Essays on the Medicare Enrollment and Medicare Costs of Older Americans

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Yuanyuan Deng

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Yuanyuan Deng

We, the dissertation committe for the above candidate for the

Doctor of Philosophy degree, hereby recommend

acceptance of this dissertation

Hugo Benitez-Silva - Dissertation Advisor
Associate Professor, Department of Economics

Warren Sanderson
Professor, Department of Economics

Ting Liu
Assistant Professor, Department of Economics

Antony Webb
Director, The New School-Retirement Equity Lab

This dissertation is accepted by the Graduate School

Charles Taber
Dean of the Graduate School

Abstract of the Dissertation

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This dissertation consists of two chapters. The 1999 to 2010 data from the Medicare Current Beneficiary Survey are used in this dissertation. The first chapter empirically analyze the role of labor supply and Medicare secondary payer on Medicare costs, taking into account the recent evolution of labor supply and the implementation of the 1983 Social Security reform. The labor force participation rate of Americans 65 years and older has sharply increased since the mid-1990s. These increases have been accompanied by an increasing number of Older Americans covered by current employer-provided health insurance plans. For those covered workers, Medicare becomes secondary payer of their health expenditures, resulting in lower Medicare costs for the system. The second chapter empirically addresses the evolution of delay enrollments into Medicare, as well as the role of delay enrollment on Medicare costs, taking into account the existence of enrollment penalties and the recent evolution of labor supply among Older Americans. The current penalties might be reconsidered by policy makers, given the fact that with the implementation of the ACA a higher proportion of Americans will reach age 65 with better health coverage and better health investment habits.

To my family and the universe.

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List of Abbreviations

MCBS	Medicare Current Beneficiary Survey
LFPR	Labor force participation rate
EPHI	Employer-provided health insurance
EPCHI	Employer-provided health insurance through current employer
EPRHI	Employer-provided health insurance through former employer
EPUHI	Employer-provided health insurance through other sources
GDP	Gross domestic product
FRA	Full retirement age
DRC	Delayed retirement credits
HI	Health insurance
SSDI	Social Security disability insurance
OA	Old age benefits
IEP	Initial enrollment period
SEP	Special enrollment period

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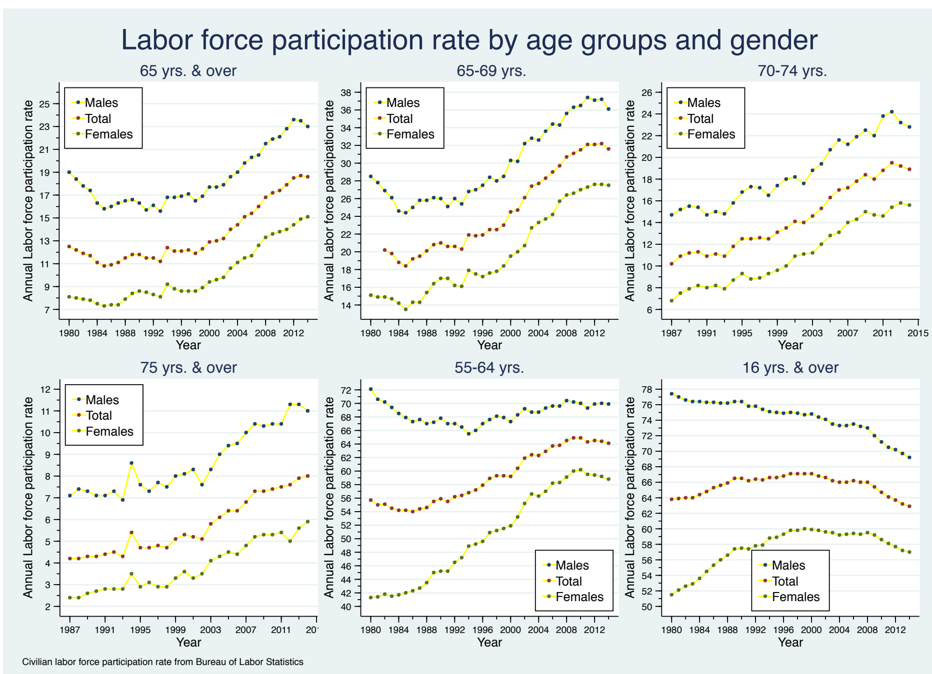
Chapter 1

1 Introduction

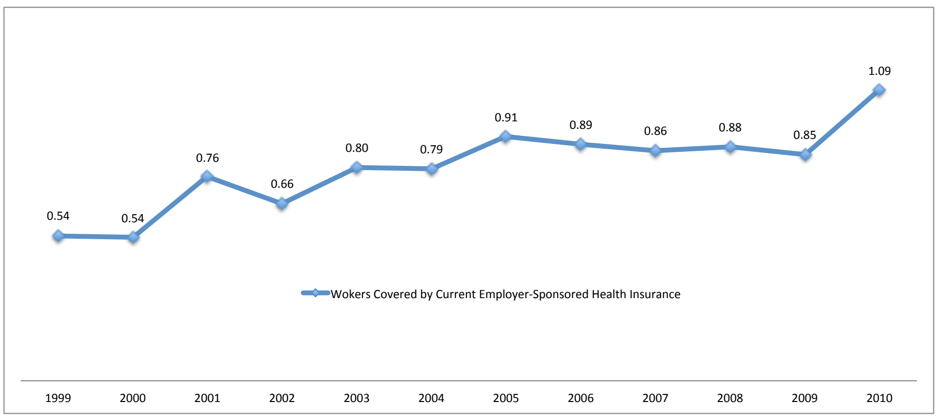
Medicare, which has over 55 million beneficiaries as of May 2015, is one of the largest Federal social insurance program in the United States. The Medicare costs accounted for 3.5% of U.S. gross domestic product (GDP) in 2014 and are projected to reach 5.4% of the GDP by 2035. The evolution of the costs of Medicare is important to the long-term fiscal balance of the Federal government and to the very future of the program.

Figure 1: Civilian Labor Force Participation Rate



The aggregate statistics (see Figure 1) show that the LFPR of those 65 years and older has increased during 1995-2014, from 12% to 19%. Notice in particular that the labor force participation rate (LFPR) among individuals aged 65 to 69 is fairly high – roughly speaking, almost 1 out of 3 males is working. Even for people ages 70 to 74, 1 out of 5 males is still working. However, the LFPR of prime age workers is decreasing. If a large proportion of Older Americans decide to work in jobs covered by employer-provided health insurance (EPHI), and then either decide to enroll in Medicare as their secondary payer or delay their enrollment into the system, the expenditures paid by Medicare will likely be lower on average per individual, as well as in total, than predicted without increases in LFPR. Figure 2 shows the population of workers covered by current employer-provided health insurance (EPCHI), either through their own employers or their spouses employers, which is doubled from 1999 to 2010.[1]

Figure 2: Workers Covered by Current Employer-Sponsored Health Insurance (in millions of individuals)



Source: Author's calculation using Medicare Current Beneficiary Survey.

Meanwhile, a non-trivial proportion of Older Americans delay their Medicare enrollment, which I will discuss in detail in Chapter 2. Those individuals who delayed their Medicare enrollment are actually generating savings to the Medicare system during the years in which they are not enrolled.

Given the linkage between individuals' withdrawal from the labor market, health insurance (HI) coverage, and their Medicare costs, an important question, therefore, is whether the employment and health insurance coverage of Older Americans significantly affect Medicare costs. This question is crucial given that the LFPR is high and the trend is rising, and likely to continue to rise given the increases in the full retirement age (FRA) and the delayed retirement credits (DRC) from Social Security Amendments of 1983,

[1]The percentage of workers covered by EPCHI doesn't follow a particular trend, it varies between 13% to 19% from 1999 to 2010.

the increasing number of Older Americans with increasing balance of debt, as well as other socio-economic or socio-demographic trends. However, there is little research on the Medicare costs response to work for individuals aged 65 and older.

