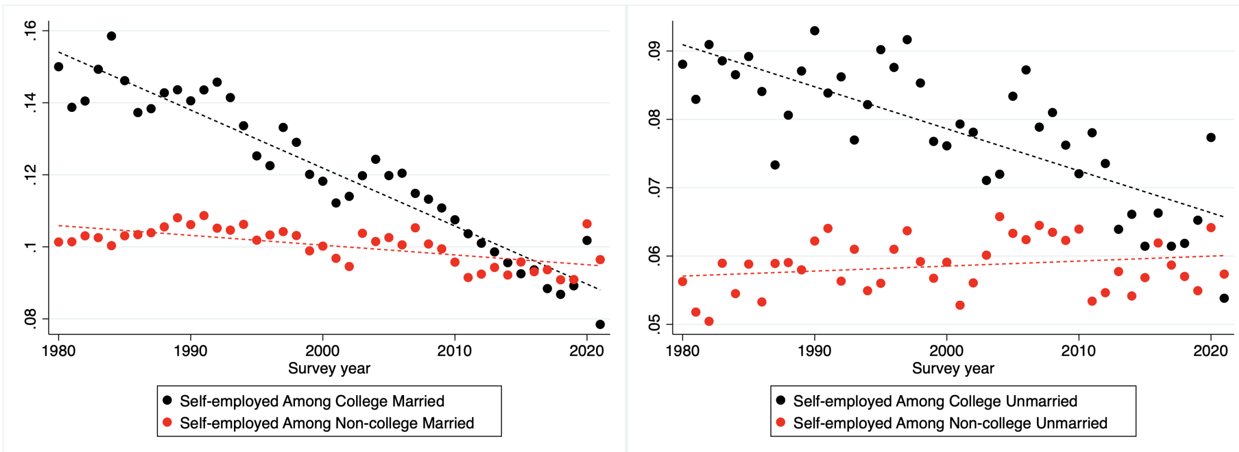
Figure A.1: Share of Entrepreneurship



Sources: CPS March Annual and Economic Supplement *Notes:* Figure A.1 shows the share of entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-65 across time in the US.

Figure A.2: Entrepreneurship Among Marriage and Education Groups

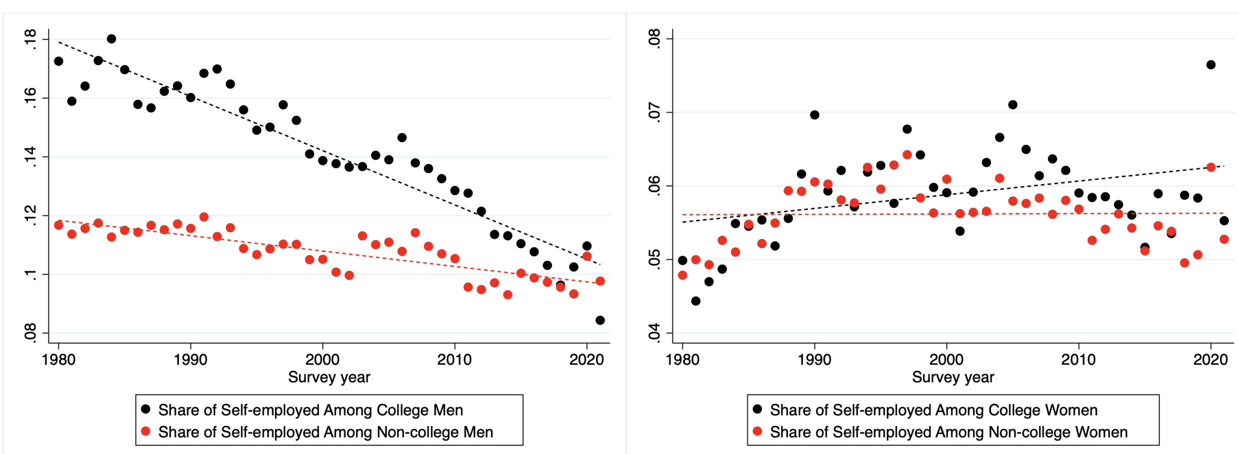
(a) *Among College vs Non-college Married* **(b)** *Among College vs Non-college Unmarried*



Sources: CPS March Annual and Economic Supplement *Notes:* Figure A.2a shows entrepreneurship among college and non-college married groups while Figure A.2b shows entrepreneurship among college and non-college unmarried groups in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-65 across time in the US.

Figure A.3: Entrepreneurship Among Gender and Education Groups

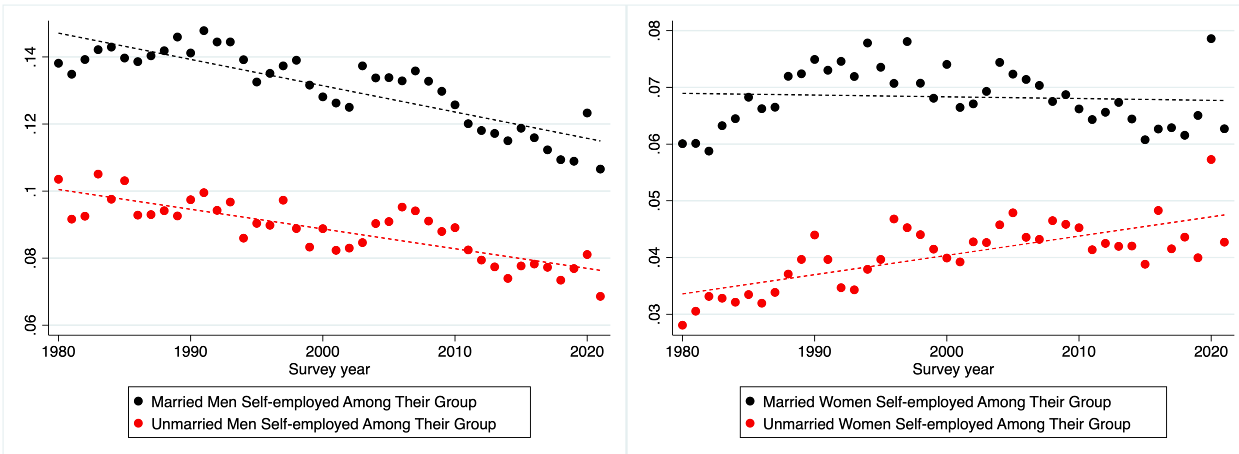
(a) *Among College vs Non-college Males* **(b)** *Among College vs Non-college Females*



Sources: CPS March Annual and Economic Supplement *Notes:* Figure A.3a shows entrepreneurship among college and non-college male groups while Figure A.3b shows entrepreneurship among college and non-college female groups in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-65 across time in the US.

Figure A.4: Entrepreneurship Among Marriage and Gender Groups

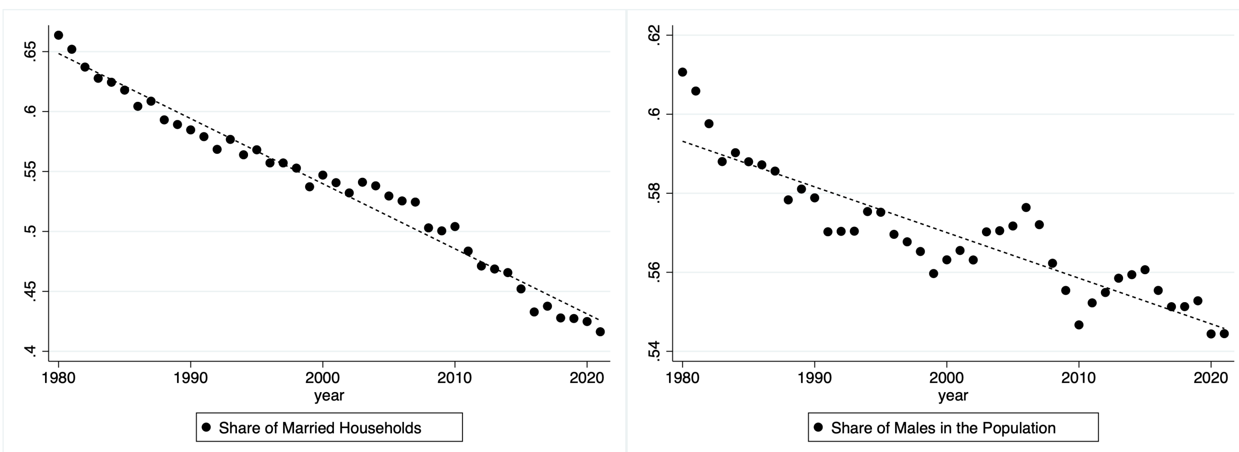
(a) *Among Married vs Unmarried Males* **(b)** *Among Married vs Unmarried Females*



Sources: CPS March Annual and Economic Supplement *Notes:* Figure A.4a shows entrepreneurship among married and unmarried male groups while Figure A.4b shows entrepreneurship among married and unmarried female groups in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-65 across time in the US.

Figure A.5: Demographic Changes for Ages 25-35

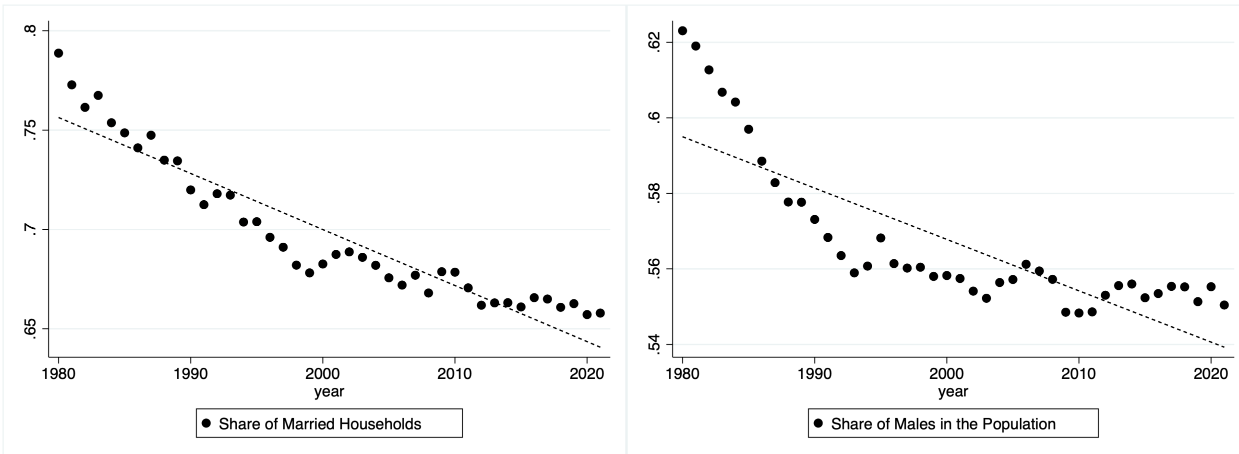
(a) *Share of Married Households* **(b)** *Share of Males*



Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.7 shows the share of married households in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-35 across time in the US. Panel B expresses the share of males in the same sample.

