Health Insurance and the Supply of Entrepreneurs: New Evidence from the Affordable Care Act's Dependent Coverage Mandate
JOB MARKET PAPER[☆]

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Abstract

Is difficulty of purchasing health insurance as an individual or small business a major barrier to entrepreneurship in the United States? I answer this question by taking advantage of the natural experiment provided by the Affordable Care Act's dependent coverage mandate, which allowed many 19-25 year olds to acquire health insurance independently of their employment. This mandate provides a means to estimate the number of potential entrepreneurs discouraged by the current system of employer-based health insurance. A difference-in-difference strategy finds that the dependent coverage mandate led to a 13-24% increase in self-employment among the treated group. The effect is found to be larger for women and for unincorporated businesses. An instrumental variables strategy finds that those actually receiving health insurance coverage as dependents were much more likely to start businesses.

Keywords: Health Insurance; Entrepreneurship; Affordable Care Act; Dependent Coverage Mandate

JEL: L26, J20, I13, I18, M13

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1. Background

1.1. Health Insurance in the United States

Currently, most Americans receive health insurance through their employers. A large company is able to pool the risks of its employees, allowing it to self-insure without risking high variance of claims or to purchase insurance without insurers fearing adverse selection. Because of this, people who work for large businesses are more likely to have insurance and pay lower premiums for equivalent policies than those working for small businesses. Conversely, those looking for insurance as individuals or small businesses find insurance at significantly higher prices or not at all, as documented by Pauly and Lieberthal (2008). Because of this, Americans may be pushed toward working for large businesses and refrain from starting their own businesses out of concern for health insurance. A recent poll found that 9% of Americans under age 35 saw access to health insurance as a key barrier to starting a business (Kauffman Foundation 2011).

1.2. The Affordable Care Act's Dependent Coverage Mandate

The Affordable Care Act (ACA) of 2010 provides a unique opportunity to estimate the causal effect of access to health insurance on entrepreneurship. The ACA introduced many changes to the US health care system, but most of its major provisions (the individual mandate, partial community rating, and guaranteed issue) do not take effect until 2014 or later. In contrast, the dependent coverage mandate was one of the first major provisions to go into effect, on September 23rd 2010. It requires insurers to offer coverage to the young adult (age 19-25) children of policyholders.

This dependent coverage mandate resulted in an increase of over 3 million in the number of insured young adults according to Sommers (2012). Many states had previously passed similar dependent coverage laws, but the ACA mandate has had a much larger effect. One reason for this is that self-insured plans (which cover roughly half of those with employer-based health insurance, according to the Medical Expenditure Panel Survey) are exempt from state mandates, whereas essentially all plans are subject to the federal mandate. A second reason is that the federal mandate is much broader. State laws had

many restrictions: requiring the young adults to be full-time students, unmarried, or dependents for tax purposes, among other restrictions. The federal mandate applies to those age 19-26 who have not been offered insurance through their own employer. Antwi et al. (2012) found that the ACA dependent coverage mandate led to a 30% increase in the likelihood that young adults were on their parents' insurance.

1.3. Previous Research

1.3.1. ACA Dependent Coverage Mandate

Two papers have used the Affordable Care Act's Dependent Coverage Mandate to study labor market outcomes. Slusky (2012) studies the effect of the mandate on labor supply and employment using a difference-in-difference approach on March Current Population Survey (CPS) data, and finds no significant effect. He then uses the mandate as an instrument for having parental insurance and finds that it significantly decreases labor supply and employment. Depew (2012) also studies the effect of the mandate on labor supply and employment. He uses a difference-in-difference approach on data from the Survey of Income and Program Participation, and finds that the mandate significantly reduces labor supply and employment among 19-25 year olds.

1.3.2. Health Insurance and Entrepreneurship

Many previous papers have examined the effect of health insurance on job-to-job mobility. A survey by Gruber and Madrian (2002) found that roughly half of these papers found significant evidence of "job-lock", reduced labor mobility due to the employer-based health insurance system. Most of these papers specifically excluded the self-employed from study. Only a handful of papers have examined the effect of health insurance on transitions to entrepreneurship specifically; this previous work has found mixed evidence for the hypothesis that lack of access to health insurance deters entrepreneurship. Gruber and Madrian (2002) presented a simple theoretical model explaining how employer-provided health insurance can lead to inefficiently low labor mobility. Holtz-Eakin et al. (1996), using data from the Panel Study of Income Dynamics and the Survey of Income and Program Participation, found that those who have health insurance through

their spouses are not significantly more likely to start businesses than those who do not. Wellington (2001) used the same approach with data from the Current Population Survey and found that those with access to a spouse's health insurance are in fact 1.2-4.6% more likely to start a business. Fairlie et al. (2011), using data from the Current Population Survey, found that those with access to a spouse's health insurance are more likely to start businesses than those without. They also found that those just over age 65 (with access to Medicare) start more businesses than do those just under age 65.