In this chapter I empirically analyze the Medicare costs of individuals aged 65 and older as a function of their health insurance coverage, and labor market attachment using the 1992-2010 waves of the MCBS. In doing so, I am able to quantify the effect of working, and the effect of health insurance coverage of workers on Medicare costs through the secondary versus primary payer effect. I am also able to quantify the companion savings resulting from individuals working beyond age 65 as well as using Medicare as secondary payer.

My econometric results find savings linked to individuals working at around \$4.46 billion per year and the Medicare secondary payer effect at around \$3.86 billion per year from 1999-2010. The average yearly change in Medicare savings from individuals working come from three components: 1) the average yearly increase in populations ages 65 and older accounts for 20.5%; 2) the average yearly increase in the Medicare costs per person per year accounts for around 46.3%; and 3) the remainder, 33.2%, comes from the the average yearly increase in LFPR. In doing so, this research makes two contributions to the literature. First, to my knowledge, it is the first paper to address the relationship between labor supply, employer provided health insurance and Medicare costs. Second, it is the first paper to address the issue of Medicare cost savings due to two aspects: 1) the role of Medicare as secondary payer versus primary payer, which comes into play when individuals are covered by Medicare and current employer-provided health insurance from his own employer or his spouse's employer; and 2) the Medicare cost savings from individuals working. Rather unexpectedly, the focus on Medicare brings positive news to the government, providing cost savings instead of uncontrollable cost increases.

Given these findings, any of the following will affect Medicare costs through the effects I have described in this research: reform of Social Security, health insurance, or tax code; changes in the debt structure of Older American households; and any developments that affect labor force participation and/or health insurance coverage.

The reminder of the paper is organized as follows: Section 2 presents a summary of the related literature; Section 3 discusses the incentives that affect retirement, health insurance choices and Medicare costs; Section 4 provides background in order to explain the connections and interactions between Medicare, the Social Security system, and working decisions; Section 5 describes the data used in the analysis; Section 6 provides the empirical analysis of the determinants of Medicare costs using the MCBS data sets, as well as my main findings; Section 7 shows how I calculate the Medicare savings; and Section 8 provides a final discussion and conclusions.

2 Related Literature

This paper builds on two strands of literature. First, the literature that analyzes Medicare costs, and second, the literature that studies the effects of the changes in the Social Security rules resulting from the Amendments of 1983.

Regarding the former set of efforts, Lubitz et al.(1995) and Miller (2001) examine the relationship between increasing longevity and Medicare expenditures. Lubitz et al.(1995) found that the effect on Medicare spending of increased longevity beyond the age of 65 may not be too large, and the more substantial effect comes from the increase in the absolute number of elderly people. Miller (2001) using a fixed time-until-death model, found that the hypothetical Medicare cost savings due to delay in morbidity, however, are not large enough to offset the Medicare solvency problem caused by population aging. My time controls and age controls try to account for these effects.

Wennberg et al.(2002) and Zuckerman et al.(2010) address the geographical differences in Medicare spending using the MCBS. Wennberg et al.(2002) try to identify the reasons behind the geographic variation in Medicare spending, controlling for health differences and discussing the role of different practice patterns for given illnesses. They find that health differences account for 27% of the variation in Medicare spending across regions. Zuckerman et al.(2010) have similar objectives, and find that the per beneficiary Medicare spending difference between the top and bottom regional quintiles (in terms of Medicare spending) are 52%, in which health status accounting for 29% of this difference. After adjusting for demographic, health characteristics and changes in health status, the geographic variation is reduced to 33%. Given these findings, we include regional controls in my analysis, aggregating States into nine regions.

Link et al.(1980), McCall et al.(1991), Cartwright et al.(1992), Hill et al.(1992), Christensen and Shinogle (1997), Ettner (1997), Hurd and McGarry (1997), Khandker and McCormack (1999) have examined the relationship between Medicare supplemental insurance and Medicare expenditures, these studies are closely related to my paper in terms of focusing the role of health insurance coverage on Medicare costs. A consistent finding across these studies is that supplemental insurance choices are associated with increased Medicare expenditures, although there is no consensus on the causes, as discussed in the excellent review of the literature by Atherly (2001). Some studies point to the role of adverse selection in insurance choices, and others to the moral hazard effect coming from the extra insurance coverage. In my estimation, I include controls for availability of other insurance coverage, and later I will discuss whether my findings are in line with this literature.

None of those papers address the role of labor supply by Older Americans on Medicare costs, and they do not focus on the difference for the system of having Medicare as secondary payer versus Medicare as primary payer, nor on the likely Medicare cost savings from individuals delaying Medicare enrollment.

Second, this paper contributes to the literature on the overall effects of the reforms to the Social Security system. Gustman and Steinmeier (1983) predicted that the increase in FRA and the increase in DRC would reduce the peak in retirement at age 65 and increase LFPR of older individuals aged 65 and older. Benítez et al. (2009) concluded that the increase in the FRA would delay claiming behavior and increase labor supply at older ages. French (2005) used his structurally estimated model to simulate the increase in the FRA and found that individuals would spend three additional months to offset 20% drop in Social Security benefit. Mastrobuoni (2009) using the Current Population Survey (CPS) dataset found workers reacted strongly to the increase in FRA. The affected cohorts increased their labor supply by about half as much as the increase in the FRA, which means two months increase in FRA will result in a one-month increase in retirement age. Pingle(2006) found that each percentage point increase in DRC led to a percentage point increase in the employment rate of men aged 65-70.

Blau and Goodstein (2007) simulate a counterfactual scenario in which the FRA is held constant at 65 for all cohorts, and the DRC is held constant at its 1983 level. Their findings indicate that the effect of increase in the FRA and the increase in DRC is quite sensitive to birth year controls. Without birth year controls, the increased FRA can explain 10%, and the increase in DRC could explain 64% of the observed increase in LFPR at old ages, respectively. But the effect falls to 0% and 10%, accordingly, with two-year birth year effects. Furthermore, using the same synthetic panel data sets, Blau and Goodstein (2010) found the increase in FRA account for between 10.5% and 20.9%, and the increased DRC account for between 15.1% and 28.0% of the increase in LFPR among different birth cohort fixed effects specification. Gustman and Steinmeier (2009), Blau and Goodstein (2010) found that increased FRA, together with the increase in DRC will increase older men's LFPR about 2% to 4% in men aged from 65-67 in Gustman and Steinmeier and about 25% to 50% in Blau and Goodstein.

Mitchell and Phillips (2000), Duggan, Singleton, and Song (2007), and Bound, Stinebrickner, and Waidmann (2009) addressed how the increased in the FRA affects Social Security Disability Insurance (SSDI) applications. All these papers found that it would increase SSDI applications in a range from 0.2 percentage point to 2 percentage point. Benítez-Silva and Yin (2009) found that increased FRA encouraged elderly workers to postpone claiming retirement benefit until they reach the FRA to file. Song and Manchester (2007) found that an increase in the FRA of one year decreases the probability of claiming benefits at age 62 by 8 percentage points. In my research I abstract from the disability program and exclude from my sample those currently on disability or those whose benefits have converted to old-age benefits, but who entered into Medicare through the disability program.

Again, that none of these papers address the effects of the increased FRA and the increase in DRC on Medicare costs.

3 Policies and Incentives that affect Employment, Health Insurance Choices, and Medicare Costs

3.1 Increase in the FRA and the DRC

The FRA is the earliest age at which workers can claim full, unreduced OA Benefits (OA), which are equal to the Primary Insurance Amount (PIA). Under the 1983 Amendments, the FRA was set to gradually increase from 65 to 67 over a 22-year period, which began in 2000 for those retiring at 62. The increase in the FRA affected the cohort born in 1938 and after (see Table 1).

The DRC was first instituted in 1972 to provide a 1% bonus to a person's

Table 1: Increase in Age for Receiving Full Social Security Benefits

Year of Birth	Full Retirement Age
1937 or earlier	65
1938	65 and 2 months
1939	65 and 4 months
1940	65 and 6 months
1941	65 and 8 months
1942	65 and 10 months
1943-1954	66
1955	66 and 2 months
1956	66 and 4 months
1957	66 and 6 months
1958	66 and 8 months
1959	66 and 10 months
1960 and later	67

Source: Social Security Administration

Social Security pension to compensate for each year after the FRA a person delayed receiving benefits, up to age 72. It was increased to 3% a year in the 1977 Amendments. The Social Security Amendments of 1983 phased in an increase in the DRC for those who claim beyond FRA, based on a person's date of birth, and lowered the age at which the increase no longer applied to 70. The increase in the DRC affected cohorts born in 1925 and after, in effect in 1990 when people born in 1925 turned 65 (see Table 2).