Figure A.6: Demographic Changes for Ages 36-50

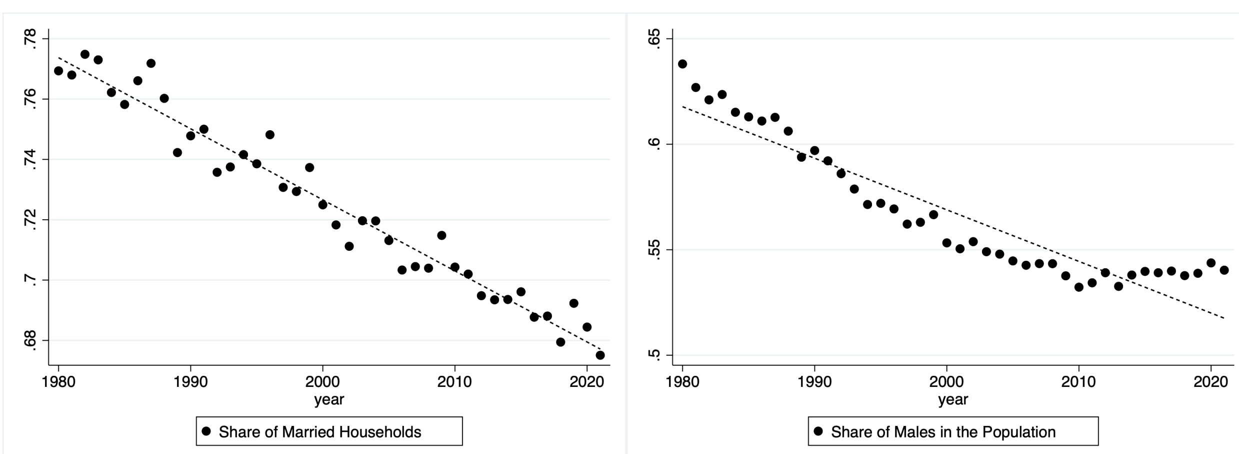
(a) *Share of Married Households* **(b)** *Share of Males*



Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.7 shows the share of married households in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 36-50 across time in the US. Panel B expresses the share of males in the same sample.

Figure A.7: Demographic Changes for Ages 51-65

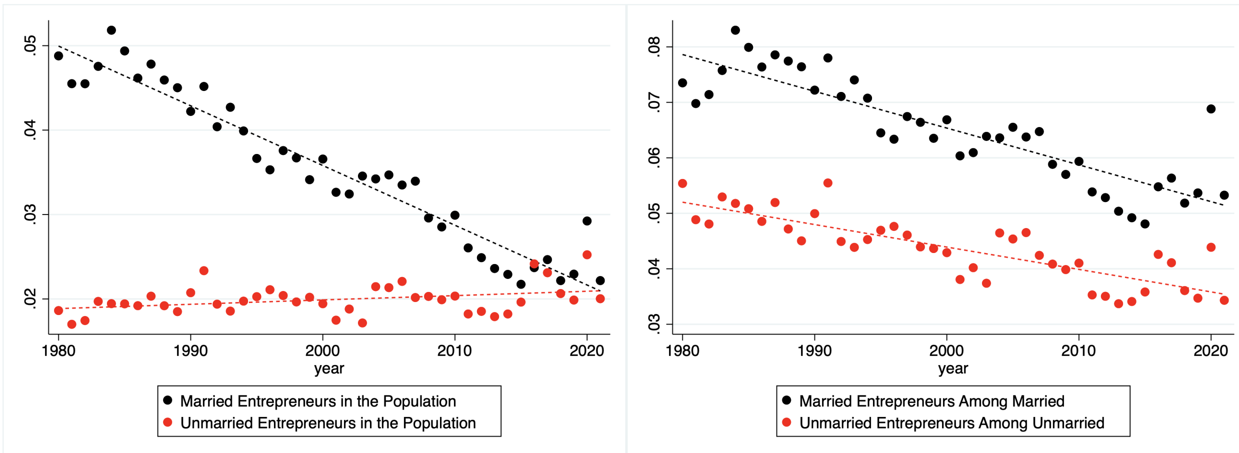
(a) *Share of Married Households* **(b)** *Share of Males*



Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.7 shows the share of married households in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 51-65 across time in the US. Panel B expresses the share of males in the same sample.

Figure A.8: Entrepreneurship By Marital Status for Ages Between 25-35

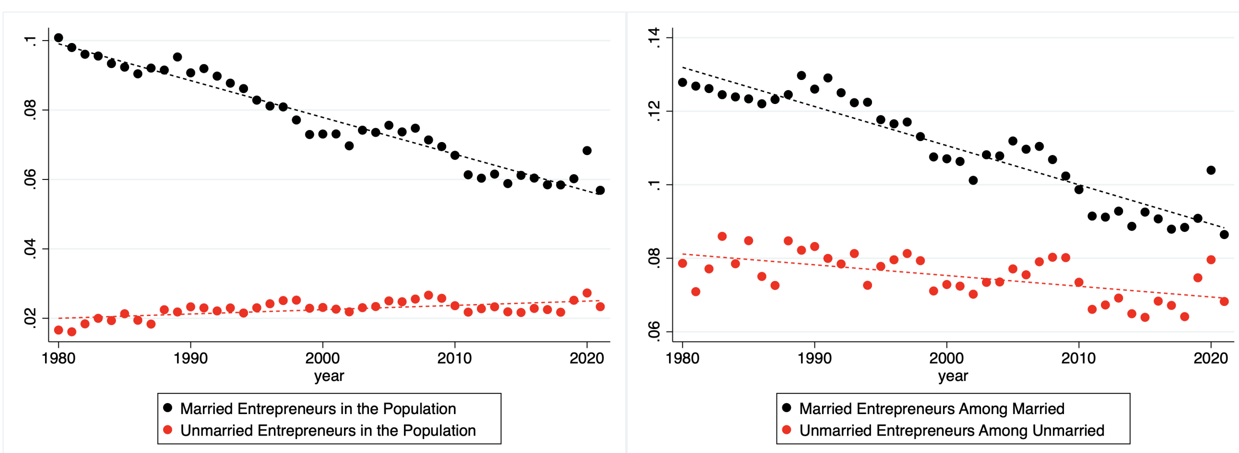
(a) *In The Population* **(b)** *In Their Group*



Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.10 shows the share of married and unmarried entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-35 across time in the US. Panel B expresses the entrepreneurs within the married and unmarried groups in the same sample.

Figure A.9: Entrepreneurship By Marital Status for Ages Between 36-50

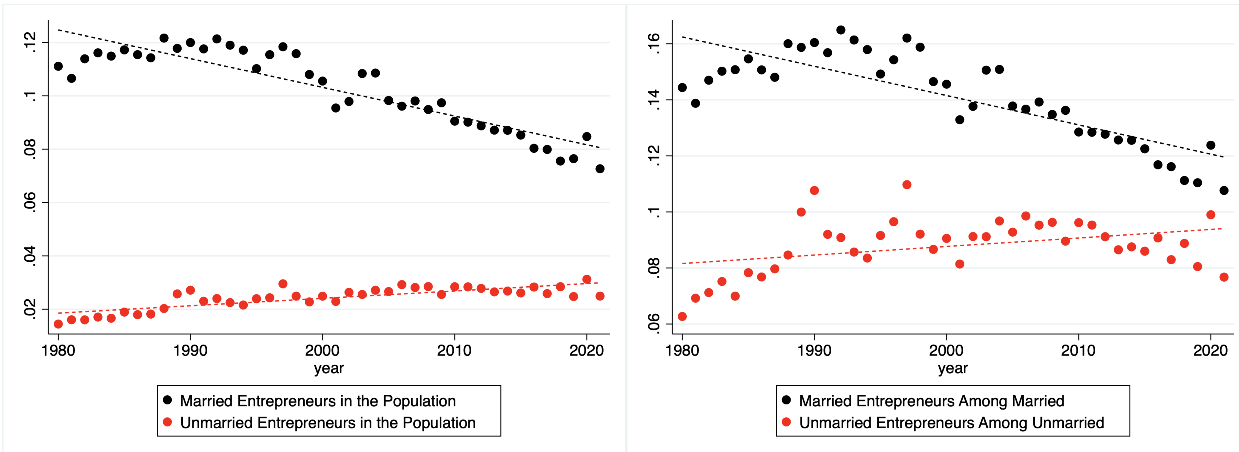
(a) *In The Population* **(b)** *In Their Group*



Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.10 shows the share of married and unmarried entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 36-50 across time in the US. Panel B expresses the entrepreneurs within the married and unmarried groups in the same sample.

Figure A.10: Entrepreneurship By Marital Status for Ages Between 51-65

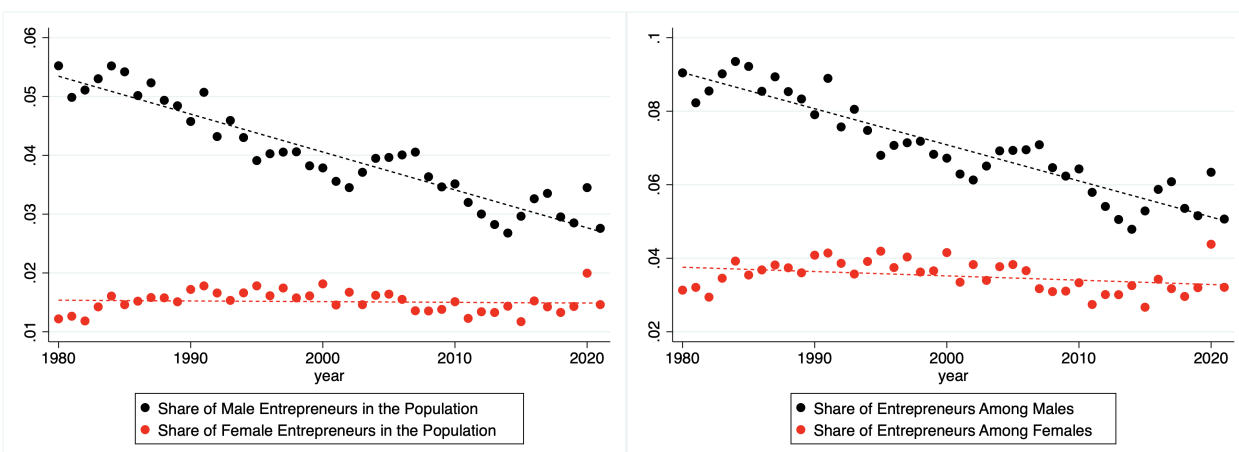
(a) *In The Population* **(b)** *In Their Group*



Sources: CPS March Annual and Economic Supplement *Notes:* Panel A of Figure A.10 shows the share of married and unmarried entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 51-65 across time in the US. Panel B expresses the entrepreneurs within the married and unmarried groups in the same sample.