1.4. Shortcomings of Previous Research

One major flaw in the previous work on health insurance and entrepreneurship is the possibility of endogeneity and selection bias. Married people differ from non-married people in many ways, some of which are hard to observe and control for. Spouses who are willing and able to provide health insurance may be helping the entrepreneur in many unobserved ways. These studies may be attributing business creation to spousal health insurance when it is really due to other causes. This selection bias / omitted variable bias could lead to biased estimates of the effect of health insurance. Furthermore, there may be an endogeneity problem. Wellington (2001) and Fairlie et al. (2011) find that spousal health insurance and self-employment are correlated, and infer that the spousal health insurance caused the self-employment. However, it is equally possible that someone quitting her job to start a business would move to her spouse's insurance, even though she would have been willing to start the business without it. The spousal insurance approach leaves the direction of causality unclear. The Medicare approach used in Fairlie et al. (2011) addresses the endogeneity problem, since almost everyone obtains access to Medicare. But some of the omitted variable concern remains, since other changes (such as access to Social Security) may occur at the same time. More importantly, it is not clear whether their estimate of how many 65 year-olds start businesses when they get access to Medicare generalizes to tell us how people in general start businesses when they have access to health insurance. Younger entrepreneurs may differ in their decision-making process of whether to start a business. They are likely to care less about

health insurance generally, since their short-term expected health costs are much lower. Furthermore, those with Medicare may act differently from those with access to private health insurance, which has different costs and benefits. The strategy of this paper, explained in detail in the section below, aims to expand the small literature on health insurance and entrepreneurship while improving on the shortcomings of previous work.

2. Theory

2.1. A Simple Model of Self-Employment

Assume that workers place value on several kinds of compensation: wages W, employer health insurance H, and being a business owner B (which provides benefits such as not dealing with bosses). This results in the separable utility function:

$$U = \alpha H + \beta W + \gamma B \tag{1}$$

To simplify, assume that those starting their own firms get no health insurance ($H = 0$), earn the same wages W as those working for other firms, and get $B = 1$ higher other compensation from being their own boss. Those working as salaried employees get health insurance $H = 1$, earn the same wages W as the self-employed, and get no compensation in the form of being their own boss ($B = 0$). The value placed on wages, β, is the same for all workers. There is heterogeneity in the value placed on health insurance (α) and being a business owner (γ). These values are uniformly distributed with support from 0 to 1, and are distributed independently of each other.

Individuals face the choice of whether to start a business or work as an employee. They choose the option that maximizes their own utility.

Employees get utility from their wages (W) and health insurance ($H = 1$):

$$U_E = \alpha + \beta W \tag{2}$$

While business owners get utility from their wages (W) and from the independence of owning their own business ($B = 1$):

$$U_B = \gamma + \beta W \tag{3}$$

Assuming that wages and the utility derived from wages are equal for both groups, the difference in utility for business owners is:

$$U_B - U_E = \gamma - \alpha \tag{4}$$

Therefore, an individual will start a business so long as their realization of the value of business ownership γ is greater than their realization of the value of employer health insurance α. If γ and α are independently and uniformly distributed between 0 and 1, then $\gamma > \alpha$ for half of individuals, and that half will start their own business.

2.2. Effect of the Mandate on Self-Employment

Now suppose the dependent coverage mandate makes it easier for some workers to get health insurance outside of the job. This reduces their value of employer health insurance by a factor δ where $0 < \delta < 1$. This results in utility:

$$U_M = \delta\alpha H + \beta W + \gamma B \tag{5}$$

The resulting difference in utility between business ownership and employment for individuals covered by the mandate is:

$$U_{MB} - U_{ME} = \gamma - \delta\alpha$$

Assume that δ, the discount in the valuation of employer health insurance caused by the mandate, is uniformly distributed, with an average value of $0 < \bar{\delta} < 1$. In this case, the proportion of self-employed people will increase by $1 - \bar{\delta}$ in the group affected by the mandate. For instance, if the mandate cuts the value of employer health insurance by half ($\delta = 0.5$), then self-employment for the group covered by the mandate will increase from 50% to 75%. If the mandate cuts the value of employer insurance by 10% ($\delta = 0.9$), then self employment will increase from 50% to 55% for the covered group. In this model,

the mandate has no effect on the self-employment of those it does not directly apply to.