As we can see from Table 3, under the increased FRA and DRC, affected cohorts are facing reduction in OA benefits. That is, a cohort born in 1960 or after can only have 86.6% of PIA if they retire at age 65, and they are facing 13.4% reduction of the PIA. The reduction in OA benefits varies across different cohorts.

Because of the reduction in OA benefits, Social Security replacement rates, defined as benefits relative to pre-retirement earnings, are declining.[2] As a result, some other sources of income must rise to offset the lost benefits, which creates an incentive for older people to continue employment.

[2] See Munnell (2003),(2007).

Table 2: Increase for Delayed Retirement Credits

Year of Birth	Monthly Rate of Increase	Yearly Rate of Increase
1924 or earlier	1/4 of 1%	3%
1925-1926	7/24 of 1%	3.5%
1927-1928	1/3 of 1%	4%
1929-1930	3/8 of 1%	4.5%
1931-1932	5/12 of 1%	5%
1933-1934	11/24 of 1%	5.5%
1935-1936	1/2 of 1%	6%
1937-1938	13/24 of 1%	6.5%
1939-1940	7/12 of 1%	7%
1941-1942	5/8 of 1%	7.5%
1943 or later	2/3 of 1%	8%

Source: Pingle(2006), Social Security Administration

Table 3: Percentage of the PIA, by Age at Which Benefits Are Claimed

Birth Year	62	65	66	67	70
1937	80.0	100.0	106.5	113.0	132.5
1943-1954	75.0	93.3	100.0	108.0	132.0
1960 or later	70.0	86.6	93.3	100.0	124.0

Source: Congressional Budget Office

3.2 Older Americans with Increasing Balance of Debt

An increasing number of Americans are entering old age with outstanding debt. The share of adults ages 65 and older with some debt increased from 30 to 43% between 1998-2010.[3] The median value of outstanding debt grew from $13,586 to $21,165 over the same period, an increase of 56%. Furthermore, the overall debt ratio, which is total debt as a percentage of total household assets, doubled from 1998-2010, rising from 6.4% to 13%.

A significant part of that debt is in the form of mortgages, which account for about half the value of all debt held by Older Americans. Another growing component is the student loan, which has grown from about $2.8 billion in 2005 to about $18.2 billion in 2013. Although compared to mortgage debt as well as credit card debt, student loan debt is only carried by a small percentage of Older Americans. But unlike other types of debt, student loan debt generally cannot be discharged in bankruptcy. GAO (2014) shows that

[3]See Karamcheva (2013).

borrowers 65 and older hold defaulted Federal student loans at a much higher rate, which can leave some retirees with income below the poverty threshold. Also, among those 65 and older, the number of individuals whose Social Security benefits were offset grew from about 6,000 to about 36,000 over the same period, roughly a 500% increase.

Under the joint effects of reduced OA benefits, the increase of debt as well as the changing debt structure of Older Americans means they have a strong incentive to continue employment after age 65 in order to meet daily needs.

3.3 Incentives that affect Labor Supply and Health Insurance Choices at Older Ages, and Medicare Costs

The mechanisms through which the increases in participation affect Medicare costs are as follows. The first mechanism is through Medicare becoming secondary payer instead of primary payer of the medical expenditures incurred by an individual. As we can see from Table 4, usually Medicare pays first, the only case Medicare will be secondary payer is when an individual is covered by a group health plan through his current employer or the current employer of a spouse of any age.

If, due to the changes in the Social Security system, increasing debt, or any other socio-demographic or socio-economic factor, affected cohorts decide to work in jobs covered by current employer-provided health insurance (EPCHI) and decide to enroll in Medicare when they reach age 65, Medicare becomes their secondary payer, and the per person as well as total Medicare costs will probably be lower compared with the case in which Medicare was the first payer. Moreover, if an individual covered by EPCHI from their working spouses, then Medicare will also be secondary instead of first payer.

If affected cohorts decide to work in jobs covered by EPCHI, they can decide whether or not to join Medicare at age 65 since they have to pay a premium for Medicare Part B. The second possible mechanism is the so called "crowd out" effect, namely, healthy individuals will delay Medicare enrollment when they reach 65, and Medicare would be left covering a higher percentage of unhealthy individuals, which would drive up the per person Medicare costs but lower total Medicare costs.

Another potential important effect of individuals' working longer on Medi-

Table 4: How Medicare Coordinates with Other Health Insurance

Health Insurance	Pays first	Pays second	Conditions
Medicare Medicaid	Medicare	Medicaid	Only pays after other insurance[4]
Medicare EPCHI[6]	Medicare	EPCHI	less then 20 employees[5]
	EPCHI	Medicare	more than 20 employees
Medicare Former employer provided HI	Medicare	Former employer provided HI	
Medicare VA	Medicare pays for Medicare covered services VA pays for VA covered services	Don't apply	
Medicare TRICARE	Medicare pays for Medicare covered services TRICARE pays for services from a military hospital or any other Federal provider	TRICARE may pay second	

Source: Center for Medicare & Medicaid Services.

[4]Medicaid pays after employer group health plans, and/or Medigap insurance have paid.

[5] If a employer joins with other employers or employee organizations (like unions) to sponsor a group health plan(called a multi-employer plan), and any of the other employers have 20 or more employees, then generally Medicare is a secondary insurance.

[6]Individual or spouse's current employer

Note: Apply to aged individuals covered by health insurance types in MCBS (disabled and/or under 65 years old individuals, as well as other types of health insurance not included in MCBS, please refer to "Medicare and Other Health Benefits: Your Guide to Who Pays First", Center for Medicare & Medicaid Services).

care finances is through the Medicare Tax, which would increase revenue to the Medicare system. When individuals have wages or income covered by Social Security, the Medicare tax rate is 1.45% of all income for both employers and employees; for self-employment, the Medicare tax rate is 2.9% of all income. Starting in 2013, an additional 0.9% Medicare tax was imposed by the ACA on earned individual income of more than $200,000 ($250,000 for married couples filing jointly). Individuals contribute more to Medicare system through payroll tax by working longer. This analysis is beyond the scope of this paper, but will be a part of the future research.

4 The Medicare System

4.1 Medicare

Medicare is the Federal health insurance program established by Congress in 1965 and is financed by payroll taxes on all earned income. It provides health care coverage (health insurance) for people 65 and older, people younger than 65 who have certain disabilities, and people of any age who have permanent kidney failure no matter their income.[7] There were 52.3 million Medicare beneficiaries in 2013, in which 43.5 million are elderly and the rest 8.8 million are non-elderly disabled beneficiaries.

Medicare has four parts: Part A, Part B, Part C and Part D. Part A is hospital insurance, which covers most medically necessary hospital stays, skilled nursing facility stays, and home health and hospice care stays. Part B is Medical Insurance, which covers most medically necessary doctor services and outpatient care. Medicare Part D is Prescription Drug Insurance, which provides outpatient prescription drug coverage. Medicare Part C, the Medicare Advantage plans, is not a separate benefit. Part C is the part of Medicare policy that allows private health insurance companies to provide Medicare benefits.

In this paper, since Medicare Part D became available in 2006, the Medicare costs will also include Part D reimbursement amount since 2006, and I will also account for Medicare Part C when some individuals rely on that kind of coverage. In 2008, nearly half of all Medicare beneficiaries had incomes below twice the Federal Poverty Level (FPL) ($20,800 for an individual and

[7]The latter is also referred to as End-Stage Renal Disease (ESRD), people with ESRD can get Medicare no matter how old they are.

$28,000 for a couple). For those beneficiaries, the OA benefits are the important and main source of income, and therefore more likely to be affected by any changes in the benefit structure of the old-age program.