Figure A.11: Entrepreneurship By Gender for Ages 25-35

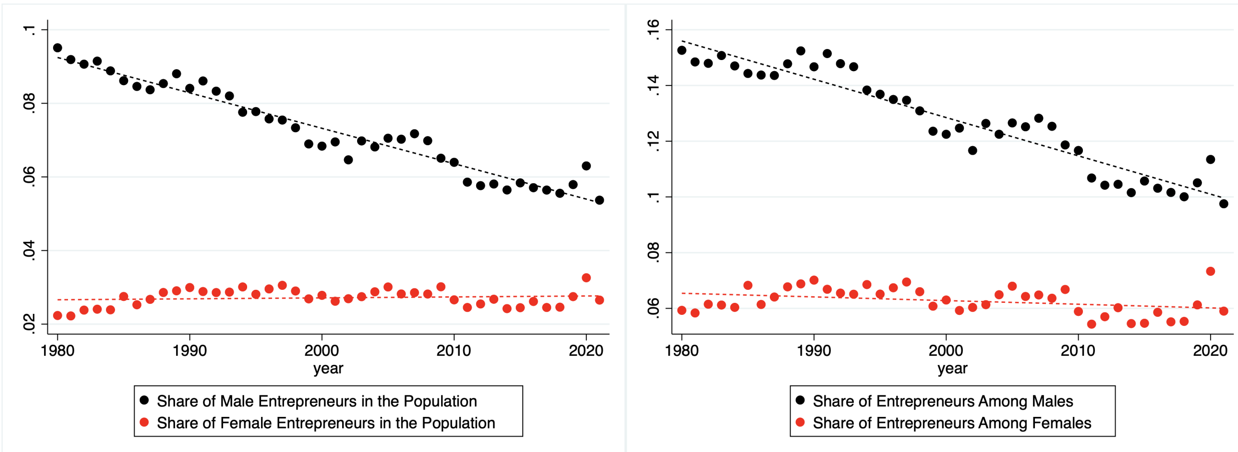
(a) *In The Population* **(b)** *In Their Group*



Sources: CPS March Supplement *Notes:* Panel A of Figure A.13 shows the share of male and female entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 25-35 across time in the US. Panel B expresses the entrepreneurs within the male and female groups in the same sample.

Figure A.12: Entrepreneurship By Gender for Ages 35-50

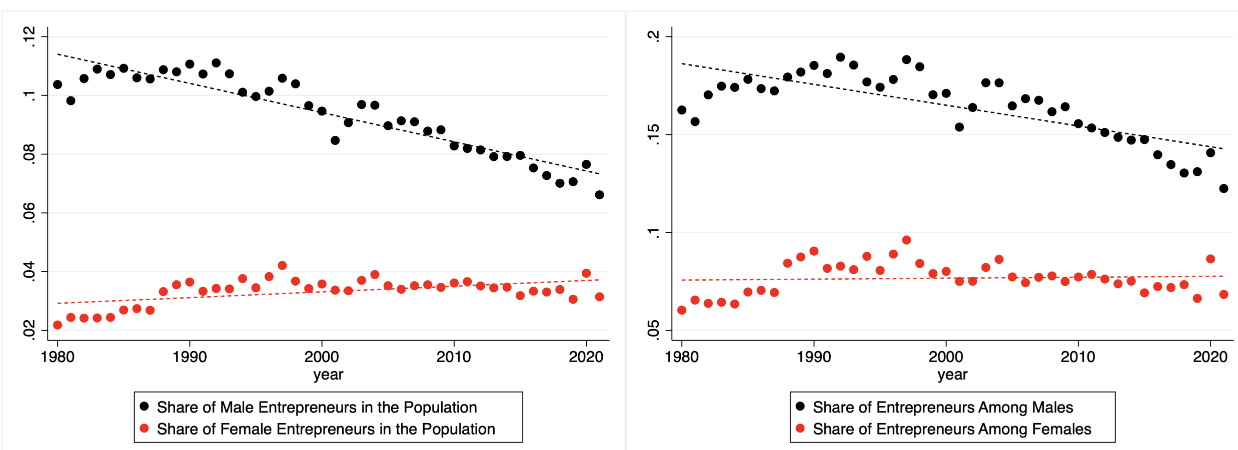
(a) *In The Population* **(b)** *In Their Group*



Sources: CPS March Supplement *Notes:* Panel A of Figure A.13 shows the share of male and female entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 35-50 across time in the US. Panel B expresses the entrepreneurs within the male and female groups in the same sample.

Figure A.13: Entrepreneurship By Gender for Ages 51-65

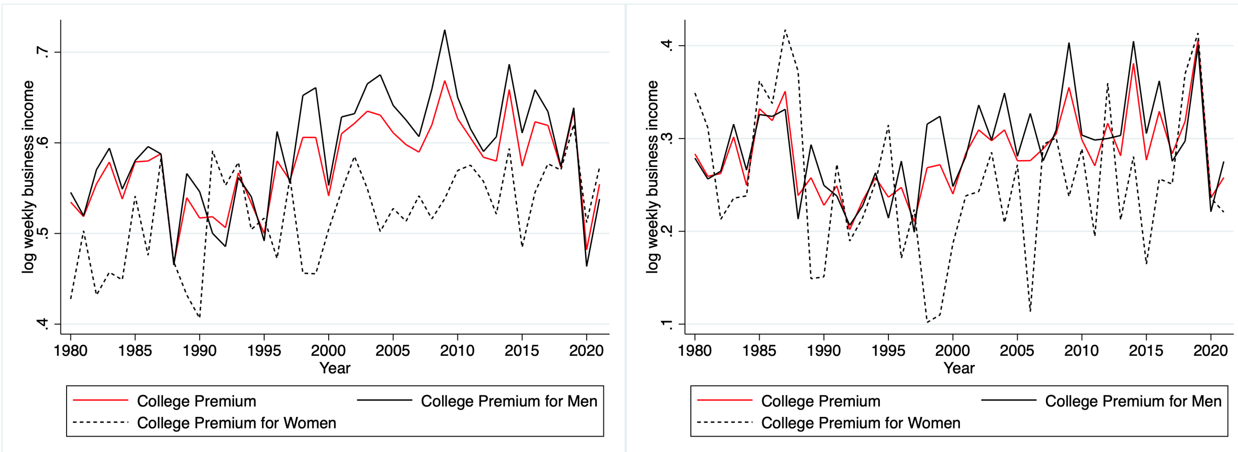
(a) *In The Population* **(b)** *In Their Group*



Sources: CPS March Supplement *Notes:* Panel A of Figure A.13 shows the share of male and female entrepreneurs in the sample of full-time, non-agricultural, non-military workers and entrepreneurs aged between 51-65 across time in the US. Panel B expresses the entrepreneurs within the male and female groups in the same sample.

Figure A.14: Skill-Premium for Entrepreneur

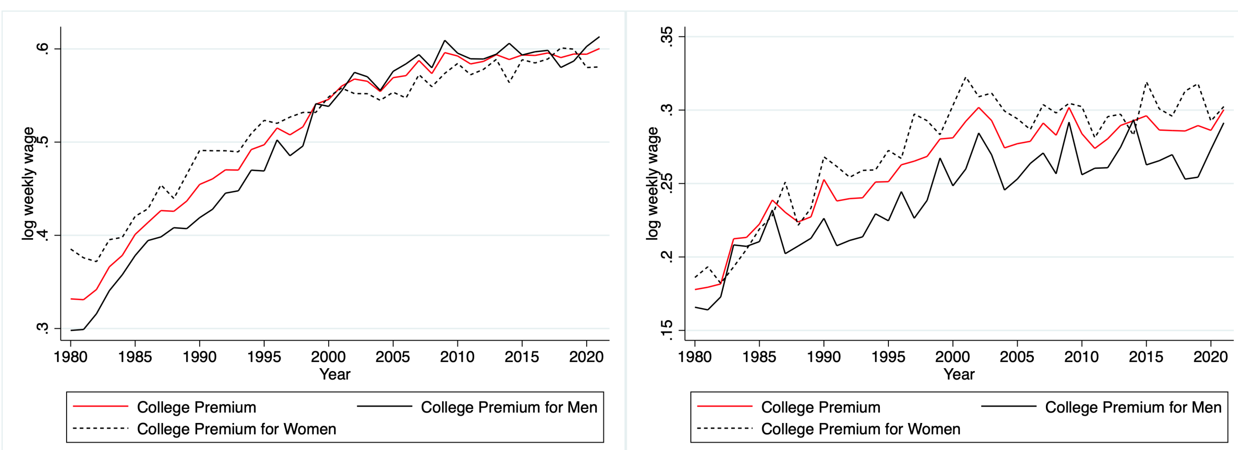
(a) *Without Occupation* **(b)** *With Occupation*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.15: Skill-Premium for Worker

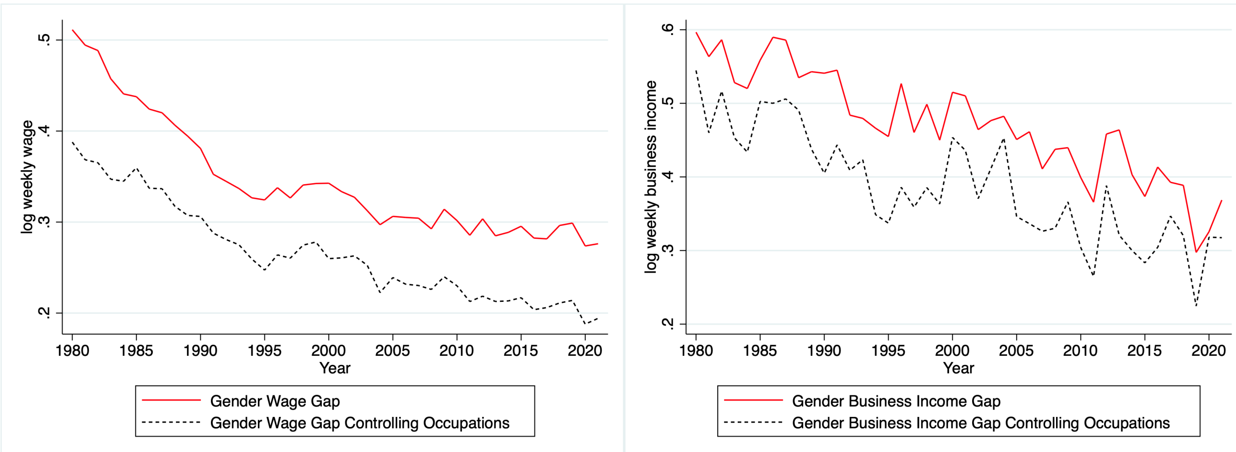
(a) *Without Occupation* **(b)** *With Occupation*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.16: Gender Gaps