3. Data and Econometric Strategy

3.1. Data

This paper uses several datasets to take advantage of each one's individual strengths. The primary dataset used is the Integrated Public Use Microdata Series (IPUMS) compilation of the American Community Survey (ACS) from 2005 to 2011. It has information about labor market outcomes (including self-employment) as well as extensive demographic controls. Its comparative advantage is its huge size: the ACS surveys over 3 million individuals per year. This is important because of my focus on a small subgroup: self-employed individuals aged 19-25. The full ACS dataset has over 21 million individuals but contains just under 50,000 self-employed individuals age 19-25. For some robustness checks I use the smaller Current Population Survey (CPS). One major advantage of the CPS is that it has information about the month in which individuals were surveyed. This allows me to look directly at the point in time when the law took effect (September 2010). The CPS also has a semi-panel structure, following individuals for a short time. This allows me to examine changes in self-employment at the individual level.

In both the ACS and CPS, individuals are coded as self-employed if they work more hours for their own business than for others.

For most specifications, the universe includes only 19-33 year olds. It is very rare for workers under 18 to be self-employed, and those over 33 may be too different from 19-25 year olds to provide approporiate controls. Robustness checks show that the results are not sensitive to this narrowing of age groups.

3.2. Difference-in-Difference Estimation

The basic strategy of the paper is to use difference-in-difference estimation to determine the effect of the dependent coverage mandate on self-employment. This means comparing people covered by the dependent coverage mandate (those age 19-25 after the

Table 1: Basic Difference-in-Difference Effect of Dependent Coverage Mandate on Self-Employment

% Self-Employed	Before September 2010	After September 2010	Difference
19-25 year olds	2.358%	2.191%	-0.167%
% Self-Employed	Before September 2010	After September 2010	Difference
27-33 year olds	5.494%	5.265%	-0.229%
Difference	-0.167%	-0.229%	0.062%

Data from the 2009-2011 American Community Survey, retrieved using sampling weights.

mandate took effect in September 2010) to those not covered by the mandate. 26-year-olds are dropped from most regressions because they can be considered both treated and un-treated. In effect, the difference-in-difference strategy uses control groups (19-25 year olds before the mandate took effect, and 27-33 year olds) to isolate the true effect of the mandates. This helps to prevent attributing to the mandate what is really due to changing economic conditions or due to young adults consistently starting fewer businesses than their older counterparts.

The first step is to generate a simple non-regression difference-in-difference estimate of the effect of the dependent coverage mandate. This is shown in Table 1. Following the implementation of the dependent coverage mandate in September 2010, 19-25 year-olds (who are covered by the mandate) increased their rate of self-employment by 0.062 percentage points relative to 27-33 year-olds (who are not covered by the mandate). However, this result could simply be due to the changing composition of each age group. Therefore, the next step is to do a difference-in-difference logit regression which controls for additional variables such as race, gender and marital status. I use logit (and probit) because the dependent variable is whether someone is self-employed, which is a binary variable. The regression takes the form:

$$SelfEmployed_i = \beta_0 + \beta_1 * Mandate + \beta_2 * AgeGroup + \beta_3 * Mandate * AgeGroup + \beta_4 * Controls + Error_i$$

This logit regression gives the main result, where β_3 gives the estimate of the effect of the dependent coverage mandate on business creation by young adults. By using a difference-in-difference strategy that takes advantage of the natural experiment of the Affordable Care Act dependent coverage mandate, this paper avoids the endogeneity and omitted variable problems that plague the previous literature. The natural experiment helps to overcome endogeneity: the Affordable Care Act extended the possibility of insurance uniformly, not only to those more or less likely to start businesses. The difference-in-difference strategy reduces the possibility of omitted variable bias by using similar control groups.

4. Results

The results of the main regressions are shown in Table 2. The coefficients for the variable *Treated* give the estimate of the treatment effect of the dependent coverage mandate. These specifications find that the mandate significantly increases the likelihood that 19-25 year olds are self-employed. Depending on the specification, the increase in self-employment is between 0.32 and 0.58 percentage points. The average rate of self-employment among 19-25 year olds over the entire period is about 2.4%, so the estimates imply a 13-24% increase. Because our dependent variable is binary (the ACS counts respondents as either self-employed or not), the linear probability model is less appropriate than the others, so more weight should be given to the logit and probit estimates of a 13-16% increase.