4.2 Medicare Part A Costs

Individuals with at least 40 quarters (around 10 years) of Medicare covered employment are eligible for Medicare, at no cost for the Hospitalization Insurance component (Part A). People who worked and paid taxes for less time will pay a monthly premium for Part A, and will pay up to $426 (the base premium) in 2014 each month. The monthly amount depends on the number of quarters of Medicare-covered employment the person (or his spouse) has:

1) People with 30 to 39 quarters of Medicare-covered employment paid a monthly premium of $234 in 2014.

2) Those with less than 30 quarters of Medicare-covered employment and who are not eligible for free or reduced Medicare premiums for any other reason paid a monthly premium of $426 in 2014.

Besides the monthly premiums, individuals also face a Medicare Part A deductible and coinsurance costs. An important Part A component is the benefit period, which starts when the beneficiary first enters a hospital and ends when there has been a break of at least 60 consecutive days since inpatient hospital or skilled nursing care was provided. There is no limit to the number of benefit periods covered by Part A during a beneficiary's lifetime; however, inpatient hospital care is normally limited to 90 days during a benefit period, and copayment requirements apply for days 61 through 90. For example, in 2014, the initial deductible for hospital benefits is $1,260, and the daily co-insurance is $0 for the first 60 days, and from the 61^{st} to 90^{th} days, the daily co-insurance is $315. If a beneficiary exhausts the 90 days of inpatient hospital care available in a benefit period, the beneficiary can elect to use days of Medicare coverage from a nonrenewable "lifetime reserve" of up to 60 (over life time) additional days of inpatient hospital care. In 2014, the coinsurance is $630 per each "lifetime reserve day" after day 90 for each benefit period. And individuals will pay all costs beyond lifetime reserve days for each benefit period.

Medicare Part A provides 100% of expenses for the first 20 days of skilled nursing care. The daily co-insurance rate is $157.5 from day 21 to day 100. And there will be no benefits starting the 101st day.

4.3 Medicare Part B Costs

Medicare Part B is the program that covers doctors' services and outpatient care. The standard Medicare Part B premium is determined by a formula contained in the 1997 Balanced Budget Act, which set the premium at 25% of total program costs. The remaining 75% of program costs are financed through general revenues. The Medicare Modernization Act of 2003 requires higher income beneficiaries to pay a higher percentage of program costs, resulting in multiple tiers of premiums based on income, and this started its implementation in 2007.[8] Less than 5% people pay a higher premium.[9] The standard Part B premium was $104.90 each month in 2014. Individuals also faced a $147 Part B deductible in 2014.

Most individuals have the premium for their Part B coverage deducted from their Social Security, Railroad Retirement, or Federal government retirement checks. The Social Security Act stated that if a person is enrolled in both Part B and Social Security, the Part B premium must be deducted from the person's Social Security check. In order to provide a basic level of protection from rapidly accelerating health care costs, a "hold-harmless" provision in the Social Security Act mandates that the Part B premium increase cannot exceed any beneficiaries' cost-of-living adjustment (COLA) in their Social Security check. As a result, the net amount of the individuals Social Security check from one year to another does not decrease.

4.4 Interactions between Medicare, and work decisions

As discussed above, there is a Part A and/or Part B penalty for individuals who delay enrollment in Medicare and do not have EPCHI. For individuals who have EPCHI as their primary insurance, they qualify for the SPE and will not be penalized by a late enrollment fee. So individual's work decision will influence his Medicare enrollment decision as well as his Medicare premium payments

[8] Higher-income beneficiaries pay monthly Part B premiums equals to 35, 50, 65 or 80% of the total cost. See SSA(2011).

[9] The income thresholds used to calculate Part B income-related premiums are frozen at 2010 levels for the 2011 through 2019 period.

5 Data and Summary Statistics

I use the 1992-2010 MCBS Cost and Use research files in the analysis. The MCBS is a nationally representative dataset conducted by the Center for Medicare and Medicaid Services (CMS), which has two modules: MCBS Access to Care and MCBS Costs and Use. MCBS produces data for both cross-sectional and longitudinal analysis. For the purpose of this research, I am using the Cost and Use series.

The Access to Care file contains information on Medicare beneficiaries' access to health care, satisfaction with care, and usual source of care. The Cost and Use research files provides complete expenditure and source of payment data on all health care services, including those not covered by Medicare. It also provide information on individual level premiums, health insurance coverage and usage, Medicare entitlement information, health status and functioning, date of death, Medicare status and Medicare claims for survey participants. Medicare status helps identify whether a Medicare beneficiary is aged or disabled or ESRD.[10] In this research, I will only focus on aged Medicare beneficiaries. Medicare entitlement start-and end-dates help identify when an individual enrolls in Medicare and how long he stays in Medicare. A great advantage of Cost and Use files is that the data match survey-reported events with true Medicare claims. This kind of matching can adjust for underreporting of the use of health care services by survey respondents and to fill gaps and make corrections in the survey expenditure data. Therefore, the MCBS is probably the best source of information on Medicare costs.

Table 5 describes the type of sample restrictions I have put together to obtain the estimation sample. In MCBS, there is only one dummy variable which captures the sample person's working status, value 1 if the sample person is currently working at a job or business and value 0 if not working. This variable is first available in 1999. Given that my goal is to link the labor market attachment, health insurance coverage and the Medicare costs of elderly individuals around retirement age, the full sample used in my analysis is 1999-2010 MCBS Cost and Use Research Files. The total observations in the full sample are 145,578, in which 110,014 are aged Medicare beneficia-

[10]Individuals enrolled in Medicare due to disability or ESRD (all of them coming from the DI program) are of very different ages and with an extremely low attachment to the labor force. Their health expenditures and Medicare costs deserve a separate analysis, and therefore I have excluded them from my sample.

ries. Notice that if a sample person was originally entitled to Medicare due to disability, once they turn 65, they will be coded as aged. In order to solve this issue, I construct the enrollment year and enrollment month variables using the information on individual's date of birth as well as his Medicare entitlement date. The Medicare 7 months initial enrollment period is 3 months before an individual turns 65, the month he turns 65 and 3 months after he turns 65. Sample respondents whose Medicare entitlement age is 64 years and 9 months or later are considered enroll in Medicare because of aging and are kept in the estimation sample.

Table 5: Selection of the Estimation Sample

Row	Description	Number	Percent
1	Total observations: MCBS 1992-2010	233,239	
2	Total observations: MCBS 1999-2010 (referred to as full sample)	145,578	62.4% of row 1
3	Aged Medicare Beneficiaries 65 & up	110,014	75.6% of row 2
4	With non-missing information on key MCBS variables	100,388	91.3% of row 3
5	Observations alive after 6 months being first observed	99,767	99.4% of row 4
6	Exclude those who interviewed in facility	99,097	99.3% of row 5
7	Exclude those who are not working but say they are covered by his EPCHI	97,405	98.3% of row 6
8	(referred to as Estimation Sample)		

Note: Estimated sample are individuals who enroll in Medicare due to aging, have no missing information on working status, no missing information on key MCBS variables, who are alive after 6 months being observed entering the MCBS, and who are not in the group of those not working and report they are covered by health insurance from their current employer.

I lost 8.7% of those observations as a result of as a result of missing information on working status, health related variables, demographic variables, and health insurance indicators, leaving 95,111 cases. 99.4% of these 100,014 observations are alive after 6 months of being first observed.[11] The consideration here is that Medicare spending is highly skewed. Typically, 25% of beneficiaries account for 85% of program spending (CBO, 2005), and individuals usually generating the highest amount of medical expenditure during the last 6 months of their lives.