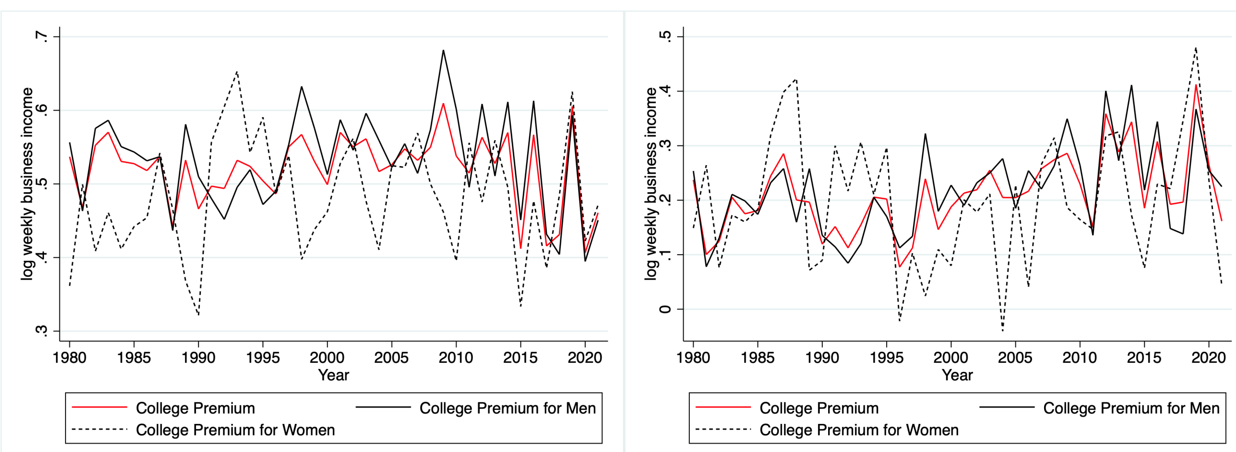
(a) *Wage Gap* **(b)** *Business Income Gap*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

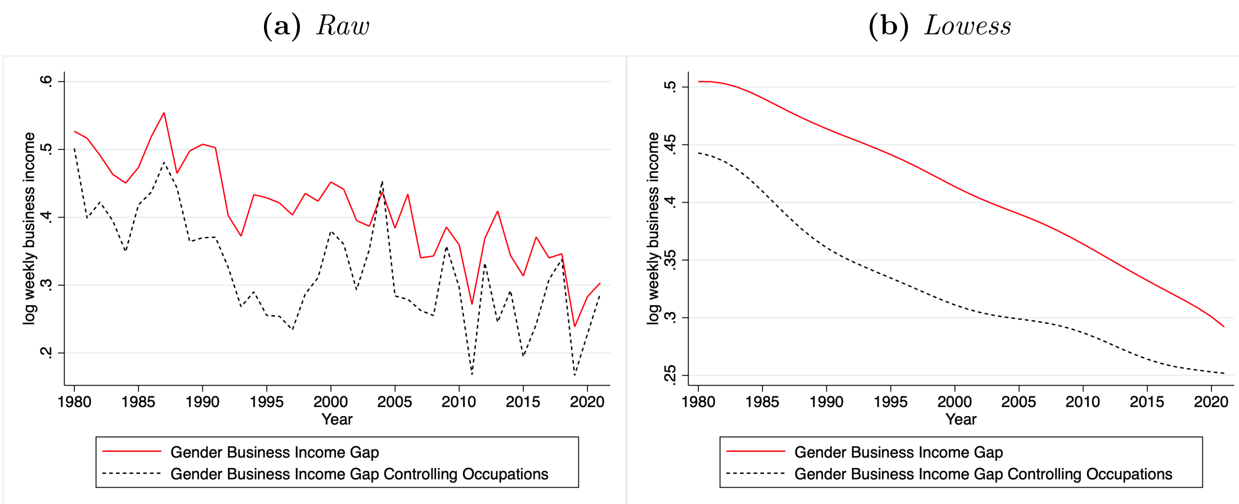
Figure A.17: Skill-Premium for Entrepreneur (Only Business Income)

(a) *Without Occupation* **(b)** *With Occupation*



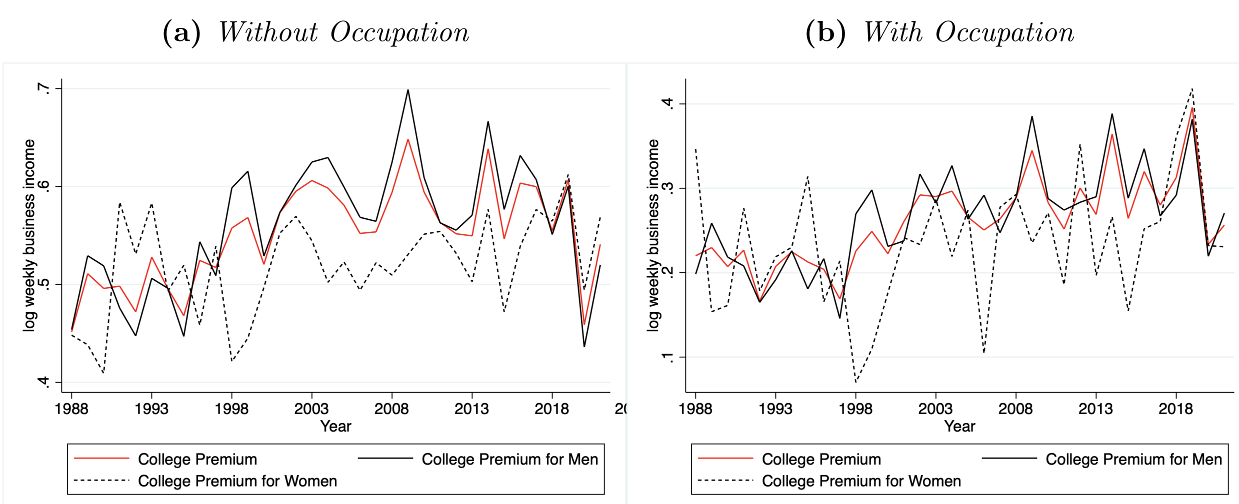
Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.18: Gender Business Income Gap (Only Business Income)



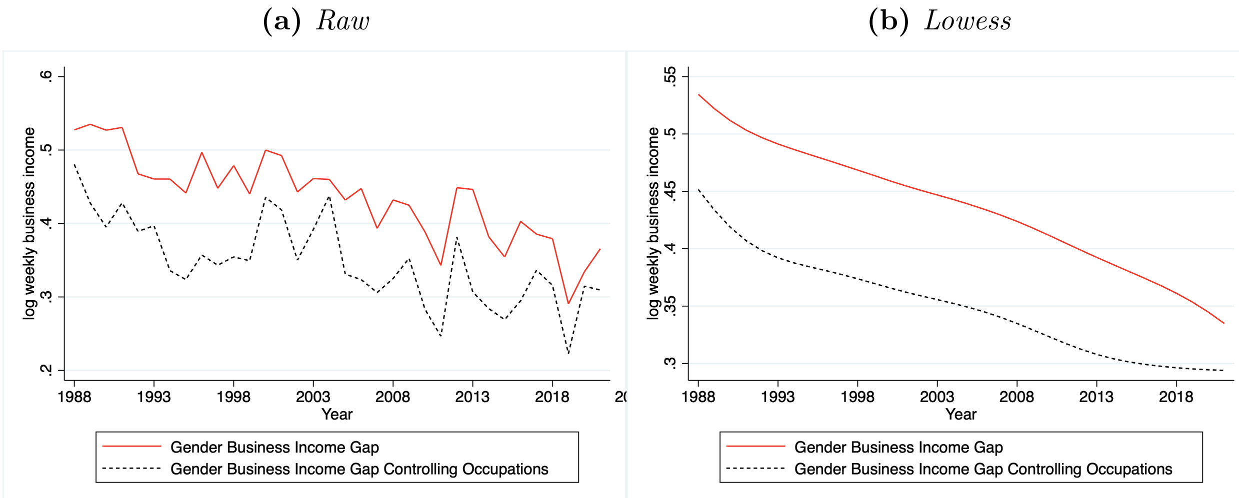
Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.19: Skill-Premium for Entrepreneur (Controlling Firm Size)



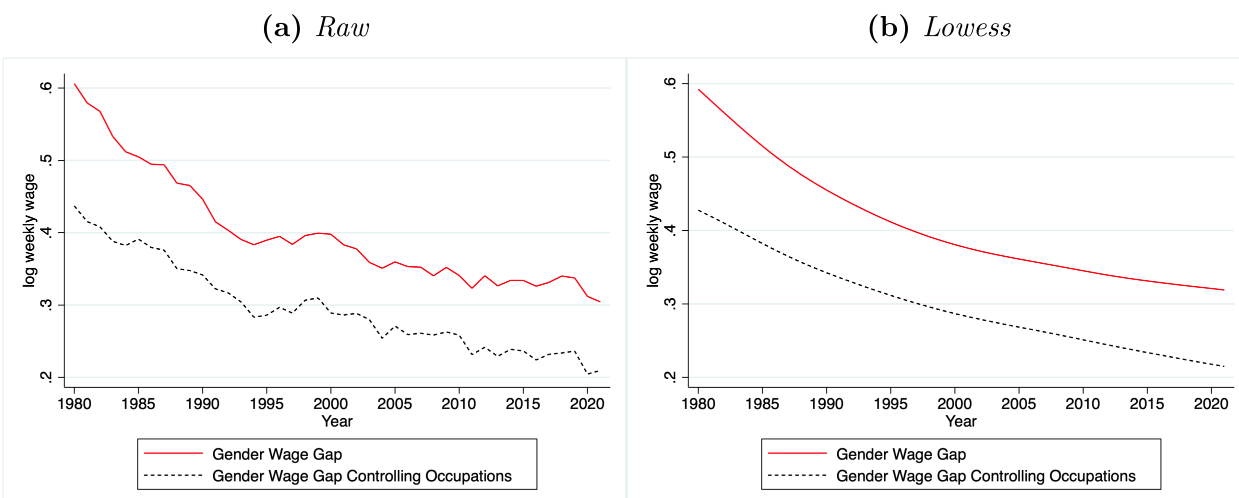
Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.20: Gender Business Income Gap (Controlling Firm Size)



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

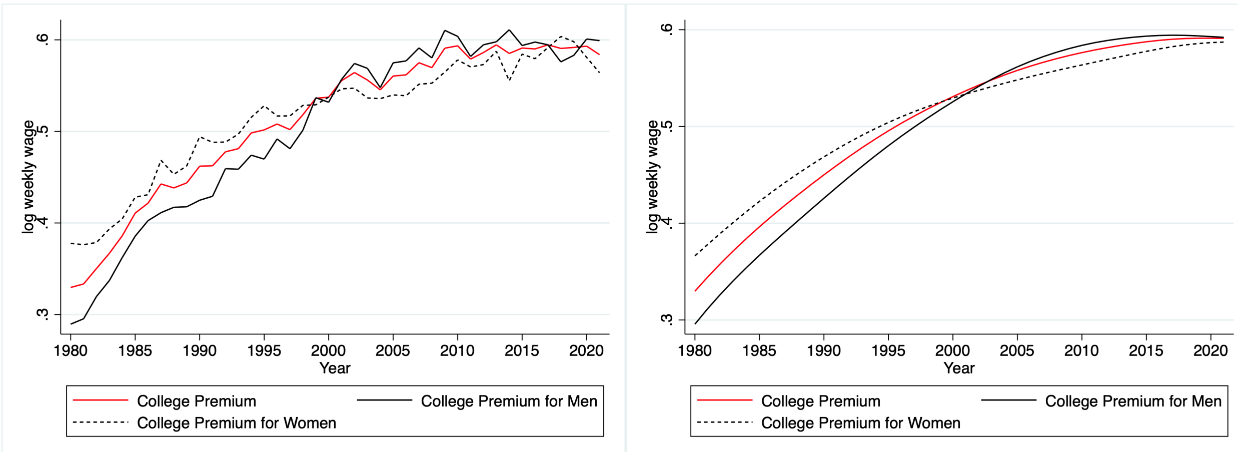
Figure A.21: Gender Wage Gap (Heckman Corrections)