4.1. High-Growth Entrepreneurship

The results above simply estimate the effect of the dependent coverage mandate on the likelihood that the average 19-25 year old will become self-employed in a business of any kind. However, it is more reasonable to expect that the mandate has different impacts on various groups and various kinds of businesses.

When considering the benefits of entrepreneurship, researchers are especially interested in the kinds of businesses that are likely to bring growth and innovation. Previous

Table 2: Regression Difference-in-Difference Effect of Dependent Coverage Mandate on Self-Employment

	Linear Probability	Logit	Probit
Treated	.0058***	.0032**	.0038***
	(.0007)	(.0008)	(.0007)
After Mandate	-.0031***	-.0015*	-.0017**
	(.0009)	(.0008)	(.0008)
Age 19-25	-.0038***	-.0059***	-.0050***
	(.0006)	(.0006)	(.0006)
Observations		2,637,376	

Controls include age, number of children, state-year employment, and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data is from the 2005-2011 IPUMS compilation of the American Community Survey. Data from 26 year olds and from the year 2010 have been dropped because they can be classified as being in both the treatment and control groups. The universe consists of 18-33 year olds who have ever worked. Robust standard errors clustered by household are given in parentheses. Coefficients reported for logit and probit regressions are the marginal effects.

research has found that incorporated businesses are more likely than unincorporated businesses to grow and hire additional employees (Henderson (2002)). About one-third of all businesses are incorporated. In order to determine how the dependent coverage mandate may have affected these two kinds of business differently, I re-run the main regression, but instead of the dependent variable being "self-employed," it is "self employed in incorporated business" or "self-employed in unincorporated business." Table 3 shows the results. The ACA dependent coverage mandate appears to have encouraged the formation of unincorporated, lower-growth businesses more than incorporated, higher-growth businesses. It is possible that as these new businesses grow they will eventually become incorporated.

4.2. Men and Women

The law may also have heterogeneous effects across men and women. Women are more risk-averse (see for instance Borghans et al. (2009)), have higher health insurance costs than men, and are less likely to start businesses (over the whole ACS sample, 6.2% of women are self-employed compared to 11.8% of men; among the group affected by the mandate, 2.0% of women are self-employed compared to 2.6% of men). Table 4 shows the results of the main regression when the sample is split into men and women. Women

Table 3: Effect of the Dependent Coverage Mandate on Incorporated vs Unincorporated Businesses

	Incorporated		
	Linear Probability	Logit	Probit
Treated	.0023***	.0003	.0006
	(.0003)	(.0005)	(.0004)
After Mandate	-.0009*	-.0002	-.0002
	(.0005)	(.0004)	(.0004)
Age 19-25	-.0010***	-.0017***	-.0013***
	(.0003)	(.0003)	(.0003)
Observations	2,637,376		
	Unincorporated		
	Linear Probability	Logit	Probit
Treated	.0035***	.0023***	.0026***
	(.0006)	(.0007)	(.0006)
After Mandate	-.0022***	-.0013*	-.0014***
	(.0007)	(.0007)	(.0007)
Age 19-25	-.0028***	-.0044***	-.0038***
	(.0005)	(.0005)	(.0005)
Observations	2,637,376		

Controls include age, number of children, state-year employment, and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data is from the 2005-2011 IPUMS compilation of the American Community Survey. Data from 26 year olds and from the year 2010 have been dropped because they can be classified as being in both the treatment and control groups. The universe consists of 18-33 year olds who have ever worked. Robust standard errors clustered by household are given in parentheses. Coefficients reported for logit and probit regressions are the average marginal effects.