I exclude individuals who had interviews in facilities.[12] After excluding

[11]If I were to include those individuals, the analysis would be dominated by the determinants of the costs in those last months of life. I will be studying those individuals separately in a companion paper

[12]Those persons are generating high Medicare costs. I will study those people separately

observations who are not working at the time of the interview but covered by health insurance from his current employer, I left with 44,353 sample person, or 97,405 person-year observations.[13]

5.1 Total Health Expenditures and Medicare Costs

The Cost and Use research files provides complete expenditure and source of payment data on all health care services, including those not covered by Medicare. For the purpose of my study, I will focus on the following three types of medical expenditures: total health expenditures of an individual, Medicare costs, and out-of-pocket (OOP) expenditures. Total health expenditures include coverage from 11 potential sources: Medicare fee-for service, Medicare Health Maintenance Organization (HMOs), Medicaid, employer-sponsored private health insurance, individually purchased private health insurance, private insurance managed care, private insurance from unknown sources, the VA and other public insurance, OOP payments, and uncollected liability. Medicare costs equal payments for fee-for-service beneficiaries, annual capitation payments to Medicare Advantage plans and pass-through expenses for inpatient hospital services. OOP expenditures including coinsurance amounts, copayments, deductibles, balance billings, and charges for non-Medicare covered services not paid for by public or private insurance plans. Related Medicare costs information includes: annual Part A premium, annual Part B premium, annual total premiums for all secondary health insurance, annual inpatient coinsurance and annual skilled nursing facility (SNF) coinsurance. I use CPI to adjust all medical expenditures to 2009 dollars.

Table 6: Descriptive Statistics of Estimation Sample from MCBS(1999-2010)

Variables	Female	Male	Total
Premium_A	\$3971.7	\$3920.8	\$3944
	(1987.3)	(1657.3)	(1797.4)
Premium_B	\$997.8	\$1003.1	\$1000
	(234)	(240.5)	(236.8)

Continued on Next Page...

in another paper.

[13]That might be due to being temporarily on leave.

Table 6 – Continued

Variables	Female	Male	Total
Premium_T	$1929	$1787.6	$1869.5
	(1507.9)	(1479.2)	(1497.5)
Coinsurance_INP	$8875.4	$6493.6	$7647.2
	(10615)	(8043.3)	(9419.2)
Coinsurance_SNF	$3026.6	$3146.8	$3066.2
	(2769.5)	(2841.2)	(2792.7)
Medicare Costs	$6862.6	$7443.4	$7098.2
	(14675.0)	(16797.6)	(15573.3)
Medicare Part A	$17901.7	$19289.5	$18488.9
Reimbursement	(21080.3)	(25067)	(22861.6)
Medicare Part B	$3533.4	$3807.1	$3643.8
Reimbursement	(5907.1)	(6433.1)	(6126.2)
Total Health	$10781.9	$11151.7	$10937.1
Expenditures	(17781.7)	(20302.2)	(18881)
Employer Provided HI	$2980.9	$2915.3	$2944.6
Expenditures	(5640.3)	(4311.9)	(4950.6)
Out-of-Pocket	$1876.6	$1781.9	$1836.9
Expenditures	(4208.9)	(3926.4)	(4093.1)
Income of Respondent	$27051.9	$38745.9	$31995.2
	(46272.9)	(76137.8)	(60990.9)
Currently Working	0.114	0.203	0.152
	(0.318)	(0.402)	(0.359)
Cov. by EPCHI	0.032	0.048	0.039
	(0.175)	(0.214)	(0.193)
Workers With EPCHI	0.095	0.168	0.126
	(0.294)	(0.374)	(0.332)

[15] Beginning in 2006, the MCBS has Medicare Part D utilization information. For the calculation of this paper, Medicare Part D reimbursement amount is included in the total Medicare reimbursement from 2006 to 2010 data. The weighted average Part D reimbursement amount is $1882.2, and is $1977.2 for males and $1723.9 for females.

Note: Premium_A = Annual premium for Medicare Part A; Premium_B = Annual premium for Medicare Part B; Premium_T = Annual total health insurance premium for all secondary health insurance; Coinsurance_INP: inpatient coinsurance; Coinsurance_SNF: skilled nursing facility coinsurance. All expenditures and costs are over sample person who have non-zero values. Expenditures and costs are in 2009 dollars. Statistics are calculated using cross-section sample weights. Standard deviations are in parentheses. Number of observations varies by variable and sample.

Table 6 shows the weighted average medical expenditure and premiums. Only individuals who have positive amounts of medical expenditures or premiums are used to calculate the average value in Table 6. In general, males generate higher medical costs then female. Individuals with less than 10 years of Social Security covered employment are the ones paying high annual Medicare Part A premiums.[14] The amount they are paying is $3944 per year, which is more than twice the amount of average OOP expenditures. The weighted population which has positive Part A reimbursement is around 18% of the weighted population which has positive Medicare costs. As a result, the average Part A reimbursement is bigger than the average Medicare costs. There are about 4% of the estimation sample covered by EPCHI, in which 52% covered by EPCHI through own employer and the rest 48% covered by EPCHI through spouses' employer. Among workers, there are about 17% covered by EPCHI.

5.2 Health, Demographic and Employment Variables

The information on employment status in the MCBS is very limited. There is only one variable capturing whether a sample person is currently working for a job or business. In contrast, the MCBS has a rich set of health measures and demographic information. The health measures include self-reported health status, activities of daily living (ADLs), Instrumental Activities of Daily Living(IADLs), cancers, and chronic diseases. The self-reported health status takes values 1 to 5, each value corresponding to excellent, very good, good, fair and poor accordingly. In the MCBS, individuals also provide health information on health transitions by answering question "Compared to one year ago, how would you rate (your/spouse's) health in general now? Would you say (your/spouse's) health is much better now, somewhat better now, about the same, somewhat worse, or much worse now".

Table 7 provides some descriptive statistics for the EPCHI and no EPCHI sample. There are significant differences between the EPCHI and no EPCHI subsamples in gender, age, educational attainment, marital status, working status as well as health status. Age in my estimation is top coded, observations aged 90 and over are coded as age 90.

[14] They are around 0.077% of the weighted population in the estimation sample, which represents around 0.29 million Medicare beneficiaries.

Table 7: Descriptive Statistics of Selected Variables

Variables	By EPCHI Status: No EPCHI	By EPCHI Status: EPCHI	All
Age	75.27	69.80	75.06
	(7.08)	(4.62)	(7.08)
Male	0.42	0.53	0.42
	(0.49)	(0.50)	(0.49)
Married	0.56	0.74	0.56
	(0.50)	(0.44)	(0.50)
Black	0.08	0.08	0.08
	(0.27)	(0.27)	(0.27)
Hispanic	0.02	0.01	0.02
	(0.14)	(0.08)	(0.14)
High School	0.30	0.25	0.30
	(0.46)	(0.43)	(0.46)
Some College	0.25	0.29	0.25
	(0.43)	(0.45)	(0.44)
College	0.11	0.14	0.11
	(0.31)	(0.35)	(0.31)
Excellent Health	0.17	0.26	0.18
	(0.38)	(0.44)	(0.38)
Very Good Health	0.31	0.35	0.31
	(0.46)	(0.48)	(0.46)
Good Health	0.32	0.27	0.32
	(0.47)	(0.45)	(0.47)
Fair Health	0.14	0.09	0.14
	(0.35)	(0.29)	(0.35)
Currently Working	0.13	0.66	0.15
	(0.337)	(0.473)	(0.358)

Note: Statistics are calculated using cross-section sample weights. Standard deviations are in parentheses. Number of observations varies by variable and sample.

5.3 Health Insurance

Due to the nature of the MCBS, individuals in the sample have at least Medicare coverage. Moreover, individuals could have one or more health insurance coverages other than Medicare. I first classify individuals into two mutually exclusive health insurance categories: those who have EPHI regardless of other health insurance coverage, and those who don't have any source of EPHI. There are 38.8% (weighted) of the sample persons have EPHI. I then further classify individuals who have EPHI into one of the following three mutually exclusive categories according to the source of EPHI: EPCHI, retiree HI (EPRHI), and other employer-provided health insurance (EPUHI).[15] Among EPCHI, I further categorize individuals according to whether they get employer-provided health insurance through themselves or through their spouses. Cases with multiple sources of insurance are assigned to categories in the order shown in Table 8. For example, a respondent who is covered by EPCHI and EPRHI is assigned to EPCHI.

Then the individuals without EPHI are classified into the following mutually exclusive health insurance categories: Original Medicare only, Medicare HMOs, private HMOs, Medigap, Medicaid, and other public health insurance such as Tricare and VA. Cases with multiple sources of insurance are assigned to categories in the order shown in Table 8, except for Original Medicare. For example, a person with both Medigap and Medicaid is assigned to Medigap.