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.22: Skill-Premium for Worker (Heckman Corrections)

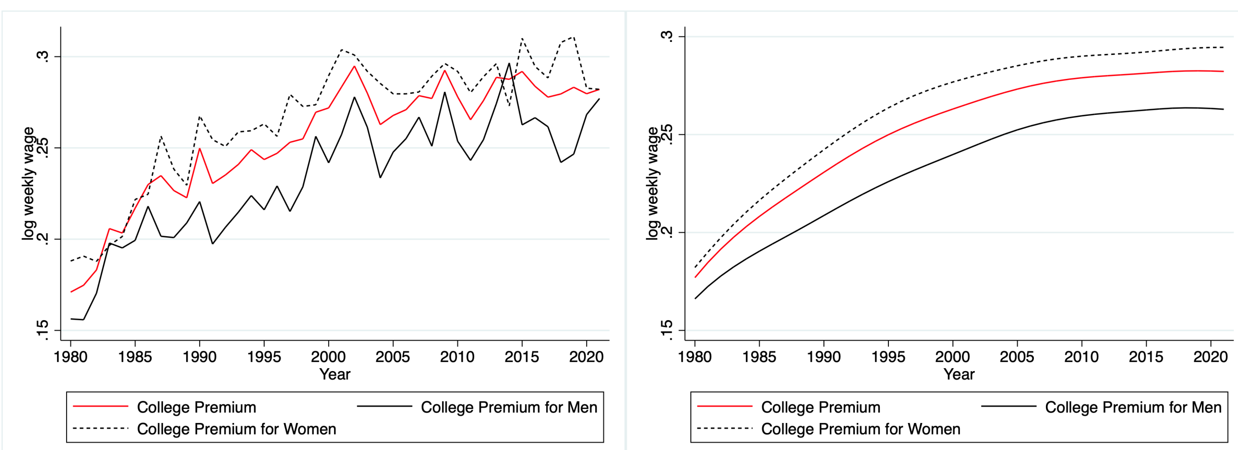
(a) *Raw* **(b)** *Lowess*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.23: Skill-Premium for Worker with Occupation (Heckman Corrections)

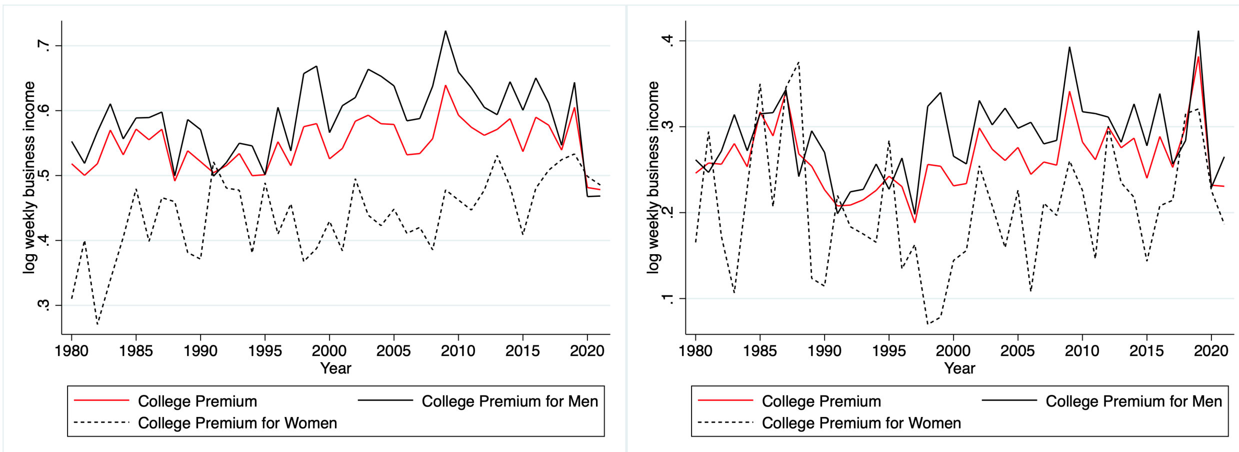
(a) *Raw* **(b)** *Lowess*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.24: Skill-Premium for Entrepreneur (Heckman Corrections)

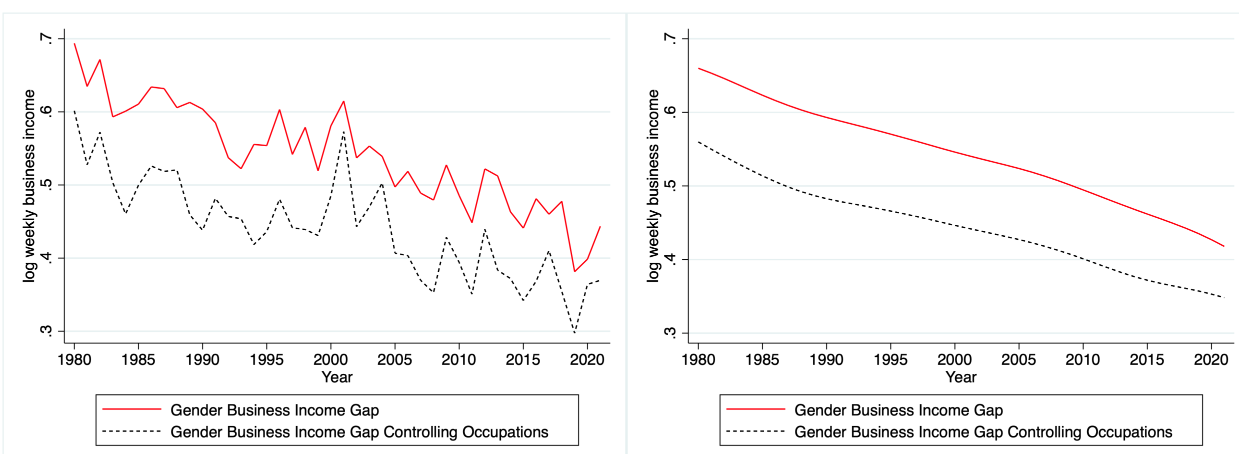
(a) *Without Occupation* **(b)** *With Occupation*



Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.25: Gender Business Income Gap (Heckman Corrections)

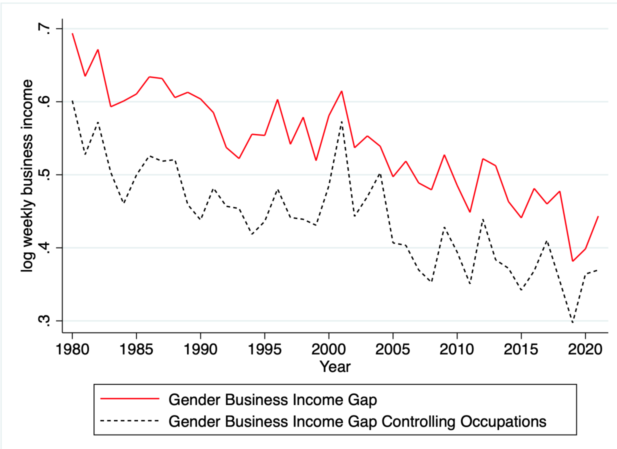
(a) *Raw* **(b)** *Lowess*



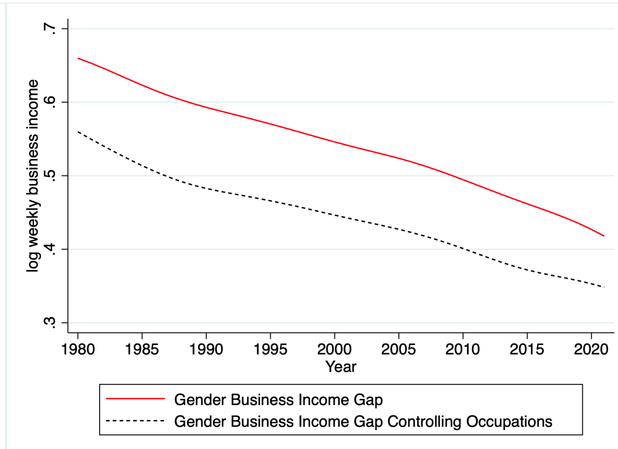
Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.26: Gender Business Income Gap (Heckman Corrections)

(a) *Raw*



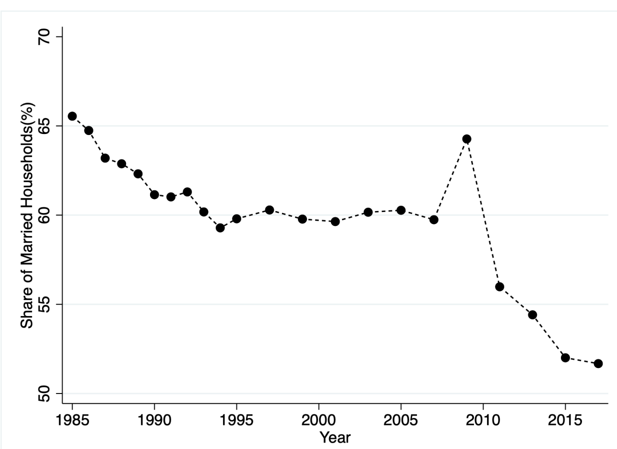
(b) *Lowess*



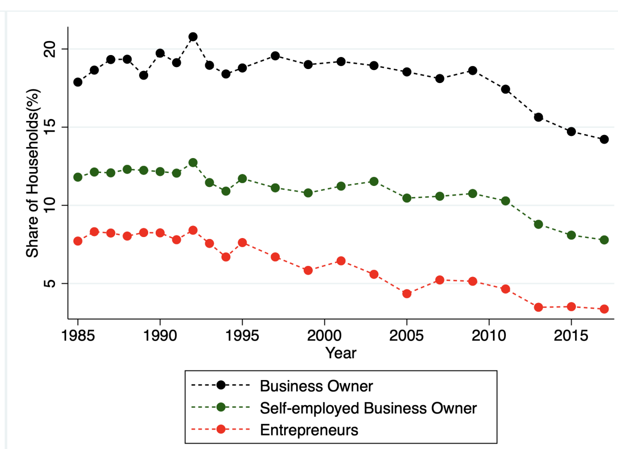
Sources: CPS March Supplement *Notes:* Panel A of Figure 6 shows the regression coefficient for having a college degree on being an entrepreneur while Panel B expresses the coefficient for being a married on being an entrepreneur. Gray area represents the 95% confidence intervals.