Table 4: Effect of the Dependent Coverage Mandate on Self-Employment Among Men and Women

	Men		
	Linear Probability	Logit	Probit
Treated	.0054***	.0014	.0022**
	(.0010)	(.0012)	(.0011)
After Mandate	-.0036***	-.0017	-.0020*
	(.0013)	(.0012)	(.0012)
Age 19-25	-.0044***	-.0065***	-.0053***
	(.0009)	(.0009)	(.0009)
Observations	1,338,947		
	Women		
	Linear Probability	Logit	Probit
Treated	.0063***	.0051***	.0053***
	(.0009)	(.0010)	(.0009)
After Mandate	-.0026**	-.0012	-.0014
	(.0011)	(.0010)	(.0010)
Age 19-25	-.0034***	-.0052***	-.0047***
	(.0008)	(.0008)	(.0008)
Observations	1,298,429		

Controls include age, number of children, state-year employment, and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data is from the 2005-2011 IPUMS compilation of the American Community Survey. Data from 26 year olds and from the year 2010 have been dropped because they can be classified as being in both the treatment and control groups. The universe consists of 18-33 year olds who have ever worked. Robust standard errors clustered by household are given in parentheses. Coefficients reported for logit and probit regressions are the average marginal effects.

appear to have started 0.51-0.63 percentage points (25-32%) more businesses in the wake of the mandate. The results for men are about one third the magnitude in the logit and probit specifications, and not statistically significant for logit.

5. Robustness

I first conduct some standard difference-in-difference robustness checks: how sensitive are the results to the age groups included, the start and end dates, and the controls used.

5.1. Rare Events Estimation

Logit and probit are the most commonly used techiques for analyzing data with a binary dependent variable. But they work best when the data has close to equal numbers of 1's and 0's. They can be biased in small samples when one outcome is

Table 5: Effect of the Dependent Coverage Mandate on Self-Employment According to Rare Events Estimators

	Logit	Rare Events Logit	Complementary Log-Log
Treated	.0032**	0.0029***	.0031***
	(.0008)	(.0008)	(.0008)
After Mandate	-.0015*	-0.0013*	-.0014*
	(.0008)	(.0008)	(.0008)
Age 19-25	-.0059***	-0.0052***	-.0062***
	(.0006)	(.0005)	(.0006)
Observations		2,637,376	

Controls include age, number of children, state-year employment, and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data is from the 2005-2011 IPUMS compilation of the American Community Survey. Data from 26 year olds and from the year 2010 have been dropped because they can be classified as being in both the treatment and control groups. The universe consists of 18-33 year olds who have ever worked. Robust standard errors clustered by household are given in parentheses. Coefficients reported are the marginal effects.

relatively rare. Because only about 2.5% of young adults are self-employed, logit and probit may be biased for this sample, even though it is not particularly small. This bias is reduced in the alternative techniques of rare events logit (relogit) and complementary log-log (cloglog) regression. Both assume that the error distribution follows and extreme value distribution. The results, given in table 5, show that the magnitudes estimated by relogit and cloglog are very slightly smaller than the logit magnitude, and remain strongly statistically significant. It appears that the large sample size is able to reduce the rare event bias almost to zero.

5.2. Sensitivity to Ages Included

Table 5 shows the results of regressions where the age groups used are broadened and narrowed. The results are robust to including all age groups, but not to narrowing the age groups to 23-25 and 27-29 years olds in order to focus on more similar treatment and control groups. This may be because the value of the mandate is smaller to those close to the age cutoff at 26. A 25 year old only has one year of dependent coverage; the mandate should have a smaller effect on their decisions than those of a 19 year old who expects 6 years of dependent coverage.

Table 6: Robustness to Age Groups Used of Difference-in-Difference Effect of Dependent Coverage Mandate on Self-Employment

	Narrow Comparison (23-25, 27-29 year olds)		
	Linear Probability	Logit	Probit
Treated	.0012	-.0012	-.0007
	(.0010)	(.0010)	(.0010)
After Mandate	-.0012	-.0005	-.0006
	(.0008)	(.0009)	(.0009)
Age Group	-.0007	-.0006	-.0004
	(.0010)	(.0010)	(.0010)
Observations		1,129,146	
	Broad Comparison (All Ages)		
	Linear Probability	Logit	Probit
Treated	.0078***	.0008	.0026***
	(.0006)	(.0011)	(.0009)
After Mandate	-.0007**	.0003	.0002
	(.0003)	(.0003)	(.0003)
Age Group	-.0188***	-.0506***	-.0410***
	(.0003)	(.0005)	(.0004)
Observations		11,520,237	

Controls include age, number of children, state-year employment, and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data is from the 2005-2011 IPUMS compilation of the American Community Survey. Data from 26 year olds and from the year 2010 have been dropped because they can be classified as being in both the treatment and control groups. The universe consists of 18-33 year olds who have ever worked. Robust standard errors clustered by household are given in parentheses. Coefficients reported for logit and probit regressions are the marginal effects.