Table 8 shows the weighted mutual exclusive health insurance categories used in this paper. The total weighted average estimation sample in a given year is around 31.03 million. Among the 31.03 million population, there are about 3.9% of the estimation sample have EPCHI coverage, corresponding to 1.2 million individuals every year from 1999 to 2010. There are 5.8% of the estimation sample only have original Medicare coverage in a given year.

[15]EPCHI: refers to main insured person's (MIP) current employment and union based health insurance, or from family business; EPRHI: refers to MIP's prior employer, deceased spouse's union or deceased spouse's employer; EPUHI: refers to AARP, fraternal/professional organization.

Table 8: Mutual Exclusive Health Insurance Categories

Variable	Percent	Freq.	Definition
EPHI	38.8%	12.00	Any employer-sponsored HI
EPCHI_r	2.0	0.62	Own current employer
EPCHI_s	1.9	0.58	Spouse current employer
EPRHI	31.6	9.79	Former employer
EPUHI	3.3	1.01	EPHI through other sources
No EPHI	61.2%	19.03	Without any EPHI coverage
Original Medicare	5.8	1.81	**only** coverd by Original Medicare
Medicare HMOs	19.3	5.99	Medicare HMOs and/or other HI
Private HMOs	5.3	1.66	Private HMOs
Medigap	23.0	7.16	Medicare and Medigap
Medicaid	6.9	2.13	Medicare and Medicaid
Other Public	0.9	0.28	Other public health insurance
Total	100%	31.03	

Note: Frequency are in millions of individuals. Statistics are calculated using cross-section sample weights. Number of observations varies by variable and sample.

Table 9 presents additional evidence that both working and health insurance are correlated with Medicare costs. Table 9 summarizes Medicare costs, total health expenditures, as well as OOP expenditures, by working status, EPCHI status, also conditional on age and health status. The full estimation sample is divided into 4 subgroups: (working, no EPCHI), (working, EPCHI), (not working, no EPCHI), (not working, EPCHI). Three aspects require attention. 1) Workers with EPCHI generate less cost to the Medicare system compared with workers without EPCHI. For individuals 65 to 69 years old, and in good health, the weighted average Medicare costs is$3837.7 for workers with EPCHI and $3225.9 for non-workers with EPCHI, a difference of $611.8. The $611.8 is mainly the effect of working on Medicare costs. If I take into account of the effect of EPCHI on Medicare costs, then the differences is increased to $2,158.8 ($3837.7-$1678.9), so the pure health insurance effect on total Medicare costs would be $1547. The effect of EPCHI is more than twice the effect of working on Medicare costs. These differences are larger for individuals who are in bad health. 2) Workers covered by EPCHI generate less Medicare cost, but they have higher total health expenditures as well as OOP expenditures regardless of health status. This suggests that workers covered by EPCHI are not necessarily low medical costs generators. It is the result of Medicare appearing only as secondary payer. 3) For individuals covered by EPCHI, EPCHI is the primary payer, we can see this kinds of primary effect in Table 9 as well. The average employer-sponsored health insurance costs are higher for those who have EPCHI, expect for those who are in good health and covered by EPCHI through their spouses, they have slightly lower employer-sponsored HI costs then those who are in good health and not working.

Table 9: Medical Expenditures, by Health Insurance and Working Status

	Not Working		Working	
	No EPCHI	EPCHI	No EPCHI	EPCHI
Medicare Costs				
Age = 65 $\sim$ 69, Good Health				
Mean	\$3811.2	\$3278.7	\$3195.6	\$1711.5
Standard Deviation	\$9511.6	\$10517.2	\$7285.6	\$6195.0
Age = 65 $\sim$ 69, Bad Health				
Mean	\$12643.9	\$10340.4	\$8310.1	\$2677.6
Standard Deviation	\$26344.4	\$36418.5	\$18796.5	\$3009.0
Employer-Sponsored HI Costs				
Age = 65 $\sim$ 69, Good Health				
Mean	\$2200.1	\$2128.0	\$2116.3	\$2427.8
Standard Deviation	\$3840.5	\$5175.0	\$3221.4	\$5067.6
Age = 65 $\sim$ 69, Bad Health				
Mean	\$4821.2	\$4938.2	\$4238.7	\$5626.5
Standard Deviation	\$13069.6	\$9265.3	\$7302.3	\$24048.7
Total Health Expenditures				
Age = 65 $\sim$ 69, Good Health				
Mean	\$6774.5	\$6200.3	\$5501.4	\$5765.1
Standard Deviation	\$12135.6	\$11656.9	\$8761.9	\$10607.9
Age = 65 $\sim$ 69, Bad Health				
Mean	\$17550.2	\$15958.7	\$11109.9	\$12483.5
Standard Deviation	\$37191.6	\$38065.4	\$20896.0	\$33020.3

Out-of-Pocket Expenditures				
Age = 65 ∼ 69, Good Health				
Mean	\$1458.6	\$1147.8	\$1323.5	\$1445.1
Standard Deviation	\$3078.8	\$1593.4	\$2114.8	\$2121.8
Age = 65 ∼ 69, Bad Health				
Mean	\$1983.0	\$1782.7	\$2115.7	\$2860.4
Standard Deviation	\$3687.6	\$2622.4	\$5122.2	\$10021.5

Note: All expenditures are in 2009 dollar. Weighted average medical expenditure are over full estimation sample.

6 Health Insurance and Medicare Costs: An Empirical Analysis

6.1 Empirical Challenges and Model Specifications

The estimation of Medicare costs brings two important challenges which need to be take into account to consistently estimate the role of work and health insurance on this process. The first is that there is a potential selection problem given a large number of observations in my sample have Medicare costs equal to zero. As we can see in Table 10, almost the whole estimation sample have positive total personal expenditure as well as OOP costs, but it doesn't mean that they all generate costs to the government; the weighted proportion of the population who has zero Medicare costs is almost 19%.

Table 10: Percentage of Population Who Has Positive Medical Expenditures

	Obs.	Percent
Total Medicare Costs	80,552	81.1%
Total Health Expenditures	95,701	97.9%
Out-of-Pocket Expenditures	94.587	96.8%
Estimation Sample	97,405	

Note: Statistics are calculated using cross-section sample weights. Number of observations varies by variable and sample.

Given the nature of our claims data, the zero Medicare costs are true zeros. Those true zeros either come from some individuals not generating any expenditure in any given year, or from a situation in which they generate health expenditures but other health insurance(s), other than Medicare, paid for them.[16] Given the information in Table 10, we know that among the 18.9% individuals who have zero Medicare costs, 2.1% of them are not generating any expenditure in any given year because they also have zero total personal health costs.

The true zero Medicare costs is not a direct choice of individuals, in other word, individuals can not choose to have zero Medicare costs. But it can be a product of individual's other choices. Those individual choices include work decision and health insurance coverage decision. If individuals self-select into certain jobs with certain EPCHI coverage, then Medicare becomes secondary payer. Under the regulations of multiple payers, the government might end up paying nothing for them in a given year.

It could be a problem that the people who have zero Medicare costs are not a random sample of the population, and there is a potential correlation between the choices that lead to zero Medicare costs and the level of the costs. As a result, we need to take into account of the potential selection problem.

The second issue is the possible endogeneity of the working indicator: workers are very different from non-workers, and workers are not randomly selected into working nor do they randomly decide to keep working after age 65. Individual characteristics induce individuals' labor decision after 65. If some of these characteristics are unobserved, for example, income shocks, labor-income shocks or health insurance benefits shocks, etc., and these are correlated with the $Work$ indicator, then the estimated coefficient β_w will be biased.