Figure A.27: Share of Married Household & Share of Entrepreneurs

(a) *Share of Married Households*



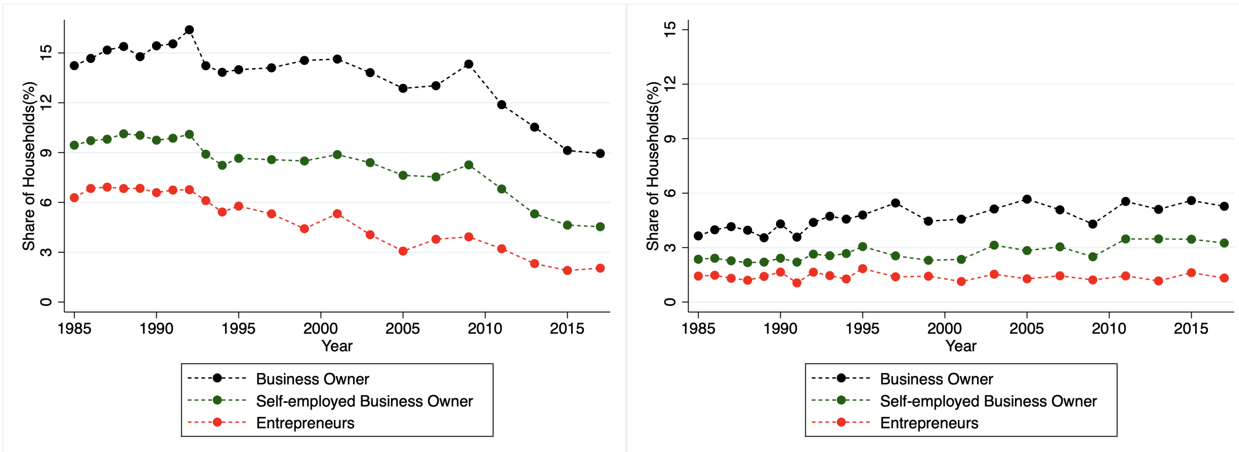
(b) *Share of Entrepreneurs*



Sources: Panel Study of Income Dynamics *Notes:* Panel A shows the share of married households in the full-time employed population ages between 25-65 while Panel B expresses the entrepreneurship rate for different definitions of entrepreneurship.

Figure A.28: Share of Entrepreneurs

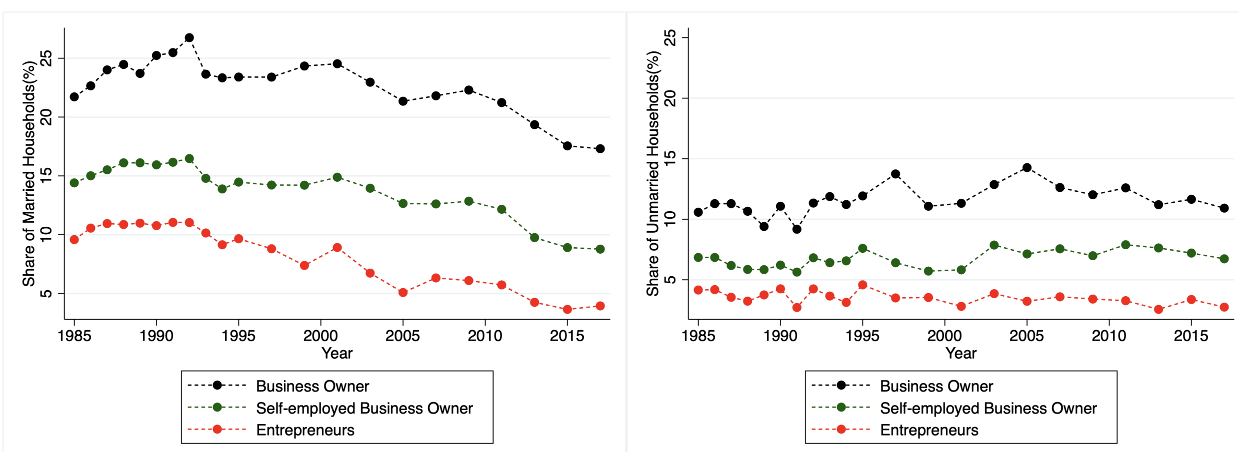
(a) *Married Entrepreneurs* (b) *Unmarried Entrepreneurs*



Sources: Panel Study of Income Dynamics *Notes:* Panel A shows the share of married entrepreneurs in the full-time employed population ages between 25-65 while Panel B expresses the unmarried entrepreneurs for different definitions of entrepreneurship.

Figure A.29: Entrepreneurship By Marital Status

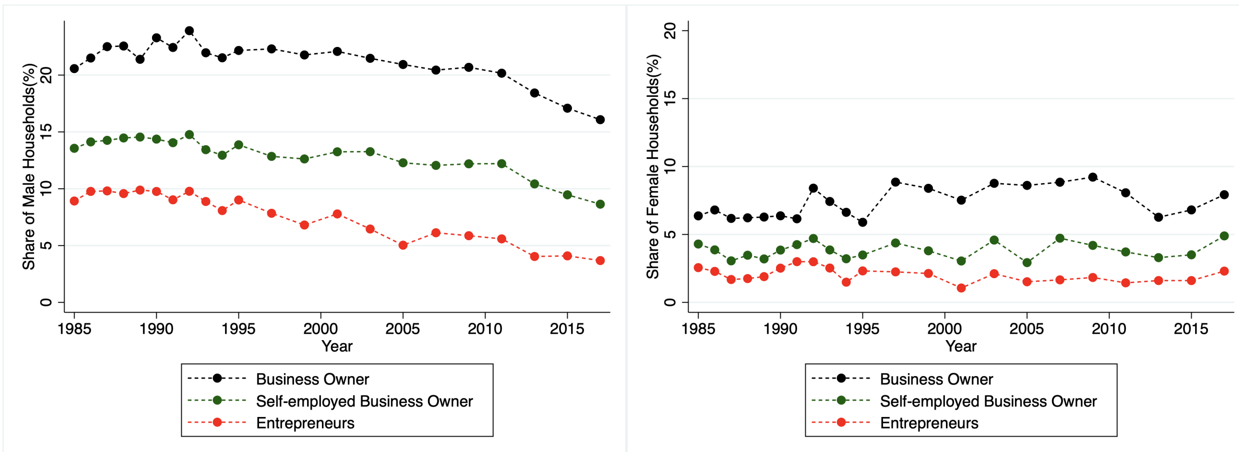
(a) *Entrepreneurship Within Married Group* (b) *Entrepreneurship Within Unmarried Group*



Sources: Panel Study of Income Dynamics *Notes:* Panel A shows the entrepreneurship within married group in the full-time employed population ages between 25-65 while Panel B expresses the entrepreneurship within unmarried group for different definitions of entrepreneurship.

Figure A.30: Entrepreneurship By Gender

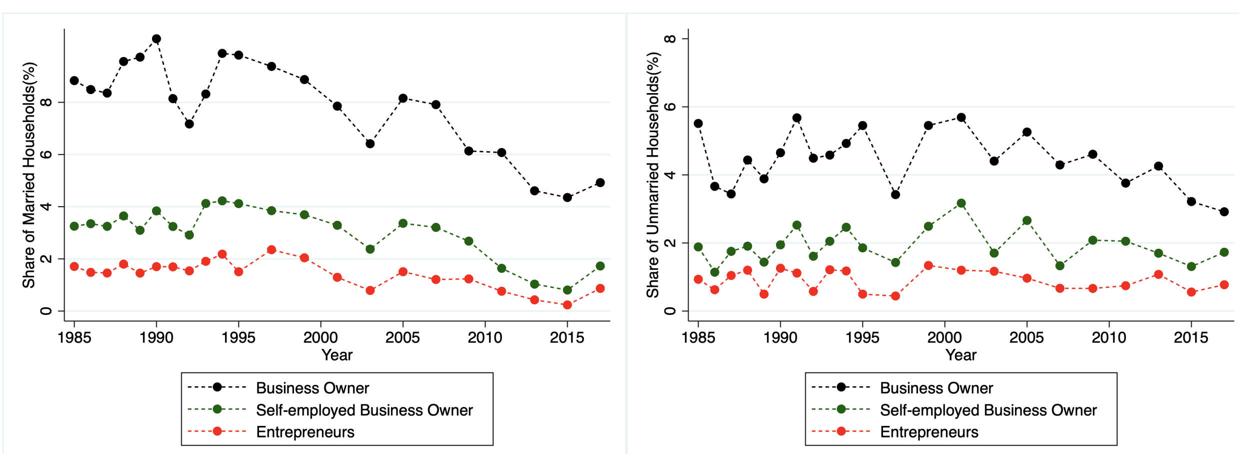
(a) *Entrepreneurship Within Male Group* **(b)** *Entrepreneurship Within Female Group*



Sources: Panel Study of Income Dynamics *Notes:* Panel A shows the entrepreneurship within male group in the full-time employed population ages between 25-65 while Panel B expresses the entrepreneurship within female group for different definitions of entrepreneurship.

Figure A.31: Entry Rate by Marital Status

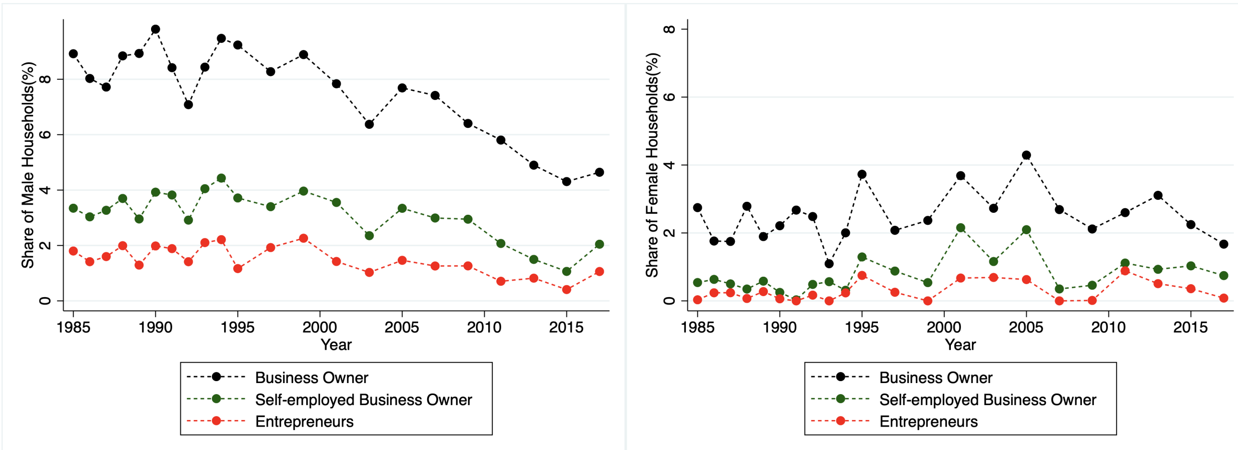
(a) *Among Married Group* **(b)** *Among Unmarried Group*



Sources: Panel Study of Income Dynamics *Notes:* Panel A shows the entry rate within married group in the full-time employed population ages between 25-65 while Panel B expresses the entry rate within unmarried group for different definitions of entrepreneurship.