5.3. Affordable Care Act or Recovery from Recession?

One possible flaw in the difference-in-difference strategy is that it is picking up the labor market distortions caused by the recession and financial crisis of 2008. Perhaps the recession hit the younger people in the treatment group harder than the older people in the control group, and we attribute to the mandate what is actually their reversion to the mean during the recovery. I try several strategies to deal with this concern. One that has already been incorporated into each specification is controlling for unemployment in each individual's state and year.

5.3.1. Dropping the Unemployed

First I restrict the universe to employed individuals. This is quite reasonable because the tradeoff considered by my theory is between salaried work and self-employment, not self-employment and unemployment. However, it will not fully solve the problem, since the decisions of employed individuals could still be differentially affected by the prospect of unemployment. Next I consider only the states where the recession had the mildest impact, where unemployment never exceeded 7%.

5.3.2. Sensitivity to Start Time

Ashenfelter demonstrated how difference in difference estimates can be highly sensitive to the choice of started period. Wolfers (2006) gives good strategies for overcoming this problem. First I drop the linear time trend from controls. Next I start dropping years from the pre-treatment period. I try dropping all early years, comparing only 2009 and 2011. I try dropping the years actually classified as recession years by the NBER, 2008 and 2009.

5.3.3. Ignore the Time Series: Regression Discontinuity

One way to get aroud the recession problem is to ignore changes over time, and simply look at the difference in self-employment between 19-25 year olds and 27-33 year olds after the mandate is in place. This is best approached as a regression discontinuity problem. After controlling for a continuous age term, are 19-25 year olds significantly more likely to be self-employed? The regression takes the form:

$$SelfEmployed_i = \beta_0 + \beta_1 * Age + \beta_2 * Age^2 + \beta_3 * AgeGroup + Error_i$$

Where β_3 is the coefficient of interest. It tells us how much more or less likely 19-25 year olds are to start businesses than 27-33 year olds. Because I control for continuous *age* and age^2, the *AgeGroup* coefficient should capture only sharp differences across groups (like whether the mandate allows them to get dependent coverage) and not things that slowly change with age. The regression discontinuity is estimated using local linear regression and local logit, so that observations closer to the boundary (26 years old) are given more weight.

Preliminary estimates suggest that the regression discontinuity design produces estimates similar to the difference in difference approach.

5.4. What is Self-Employment?

It is possible that previous results have been artifacts of the way self-employment is reported. Perhaps some people report themselves as being self-employed despite essentially working for someone else, for instance when someone wants to work as an employee but is hired as an independent contractor so as not to qualify for benefits. Others may report themselves as self-employed even though they work very few hours, perhaps to avoid the stigma of enemployment.

To determine that an individual is really self-employed rather than working for someone else, I use their response to the occupation question. I try counting people as self-employed only if they work as managers.

I also consider how much effort entrepreneurs are putting in to their businesses. I try modifying the original specifications to count people as self-employed only if they work a certain minimum number of hours per week. The results are similar to the original specification.

Table 7: Effect of Dependent Coverage on Hours Worked by Self-Employed

	Linear Regression	Tobit
Treated	.2482***	2.677***
	(.0265)	(.6356)
After Mandate	-.0807**	-1.027
	(.0349)	(.6876)
Age 19-25	-.1114***	-4.135
	(.0242)	(.5225)
Observations	2,637,376	2,637,376

Controls include age and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data are from the 2005-2011 IPUMS compilation of the American Community Survey. Data from 26 year olds and from the year 2010 have been dropped because they can be classified as being in both the treatment and control groups. Robust standard errors clustered on households are given in parentheses.

5.4.1. Self-Employment Defined on a Continuum

Although this thesis has considered several definitions of self-employment, the concept has still been treated in a black-and-white way, since people are coded as either self employed or not. One more nuanced definition is to consider the continuous variable, hours worked as self-employed. I construct this variable from ACS data by multiplying hours worked and whether individuals are self-employed. Table 7 shows the effect of the dependent coverage mandate on self-employed hours worked. The OLS results show that hours worked increased by about 0.25 (15 minutes). Given that hours worked as self-employed was initially very low (because almost everyone reports zero hours), this represents a 10% increase it total hours of self-employment. I also consider a tobit model that accounts for selection into self-employment. It shows that hours of self-employment increase by 2.67 per person.