In order to estimate how insurance plans affect medical expenditures, several models have been proposed and used in the literature. Ordinary Least Squares (OLS) estimation is simple and easy to interpret but can be problematic to use when the data contains a relatively large number of zeros. The Two-Part model (TPM) (Duan et al.(1983), Dow and Norton(2003), Albouy et al. (2010)), has all the advantages of the OLS while still acknowledging that the zeros are not the product of choice but are actual absence of expenditures, there is also no correction for the possible correlation between the probability of having zero Medicare costs and the level of the costs. TPM is

[16] It is important to mention that Medicare costs are highly left skewed, so typically, 25% of beneficiaries account for 85% of program spending (CBO, 2005).

the most widely used when analyzing Medicare costs, and in particular using the MCBS data sets (Khandker and McCormack(1999), Atherly(2002)). The Heckman's sample selection model (following Heckman (1979), presented by Dow and Norton (2003), Chaze (2005), Albouy et al. (2010)) has also been proposed. Different from the Two-Part model, in which no correlation between the first and second stage, the Heckman's sample selection model allows the censoring function and the uncensored expenditure function to have different coefficients and allows correlated unobservables across the two processes.

The panel data specification and Instrumental Variable (IV) specification help directly address the possible endogeneity issue. The panel component of MCBS (4 years, at most) allows me to deal with endogeneity by including individual fixed effects to control for any fixed, time invariant, individual unobserved factor. For IV estimation, finding robust and exogenous exclusion restrictions is crucial. These exclusion restrictions should be correlated with individuals' working decision, the $Work$ dummy, such as DRC, FRA and marital status, and should not be correlated with the error term in the Medicare cost equation.

To check the robustness and exogeneity of the exclusion restrictions, I can first rely on the F-score from the first stage of the IV specification. The rule of thumb is that the F-score has to be greater than 10 to consider an exclusion restriction as non-weak. Then I can use the J-test of overidentification restrictions. There is no such test in IV that can tell whether an instrument is exogenous or not if I have a just-identified model. But if I have more exclusion restrictions than endogenous variables, then I can use this test, and if the p-value is less than the significant level, then I reject the null hypothesis under the J-test, and then I know that at least there is one exclusion restriction that is not valid.

Given all these considerations, I use Heckman's sample selection model in the regression analysis. The Heckman's sample selection model will be my preferred model specification because the Inverse Mill's ratio from the Heckman's sample selection model is significant.

In the Heckman's sample selection model, there are two separate equations - first, an equation that estimates the probability to have positive health expenditures $\Pr(Y_{it} \succ 0)$, and second, a specification that estimates the level of expenditures, conditional on those being positive $E(\ln Y_{it}|Y_{it} \succ 0)$. Usually, the first equation will use a probit specification to estimate the dichotomous event of having zero or positive expenses (although it could also be a logit), and where the second equation is a linear model on the log scale for positive expenditures.

I investigate the effect of health insurance coverage and working decisions on individuals' total health expenditures, Medicare costs, and OOP expenditures by running the following Heckman selection specifications. Equation (1) is used in the first stage of Heckman's sample selection model, and equation (2) is used in the second stage:

$$\Pr(y_{it} = 1|\mathbf{x}_{it}) = \Phi(\mathbf{x}_{it}\delta_2) \tag{1}$$

$$\begin{aligned} \ln(Y_{it}|Y_{it} \succ 0) = \beta_0 + \beta_w W_{it} + \beta_{cr} EPCHI_{it} \\ +\beta_{hi}\mathbf{HI}_{it} + \beta_h \mathbf{H}_{it} + \beta_x \mathbf{X}_{it} + \beta_y \mathbf{T}_t + \varepsilon_{it} \end{aligned} \tag{2}$$

where y_{it} is a dummy equals to 1 when medical expenditure is greater than 0. $\mathbf{x}_{it}$ is a vector of regressors, including working dummy, health insurance coverage dummies, health controls, demographic controls, as well as $\mathbf{DRC}_i$ dummies.

In this specification, $\mathbf{DRC}_i$ dummies are used as an exclusion restriction which only appears in the first stage of the Heckman's sample selection model to add non-parametric identification to the model. I construct $\mathbf{DRC}_i$ dummy variables indicating the effects of DRC and/or FRA for each respondent in the sample according to their birth year, DRC and FRA rules (Table 1, Table 2). Cohorts born in 1925 and 1937 are only affected by DRC, and $DRC3.5$ is a dummy indicating cohorts born in 1925 to 1926 and with 3.5% DRC. Cohorts born in 1938 and after are affected by both DRC and FRA. $DRC6.5\_FRA2$ is a dummy indicating a cohort born in 1938 with 6.5% DRC and FRA of 65 and 2 months. Similarly, $DRC7.0\_FRA4$ represents cohorts born in 1939 with 7% DRC and FRA of 65 and 4 months. Due to data limitation, the youngest cohorts I am able to observe in MCBS is cohorts born in 1945, with DRC of 8% and FRA of 66.

I obtain the probit estimate $\overset{\wedge}{\delta_2}$ from the equation (1) using the full estimation sample. Then, obtain the estimated inverse Mills ratio $\overset{\wedge}{\lambda_{it}} = \lambda(\mathbf{x}_{it}\overset{\wedge}{\delta_2})$.

In equation (2), Y_{it} is one of the outcomes of interest (e.g., individual Medicare costs, individual total health expenditures, and individual OOP expenditures) for individual i in year t, while the dependent variables lnY_{it} is the natural logarithm of one of the outcomes of interest for individual i in year t. The explanatory variables in equation (2) are the same as in equation (1), the only difference is $\mathbf{DRC}_i$ dummies only appear in equation

(1). W_{it} is a dummy variable that represents those who are working but without EPCHI coverage (currently working at a job and without EPCHI=1), which captures the pure effect of working. $EPCHI$,[17] which refers to an individual who is covered by current employer, refer to his own employer or his spouse's employer,[18] provided health insurance plan at time t regardless of his own working condition. $EPCHI$ captures the effect of Medicare as secondary payer.[19] $\mathbf{HI}_{it}$ is a list of dummy variables that capture individuals' HI coverage besides EPCHI, which include EPRHI, EPUHI, Medicare HMOs, private HMOs, Medigap, Medicaid as well as other public health insurance programs. $\mathbf{H}_{it}$ is a list of health controls.[20] $\mathbf{X}_{it}$ is a list of demographic controls–e.g., gender, race, individual level income, marital status, education, census regions, age, age square, number of kids, $\mathbf{T}_t$ are year dummies, and ε_{it} is an unobservable component.

Given this set of variables, the base group in the estimation include those who are not working, who only have Original Medicare coverage (either Part A, Part B or both), whose census region is north east, whose annual household income is less than $5,000 (in 2009 dollar), who never married, who are white, and with high school degree, and whose health status is excellent or very good.

[17]In MCBS, when individuals are covered by EPCHI, then a follow up question will ask which industry they are working for. I can imagine a situation in which maybe the choice of industry by individuals could be correlated with unobservables, which leads to lower Medicare costs. If the measure of industry is correlated with work in an insured job, the result could be a biased coefficient on the insurance indicator. But in the estimation of the expanded model, with industry controls, the coefficients of $EPCHI$ become even more negative and statistically significant. So my original specification remains a lower bound on the true effect, and the role of EPCHI seems to not be affected by the inclusion of the industry measures. Given that industry indicators are only available in a few years of the estimation data, I am not including them in my preferred specifications.

[18]Very few people get from father, mother or other people.

[19]There are weighted 1.14% observations in estimation sample who have health insurance coverage through spouse's current employer. 34.2% of those are working and the rest 55.8% are not working.

[20]Follow Fang et al. (2008) and include health reported health status; ever smoker; current smoker; diagnoses of arthritis, high blood pressure, diabetes, cancer, lung disease, heart attack, chronic heart problems, stroke, psychiatric illness, Alzheimer's disease, broken hip; treatment of cataract surgery or a hearing aid; I also include ADLs and IADLs.

6.2 Results from Heckman's Sample Selection Model

Table 11 and Table 12 present the results using the Heckman's sample selection model for Medicare costs (column 1), total health expenditures (column 2), and OOP expenditures (column 3).[21] Table 11 shows the marginal effects from the first stage of Heckman's sample selection model. Table 12 shows the results of the second stage of Heckman's sample selection model, which is equivalent to running OLS on the set of individuals with positive expenditures. The Inverse Mill's ratio is significant and negative across board, suggesting that the Sample Selection model is appropriate and the error terms in the selection and primary equations are negatively correlated. Year dummies are positive and significantly correlated with Medicare costs in both first and second stage of Heckman sample selection model. Year dummies are positive and significantly correlated with total person health expenditures, and negative and significantly correlated with OOP in the second stage.