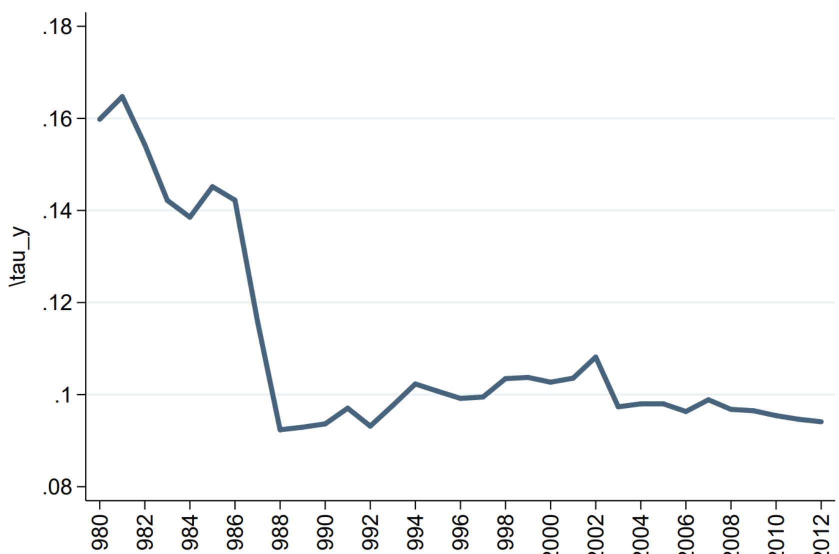
Figure A.32: Entry Rate by Gender

(a) *Among Males* **(b)** *Among Females*



Sources: Panel Study of Income Dynamics *Notes:* Panel A shows the entry rate within male group in the full-time employed population ages between 25-65 while Panel B expresses the entry rate within female group for different definitions of entrepreneurship.

Figure A.33: Progressivity of Income Tax Parameter



Sources: Dyrda and Pugsley(2018). *Notes:* The figure is retrieved from Dyrda and Pugsley.

B Estimating Marriage Margin

Given that the share of married entrepreneurs was 8.29% in 1980, the decline in the entrepreneurship among married households accounts for the decline of the married self-employed households:

$$\textit{Marriage Margin for Married SE} = \frac{\textit{Married } SE_{1980} - \widehat{\textit{Married}}\, SE_{2021}}{\textit{Married } SE_{1980} - \textit{Married } SE_{2021}} = \frac{8.29 - 6.71}{8.29 - 5.2} = \frac{1.58}{3.09} = 51.13\%$$

This indicates that the marriage margin, i.e. the decline in entrepreneurs among married households, accounts for **51.13%** of the decline in the share of married entrepreneur households.

In the same manner, to estimate the marriage margin for the full-time employed population, I compute the counterfactual rate of entrepreneurs for unmarried group as below:

$$\widehat{\textit{Unmarried}}\, SE_{2021} = (1\text{-}\textit{Marriage Rate})_{2021} \times (\textit{SE Among Unmarried})_{1980} = 40.54\% \times 6.38\% = 2.59\%$$

In the same manner, to estimate the marriage margin for the full-time employed population, I compute the counterfactual rate of entrepreneurs for unmarried group as below:

$$\widehat{\textit{Unmarried}}\, SE_{2021} = (1\text{-}\textit{Marriage Rate})_{2021} \times (\textit{SE Among Unmarried})_{1980} = 40.54\% \times 6.38\% = 2.59\%$$

This reveals that if the share of unmarried households were the same as the 1980 level, the share of unmarried entrepreneur households would be 2.59% of the households in 2021, that is higher than the actual share of unmarried entrepreneurs in 2021, 2.27%. This is due to the rise in the share of unmarried households in the population. The counterfactual entrepreneurship in 2021 would be

$$\widehat{SE}_{2021} = \widehat{\textit{Married}}\, SE_{2021} + \widehat{\textit{Unmarried}}\, SE_{2021} = 6.71\% + 2.59\% = 9.3\%$$

This means that if the share of married households (and unmarried households) remained constant, the share of entrepreneurs would be 8.16%, whereas the actual share was 7.9% in 2021. Therefore, marriage margin accounts for

$$\textit{Marriage Margin for SE} = \frac{SE_{1980} - \widehat{SE}_{2021}}{SE_{1980} - SE_{2021}} = \frac{9.98 - 9.3}{9.98 - 7.47} = \frac{0.68}{2.51} = 27.1\%$$

27.1% of the fall in the entrepreneurship in the US.

The implied share of male entrepreneurs would be 7.12% if the self-employment rate among male is at the 1980 level. Given that the share of male self-employed was 8.15% in 1980 and 5% in 2021 which gives us to estimate the extensive margin for male self-employed in the population

$$Gender\ Margin\ for\ Male\ SE = \frac{Male\ SE_{1980} - \widehat{Male\ SE}_{2021}}{Male\ SE_{1980} - Male\ SE_{2021}} = \frac{8.15 - 7.12}{8.15 - 5} = \frac{1.03}{3.09} = 32.7\%$$

This indicates that the extensive margin, i.e. the decline in self-employment among male, accounts for **32.7%** of the decline in the share of male self-employed in the US. Similarly, the implied female self-employment can be found by absorbing the change in the self-employment rate in female group between 1980 and 2021 as follows:

$$\widehat{Female\ SE}_{2021} = (Share\ of\ Female)_{2021} \times (SE\ Among\ Female)_{1980} = 45.72\% \times 4.83\% = 2.21\%$$

which gives the implied self-employment rate as

$$\widehat{SE}_{2021} = \widehat{Male\ SE}_{2021} + \widehat{Female\ SE}_{2021} = 7.12\% + 2.21\% = 9.33\%$$

Using the counterfactual share of entrepreneurs , the extensive margin is:

$$Gender\ Margin\ for\ SE = \frac{SE_{1980} - \widehat{SE}_{2021}}{SE_{1980} - SE_{2021}} = \frac{9.98 - 9.33}{9.98 - 7.47} = \frac{0.65}{2.51} = 25.9\%$$

Therefore, the decline in the share of male accounts for **25.9%** of the fall in the entrepreneurship in the US.

C Tables

Table C.1: Probit Model Results

	(1)	(2)	(3)
Married	$.29^{***}$	$.17^{***}$	$.16^{***}$
	(73.9)	(41.2)	(38.7)
College	$.13^{***}$	$.12^{***}$	$.13^{***}$
	(22.2)	(20.3)	(21.8)
Married × College	$-.05^{***}$	$-.07^{***}$	$-.07^{***}$
	(-7.8)	(-10.7)	(-9.9)
Controls	No	Yes	Yes
Year Fixed Effects	No	No	Yes
Observations	2,325,812	2,325,783	2,325,783

Notes: Parentheses refer to z-score. Model 1 precludes the covariates, while Model 2 includes control variables, and Model 3 additionally includes year fixed effects.

$$Entrepreneur_{i,t} = \beta_0 + \beta_1 male_{i,t} + \beta_2 bachelor_{i,t} + \beta_3(male_{i,t} * bachelor_{i,t}) + \beta_4 X_{i,t} + \beta_{5t} \cdot \text{year} \tag{13}$$

where i represents individual i, t represents year t and X includes individuals characteristics (age, age^2, income, married, race, hispanic).

Table C.2: Probit Model Results

	(1)	(2)	(3)
Male	$.34^{***}$	$.33^{***}$	$.33^{***}$
	(96.5)	(89.9)	(89.6)
Bachelor	$.03^{***}$	$-.003$	$.02^{***}$
	(5.7)	(-0.7)	(3.1)
Male × Bachelor	$.11^{***}$	$.06^{***}$	$.05^{***}$
	(18.3)	(9.7)	(7.7)
Controls	No	Yes	Yes
Year Fixed Effects	No	No	Yes
Observations	2,389,786	2,389,757	2,389,757

Notes: Parentheses refer to z-score. Model 1 precludes the covariates, while Model 2 includes control variables, and Model 3 additionally includes year fixed effects.

Additionally, to explore the interaction between being married, female with a college degree, I construct the following regression:

Table C.3: Probit Model Results for Married Sample

	(1)	(2)	(3)
College	.04**	.04**	.05**
	(85.3)	(7.3)	(9.3)
College Spouse	.02**	.14**	.16**
	(25.0)	(25.7)	(29.1)
College × College Spouse	−.002**	−.08**	−.09**
	(−2.63)	(−10.8)	(−11.3)
Controls	No	Yes	Yes
Year Fixed Effects	No	No	Yes
Observations	1,695,067	1,695,040	1,695,040

Notes: Parentheses refer to z-score. Model 1 precludes the covariates, while Model 2 includes control variables, and Model 3 additionally includes year fixed effects.

$$\begin{aligned} Entrepreneur_{i,t} = \beta_0 + \beta_1 married_{i,t} + \beta_2 bachelor_{i,t} + \beta_3 female_{i,t} \\ + \beta_4(married_{i,t} * bachelor_{i,t}) + \beta_5(married_{i,t} * female_{i,t}) + \beta_6(female_{i,t} * bachelor_{i,t}) \\ + \beta_7(married_{i,t} * female_{i,t} * bachelor_{i,t}) + \beta_8 X_{i,t} \end{aligned} \tag{14}$$

where i represents individual i, t represents year t and X includes individuals characteristics (age, age^2, income, race, Hispanic).

Table C.4: Probit Results for Model 14

	(1)	(2)	(3)
Married	.25***	.13***	.12***
	(49.7)	(26.0)	(22.9)
Bachelor	.16***	.10***	.11***
	(21.0)	(13.4)	(13.9)
Female	−.36***	−.39***	−.40***
	(−52.9)	(−56.6)	(−57.2)
Married × Bachelor	−.04***	−.06***	−.06***
	(−4.5)	(−7.2)	(−6.6)
Married × Female	.05***	.09***	.10***
	(5.7)	(11.3)	(12.4)
Female × Bachelor	−.05***	−.02	−.01
	(−3.9)	(−1.3)	(−0.4)
Married × Female × Bachelor	−.09***	−.07***	−.07***
	(−6.9)	(−5.5)	(−5.2)
Controls	No	Yes	Yes
Year Fixed Effects	No	No	Yes
Observations	2,389,786	2,389,757	2,389,757

Notes: Parentheses refer to z-score. Model 1 precludes the covariates, while Model 2 includes control variables, and Model 3 additionally includes year fixed effects.

Table C.5: Distribution of Households in the US

	Male			Female		
	All	Married	Unmarried	All	Married	Unmarried
Non-college	73.6	57.1	16.5	82.1	63.3	18.8
College	26.4	20.6	5.8	17.9	14.4	3.5

*Source:*CPS ASEC *Notes:* The distribution of households are estimated similar to Guner et al. (2012) for ages between 25-65.

Table C.6: Married Female Labor Force Participation Rate

	Females	
Males	Non-college	College
Non-college	49.8	69.3
College	45.3	56.4

Notes: Table 3 illustrates the married female labor force participation rate for different skilled group of male and female. Labor force participation is defined as female works generally more than or equal to 30 hours and has a positive income with ages betwen 25-65.

Table C.7: Married Female Labor Force Participation Rate

Benchmark Economy			Married Male Non-participant			No Gender Gaps		
	Female			Female			Female	
Male	Non-college	College	Male	Non-college	College	Male	Non-college	College
Non-college	60.7	64.7	Non-college	60.9	98.5	Non-college	61.2	99.1
College	54.5	59.4	College	54.8	59.3	College	58.5	69.0

Notes: Table C.7 shows the equilibrium results for married female labor force participation rate for each skill group of households. Left table indicates the participation rate for the 2017 benchmark economy while right table depicts the results after policy changes that allows married male to be a non-participant.