5.5. Clustering, Weighting

Each previous specification has used robust standard errors clustered on households, a standard technique to account for intra-household correlations. The non-clustered standard errors reported in Table 8 are the same as the clustered standard errors used in the baseline specification to four significant digits. Bootstraped standard errors, also reported in Table 8, are slightly smaller than traditional standard errors. Previous speci-

Table 8: Robustness to Clustering and Weighting

	No Clustering	Bootstrap cluster	Probability Weights
Treated	.0032***	.0032***	.0020**
	(.0008)	(.0007)	(.0010)
After Mandate	-.0015*	-.0015*	-.0017*
	(.0008)	(.0007)	(.0010)
Age 19-25	-.0059***	-.0059***	-.0047***
	(.0006)	(.0006)	(.0008)
Observations		2,637,376	

Controls include age, number of children, state-year employment, and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data is from the 2005-2011 IPUMS compilation of the American Community Survey. Data from 26 year olds and from the year 2010 have been dropped because they can be classified as being in both the treatment and control groups. The universe consists of 18-33 year olds who have ever worked. Robust standard errors are given in parentheses. Coefficients reported are the marginal effects of logit regressions.

fications have not used probability weights, because the universe consists of young adults and is not intended to represent to full population (see Solon et al. (2013)). However, the results are robust to the inclusion of probability weights.

6. Effect on Individuals: Instrumental Variables

An instrumental variables approach brings together the theories underlying the previous estimation to make more general statements about dependent health insurance. The previous sections of this paper examined the effect of the Affordable Care Act's dependent coverage mandate on self-employment. They assumed that the mechanism was that the ACA increased dependent coverage, which, in turn, increased self-employment. However, the difference-in-difference estimates did not actually incorporate any information on dependent health coverage. This means they suffer from two shortcomings. One is that they did not actually prove a direct link between health insurance and self-employment: they leave open the possibility that there was some other change affecting 19-25 year-olds around September 2010 that was the true cause of their self-employment. By contrast, an instrumental variables approach using the Affordable Care Act dependent coverage mandate as an instrument for health insurance can demonstrate the link directly. The second shortcoming of this paper's previous estimates is the lack of gen-

erality of what they are estimating: the effect of the ACA dependent coverage mandate on self-employment. This is a good question to know the answer to, but in the end it is simply one policy change. It would be better to answer a more general question: what is the effect of acquiring dependent health coverage on self-employment? The instrumental variables approach can answer this question directly in a way that difference-in-difference could not.

The first stage of the the instrumental variables approach is to use the ACA dependent coverage mandate as an instrument for health insurance, as follows:

$$HealthInsurance_i = \beta_0 + \beta_1 * Treated_i + \beta_2 * Controls + Error_i$$

where $Treated_i$ is a dummy that is equal to one for 19-25 year-olds after September 2010 and equal to zero for all others. Ideally, $HealthInsurance_i$ would refer to whether people are covered by their parent's health insurance as a dependent. However, most datasets do not provide this level of specificity. The ACS says only whether an individual has health insurance (and whether it is public or private, and direct-purchase or employer based), not their relationship to the policyholder. The IPUMS compilation of the March CPS is more specific: it says whether an individual has group health insurance as a dependent. In the CPS data, 57% of those 19-25 have private health insurance of some kind, while 27% have coverage as a dependent. I first estimate the effect of having any private health insurance on self-employment using the ACS. The large size of the ACS is beneficial since there are relatively few treated subjects, and instrumental variables estimators are not very efficient. I then use the CPS to find the effect of dependent coverage on self-employment. The ACA dependent coverage mandate is a stronger instrument in the CPS case. Antwi et al. (2012) found that the mandate increased dependent coverage 2-3 times more than it increased total private insurance coverage among 19-25 year olds.

The second stage is as follows:

Table 9: Instrumental Variable Estimates of the Effect of Health Insurance Coverage on Self-Employment

	OLS	Linear Instrumental Variables
$HealthInsurance_i$	-.033***	.0351***
	(.0004)	(.0123)
Observations	1,345,772	1,345,772

Controls include age and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data are from the 2008-2011 IPUMS compilation of the American Community Survey; ACS began asking about insurance in 2008. Data from 26 year olds have been dropped because they can be classified as being in both the treatment and control groups. Data from individuals under age 18 and over age 33 have been dropped because they do not provide a close control for the treated group, individuals age 19-25. Clustered, robust standard errors are given in parentheses.

$$SelfEmployed_i = \beta_0 + \beta_1 * \hat{HealthInsurance_i} + \beta_2 * Controls + Error_i$$

The results of the instrumental variables approach using ACS data are given in the second column of Table 9. The first column shows the results of an OLS regression. It finds a significant negative correlation between health insurance coverage and self-employment. Presumably the causation here is that self-employed people find it hard to get health insurance, rather than health insurance coverage somehow making people not want to start businesses. The instrumental variable results support this idea. They find that health insurance coverage has a significant positive effect on self-employment. Those who acquired health insurance as a result of the mandate were 3.51 percentage points (77%) more likely to be self-employed.