Table C.8: Married Male Labor Force Participation Rate

Benchmark Economy			Married Male Non-participant			No Gender Gaps		
	Female			Female			Female	
Male	Non-college	College	Male	Non-college	College	Male	Non-college	College
Non-college	100	100	Non-college	100	62.6	Non-college	100	58.5
College	100	100	College	100	100	College	100	100

Notes: Table C.8 shows the equilibrium results for married male labor force participation rate for each skill group of households. Left table indicates the participation rate for the 2017 benchmark economy while right table depicts the results after policy changes that allows married male to be a non-participant.

D Married Households Problem

The problem of a married household where male entrepreneur and female worker is the following :

$$W_{ew}^{s\tilde{s}}(\Theta, q; \Omega) = \max_{o'} 2log(c) - q + \beta \max \Big\{ \tag{15}$$

$$\underbrace{E(W_{ee}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female entrepreneur}}}, \underbrace{E(W_{we}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female entrepreneur}}}, \underbrace{E(W_{ew}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female worker}}}$$

$$\underbrace{E(W_{ww}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female worker}}}, \underbrace{E(W_{en}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female not in LF}}}, \underbrace{E(W_{wn}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female not in LF}}} \Big\}$$

subject to

$$c = \pi(z_m) + \phi w^{\tilde{s}} \epsilon_f - T^M(\pi(z_m) + \phi w^{\tilde{s}} \epsilon_f)$$

The problem of a married household where male entrepreneur and female not in labor force is the following :

$$W_{en}^{s\tilde{s}}(\Theta, q; \Omega) = \max_{o'} 2log(c) + \beta \max \Big\{ \tag{16}$$

$$\underbrace{E(W_{ee}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female entrepreneur}}}, \underbrace{E(W_{we}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female entrepreneur}}}, \underbrace{E(W_{ew}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female worker}}}$$

$$\underbrace{E(W_{ww}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female worker}}}, \underbrace{E(W_{en}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male entrepreneur} \\ \text{Female not in LF}}}, \underbrace{E(W_{wn}^{s\tilde{s}}(\Theta', q; \Omega'))}_{\substack{\text{Male worker} \\ \text{Female not in LF}}} \Big\}$$

subject to

$$c = \pi(z_m) - T^M(\pi(z_m))$$

The problem of a married household where male entrepreneur and female entrepreneur is the following :

$$W_{ee}^{s\tilde{s}}(\Theta, q; \Omega) = \max_{o'} 2log(c) - q + \beta \max \Big\{ \tag{17}$$

$$\underbrace{E(W^{s\tilde{s}}_{ee}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female entrepreneur}}},\underbrace{E(W^{s\tilde{s}}_{we}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female entrepreneur}}},\underbrace{E(W^{s\tilde{s}}_{ew}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female worker}}}$$

$$\underbrace{E(W^{s\tilde{s}}_{ww}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female worker}}},\underbrace{E(W^{s\tilde{s}}_{en}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female not in LF}}},\underbrace{E(W^{s\tilde{s}}_{wn}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female not in LF}}}\Bigg\}$$

$$\text{subject to}$$

$$c = \pi(z_m) + \pi(z_f) - T^M(\pi(z_m) + \pi(z_f))$$

The problem of a married household where male worker and female entrepreneur is the following :

$$W^{s\tilde{s}}_{we}(\Theta,q;\Omega) = \max_{o'} 2log(c) - q + \beta \max\Bigg\{ \tag{18}$$

$$\underbrace{E(W^{s\tilde{s}}_{ee}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female entrepreneur}}},\underbrace{E(W^{s\tilde{s}}_{we}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female entrepreneur}}},\underbrace{E(W^{s\tilde{s}}_{ew}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female worker}}}$$

$$\underbrace{E(W^{s\tilde{s}}_{ww}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female worker}}},\underbrace{E(W^{s\tilde{s}}_{en}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female not in LF}}},\underbrace{E(W^{s\tilde{s}}_{wn}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female not in LF}}}\Bigg\}$$

$$\text{subject to}$$

$$c = w^s\epsilon_m + \pi(z_f) - T^M(w^s\epsilon_m + \pi(z_f))$$

The problem of a married household where male worker and female not in labor force is the following :

$$W^{s\tilde{s}}_{wn}(\Theta,q;\Omega) = \max_{o'} 2log(c) - q + \beta \max\Bigg\{ \tag{19}$$

$$\underbrace{E(W^{s\tilde{s}}_{ee}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female entrepreneur}}},\underbrace{E(W^{s\tilde{s}}_{we}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female entrepreneur}}},\underbrace{E(W^{s\tilde{s}}_{ew}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female worker}}}$$

$$\underbrace{E(W^{s\tilde{s}}_{ww}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female worker}}},\underbrace{E(W^{s\tilde{s}}_{en}(\Theta',q;\Omega'))}_{\substack{\text{Male entrepreneur}\\ \text{Female not in LF}}},\underbrace{E(W^{s\tilde{s}}_{wn}(\Theta',q;\Omega'))}_{\substack{\text{Male worker}\\ \text{Female not in LF}}}\Bigg\}$$

subject to

$$c = w^s\epsilon_m - T^M(w^s\epsilon_m)$$

E Stationary Competitive Equilibrium

Let $x = (z_m, \epsilon_m, s, z_f, \epsilon_f, \tilde{s}, q)$ and $v = (z_m, \epsilon_m, s)$ A stationary competitive equilibrium(SRCE) consists of

- set of government policies $\{T(.), G\}$,

- set of prices $\{w_h, w_l\}$

- decision rules for unmarried households $\{d^m(v; \Omega)$, $d^f(v; \Omega)$, $n_h^m(v; \Omega)$, $n_l^m(v; \Omega)$, $n_h^f(v; \Omega)$ and $n_l^f(v; \Omega)\}$,

- decision rules for married households $\{d(x; \Omega)$, $n_h^m(x; \Omega)$, $n_l^m(x; \Omega)$, $n_h^f(x; \Omega)$ and $n_l^f(x; \Omega)\}$,

- value functions $W_{ee}^{s\tilde{s}}(x; \Omega)$, $W_{ew}^{s\tilde{s}}(x; \Omega)$, $W_{en}^{s\tilde{s}}(x; \Omega)$, $W_{we}^{s\tilde{s}}(x; \Omega)$, $W_{wn}^{s\tilde{s}}(x; \Omega)$, $W_{ww}^{s\tilde{s}}(x; \Omega)$, $V^e(a, z, \epsilon), V^w(a, z, \epsilon), W_r(a), W(a, z), W_e(a, z)$,

- high-skill and low-skill labor demand for corporate sector $\{L_h^c, L_l^c\}$ and

- invariant distribution $\mu^* = (\mu_w^*, \mu_e^*, \mu_{or}^*, \mu_{oe}^*)$ with its law of motion function $H(\mu^*)$ such that

i) Given prices and government policies, decision rules for unmarried households and, decision rules for married households solve the households' problem.

ii) Given prices and government policies, decision rules for corporate sector solves its problem.

iii) High-skill labor market clears.

$$L_h^c + \sum_{s=h,l} \sum_{g=m,f} \int_x n_h^* d\mu_e(M, s, g, x) + \sum_{s=h,l} \sum_{g=m,f} \int_v n_h^* d\mu_e(UM, s, g, v)$$

$$= \int_x \epsilon_m d\mu_w(M, H, g = m, x) + \int_x \mathbf{I_{h_f>0}} \phi \epsilon_w d\mu_f(M, H, g = f, x)$$

$$+ \int_v \phi \epsilon_f d\mu_w(UM, H, g = f, v) + \int_v \epsilon_m d\mu_w(UM, H, g = m, v)$$

iv) Low-skill labor market clears.

$$L_l^c + \sum_{s=h,l} \sum_{g=m,f} \int_x n_l^* d\mu_e(M, s, g, x) + \sum_{s=h,l} \sum_{g=m,f} \int_v n_l^* d\mu_e(UM, s, g, v)$$

$$= \int_x \epsilon_m d\mu_w(M, L, g = m, x) + \int_x \mathbf{I_{h_f>0}} \phi \epsilon_f d\mu_f(M, L, g = f, x)$$

$$+ \int_v \phi \epsilon_f d\mu_w(UM, L, g = f, v) + \int_v \epsilon_m d\mu_w(UM, L, g = m, v)$$

v) Corporate sector makes zero profits and prices are competitive:

$$w_h = \left[\left(\theta_l L_l^C \right)^\sigma + \left(\theta_h L_h^C \right)^\sigma \right]^{\frac{1}{\sigma} - 1} \theta_h^\sigma \left(L_h^C \right)^{\sigma - 1}$$

$$w_l = \left[\left(\theta_l L_l^C \right)^\sigma + \left(\theta_h L_h^C \right)^\sigma \right]^{\frac{1}{\sigma} - 1} \theta_l^\sigma \left(L_l^C \right)^{\sigma - 1}$$

vi) Government budget is balanced.

$$G = \sum_{s=h,l} \int_x T^M(\pi(z_m) + \pi(z_f)) d\mu_{ee}(M, s, x) + \sum_{s=h,l} \int_x T^M(\pi(z_m) + \phi w^s \epsilon_f) d\mu_e w(M, s, x)$$

$$\sum_{s=h,l} \int_x T^M(w^s \epsilon_m + \pi(z_f)) d\mu_{we}(M, s, x) + \sum_{s=h,l} \int_x T^M(w \epsilon_m + \phi w^s \epsilon_f) d\mu_{ww}(M, s, x)$$

$$\sum_{s=h,l} \int_x T^M(w^s \epsilon_m) d\mu_{wn}(M, s, x) + \sum_{s=h,l} \int_x T^M(\pi(z_m)) d\mu_{en}(M, s, x)$$

$$+ \sum_{s=h,l} \int_v T^{UM}(\phi w^s \epsilon_f) d\mu_w(UM, s, g = f, v) + \sum_{s=h,l} \int_v T^{UM}(w^s \epsilon_m) d\mu_w(UM, s, g = m, v)$$

$$+ \sum_{s=h,l} \sum_{g=m,f} \int_v T^{UM}(\pi(z_g)) d\mu_e(UM, s, g, v)$$

(vii) The distribution is stationary:

$H(\mu^*) = \mu^*$ where the law of motion function is $H(\mu) = \mu'$ where $\mu^* = (\mu^*(M), \mu^*(UM))$

$$\mu^*(M) = \mu^{*HH} + \mu^{*HL} + \mu^{*LH} + \mu^{*LL}$$

$$\mu^{*s\tilde{s}} = (\mu^{s\tilde{s}}_{ww}, \mu^{s\tilde{s}}_{we}, \mu^{s\tilde{s}}_{wn}, \mu^{s\tilde{s}}_{ew}, \mu^{s\tilde{s}}_{ee}, \mu^{s\tilde{s}}_{en}) \qquad \text{for } s = (H, L) \text{ and } \tilde{s} = (H, L)$$