The IV equation is exactly identified. The F-statistic is 245, meaning the coefficients are strongly jointly significant.

The instrumental variables results using CPS data are given in Table 10. The ordinary least squares results find a small positive and significant correlation between dependent health insurance coverage and self-employment. The instrumental variables approach finds a much larger effect: 9.41 percentage points (208%) instead of 1.61 percentage points (36%). This suggests that de-linking health insurance from employment can have

Table 10: Instrumental Variable Estimates of the Effect of Dependent Health Insurance Coverage on Self-Employment

	OLS	Linear Instrumental Variables
$HealthInsurance_i$	.0161***	.0941**
	(.0015)	(.0376)
Observations	166,187	166,187

Controls include age and a time trend along with dummies for race, high school and college completion, marital status, and state fixed effects. Data are from the 2007-2012 IPUMS compilation of the Current Population Survey. Data from 26 year olds have been dropped because they can be classified as being in both the treatment and control groups. Data from individuals under age 18 and over age 33 have been dropped because they do not provide a close control for the treated group, age 19-25. Robust standard errors clustered by household are given in parentheses.

massive effects on the willingness to start a business.

As with the ACS estimates, the system of equations is exactly identified, and an F-test shows the first stage results to be strongly significant.

7. Policy Implications

The preponderance of evidence presented in this work suggests that a statistically and economically significant number of potential entrepreneurs are deterred from self-employment by the current employer-based health insurance system. When 19-25 year-olds gained access to health insurance unrelated to their employment, many chose to start businesses. But most people over age 25 do not get the same opportunity. This means that the health insurance system still discourages many people from starting their own businesses.

This thesis takes no stand on the optimal number of self-employed people. It is possible that there are other distortions in the economy pushing people toward self-employment, such as principal-agent problems and regulations that apply only to large firms, and that these outweigh distortions in the other direction, leaving overall self-employment too high. This would mean that the distortions caused by the health insurance system are actually beneficial. In the absence of other distortions though, the evidence in this paper suggests that the health insurance system leads to too few self-employed Americans. This thesis leaves open the question of the best way to reduce the

distortions of employer-based health insurance, except to say that the ACA dependent coverage mandate did increase self-employment. But there are many other policies that would allow people to find insurance outside of the employer-based system.

One commonly discussed alternative is government provision of insurance. This is already done for the poor (Medicaid) and elderly (Medicare). Fairlie et al. (2011) found that Americans are 13.8% more likely to own a business at age 65 than at age 64, and attributed this difference largely to the fact that Medicare eligibility starts at age 65, allowing people access to health insurance even when they leave their large-company jobs to start a business.

Another alternative is to make individual health insurance competitive with employer health insurance. One step toward this would be to equalize the tax treatment of individual and employer-based plans. Under current law employer-based plans are almost entirely exempt from income taxes, while most individual plans are not. Making individual and small-group plans competitive with large-group plans also means finding ways around the adverse selection problem. The Affordable Care Act of 2010 attempts to solve this problem with an individual mandate (everyone must buy health insurance, even if healthy) and guaranteed issue (insurers must sell policies to everyone, even if sick), which take effect in 2014.

A final alternative solution would be to enact health reforms that reduce the perceived necessity of health insurance. This could mean reductions in total health care spending, or the introduction of policies such as health savings accounts which make it easier to pay out of pocket. Any policy alternative that reduces the importance of employer-based health insurance is likely to increase self-employment, although this should be examined in detail for each proposed policy.

8. Conclusion

This paper's main difference-in-difference specification finds that the Affordable Care Act's dependent coverage mandate led to a 13-24% increase in self-employment among

19-25 year olds. The estimate is robust to the use of several alternative estimators and definitions of self-employment. This result should be interpreted with caution for two reasons. One is that it is not robust to comparing only narrower age groups. The second is that even if this thesis did discover the true effect of extending insurance access for 19-25 year olds, the effect on other age groups may differ. Young adults have unusually low health care and individual health insurance costs, reducing the importance of large-group employer-based health insurance; the employer-based health insurance system is more likely to deter older individuals from starting businesses.

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