Table 11: The Effects of Working and HI coverage on the Probability of Observing Positive Medical Spending Costs

Variables	Medicare Costs (1)	Total Health Exp. (2)	Out-of-Pocket Exp. (3)
Work	-0.044***	0.002	0
	(0.004)	(0.002)	(0.002)
EPCHI	-0.067***	0.026***	0.034***
	(0.009)	(0.003)	(0.004)
EPRHI	0.156***	0.035***	0.043***
	(0.006)	(0.002)	(0.003)
EPUHI	0.101***	0.035***	0.042***
	(0.012)	(0.004)	(0.006)
HMO	-0.112***	0.027***	0.033***
	(0.006)	(0.002)	(0.003)

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[21] I run the Heckman's sample selection model for subsample of individuals who have Part A only, and a subsample of individuals who have both Part A and Part B. Individuals with Part B only are only .09% of the estimation sample and are not addressed separately. Only 5% of observations have positive Medicare Part A costs among those who have only Part A coverage. The results for individuals with both Part A and Part B are not very different from the results in Table 11 and Table 12.

Table 11 – Continued

Variables	Medicare Costs (1)	Total Health Exp. (2)	Out-of-Pocket Exp. (3)
PriHMO	0.035***	0.029***	0.032***
	(0.008)	(0.003)	(0.004)
Medigap	0.236***	0.030***	0.035***
	(0.007)	(0.002)	(0.003)
Medicaid	0.183***	0.019***	-0.005*
	(0.009)	(0.002)	(0.003)
Other_HI	0.160***	0.026***	0.035***
	(0.015)	(0.006)	(0.007)
Age	0.052***	0.012***	0.014***
	(0.008)	(0.003)	(0.003)
Age^2	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Year Dummies	Yes	No	No
Observations	96,980	96,980	96,980

Notes: All regressions also contain gender, income dummies, health controls, race, education, marital status, census region dummies, **DRC** dummies not reported. Robust Standard errors are in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

Due to the emphasis of this paper, and the way I constructed the mutual exclusive health insurance categories, only sample person who have EPHI coverage could have positive employer sponsored health insurance payments. As a results, all non-EPHI covered individuals are having zero employer sponsored health insurance payments, including those in the base group. There is not much to explore in terms of the role of health insurance coverages on employer sponsored health insurance payments compared with Medicare, total personal as well as OOP expenditures.

Table 12: The Effects of Working and HI Coverage on the Level of Medical Spending

Variables	Medicare Costs (1)	Total Health Exp. (2)	Out-of-Pocket Exp. (3)
Work	-0.146***	-0.095***	-0.002
	(0.02)	(0.022)	(0.013)
EPCHI	-0.236***	0.243***	-0.415***
	(0.045)	(0.05)	(0.029)
EPRHI	0.435***	0.388***	-0.439***
	(0.031)	(0.035)	(0.02)
EPUHI	0.326***	0.386***	-0.521***
	(0.041)	(0.051)	(0.029)
HMO	-0.481***	-0.131***	-0.636***
	(0.032)	(0.035)	(0.02)
PriHMO	0.322***	0.231***	-0.488***
	(0.037)	(0.044)	(0.025)
Medigap	0.608***	0.363***	-0.170***
	(0.033)	(0.035)	(0.02)
Medicaid	0.638***	0.323***	-1.336***
	(0.036)	(0.041)	(0.023)
Other_HI	0.484***	0.322***	-0.073
	(0.061)	(0.074)	(0.042)
Age	0.309***	0.254***	0.201***
	(0.019)	(0.022)	(0.013)
Age^2	-0.002***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
lambda	0.120*	-2.007***	-0.693***
	(0.053)	(0.134)	(0.074)
Year Dummies	Yes	Yes	Yes
Obs.	80,208	95,288	94,186

Notes: All regressions also contain gender, income dummies, health controls, race, education, marital status, census region dummies not reported. Robust Standard errors are in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

6.2.1 The Role of Working

As we can see from Table 11, $Work$ dummy is negative and significantly correlated with Medicare costs, showing that working will lower the probability of having positive Medicare expenditures. Conditional on having positive Medicare costs, as we can see from Table 12, workers generate 14.6% less Medicare costs compared with non workers, regardless of health insurance coverage. Since I conditional on health measure as well as other demographic measures, the possible explanations for workers generate less cost mainly come the opportunity costs. Workers have less time and less availability to go to Medicare services compared with non-workers, so workers tend to have less Medicare usage compared with non-working individuals, resulting in less per person Medicare cost on average. But the $Work$ dummy is also negative and significantly correlated with total health care expenditures, suggesting the possible endogeneity issue. I will discuss this further in section 7.2.

6.2.2 Medicare as Secondary Payer versus Primary Payer

Given the definitions of the variables discussed in the previous subsection, Medicare will be secondary payer only when the individual is covered through his current employer or the current employer of a spouse of any age. This is captured by the variables $EPCHI$.[22] The sign of $EPCHI$ is negative and significantly correlated with Medicare costs, compared with the case in which Medicare is the primary payer, including retiree HI or union or other health insurance, then the sign is positive and is also significantly correlated with Medicare. This supports the idea that Medicare as secondary or primary payer matters to Medicare costs. On average, individuals with Medicare as s secondary payer generate 23.6% less Medicare costs compared with individuals with Medicare as primary payer.

However, regardless whether Medicare is secondary or primary payer, all health insurance regressors are positive and significantly correlated to total health expenditures, except for those who covered by Medicare HMOs. This

[22] $EPCHI$ is the sum of two dummies: $EPCHI\_R$ and $EPCHI\_S$. $EPCHI\_R$ captures those who work and have EPCHI through their own employer; $EPCHI\_S$ captures those who have EPCHI through their spouses employer,regardless of their own working status. $EPCHI\_R$ is a mix of working and health insurance effect, while $EPCHI\_S$ captures the pure health insurance effect. The reason that I put them together is I want to capture the effects of Medicare as secondary.

suggests that those covered by EPCHI are generating less to the Medicare system, but it is not necessarily true that their total health expenditures are lower. It is the matter who pays the bills, and the burden of Medicare system is lower for this group and carried mostly by the private sector, and other government health insurance programs in some cases.

6.2.3 Out-of-Pocket Minimizers

When estimating the specification that has out-of-pocket expenditures as the dependent variable, we can observe that health insurance dummies are negatively and significantly correlated with this type of expenditure. Especially for those who are Medicaid and Medicare dual eligible beneficiaries, the coefficient lowers the OOP the most. Since Medicaid enrollees are low-income person. This suggests that no matter what health insurance coverage individuals chose to enroll in, they are trying to minimize their out-of-pocket expenditures, which is what I would expect since it is what really matters to individuals.

6.2.4 About Medicare HMOs

From Table 11, we can see that individuals who choose to enroll in Medicare HMOs instead of the Original Medicare will lower the probability of having positive Medicare costs. From Table 12, individuals who choose to enroll in Medicare HMOs are having lower Medicare as well as total personal health expenditure. In this paper, Medicare HMOs including individuals who have Medicare HMOs coverage and/or have access to one of the following health insurance coverages: Medicaid or other public health insurance besides Medicare HMOs.

The Original Medicare is the traditional fee-for-service program offered directly through the Federal government, which pays directly for the health care services you receive. In contrast, Medicare HMO plans are paid a fixed amount to provide Medicare benefits. With the Original Medicare, individuals generally pay 20% coinsurance for doctors' visits and other medical services, and enrollees can purchase a Medigap plan that supplements the costs of Original Medicare benefits. Medicare HMO enrollees can't use and can't be sold a Medigap plan.[23] They usually pay a fixed amount for services (copayment) and HMO copays cannot be higher than Original Medicare for

[23]See CMS(2015).

some services, like chemotherapy, dialysis and durable medical equipment, But it could be higher for other services, such as home health and hospital. Also, unlike Original Medicare, HMOs must have a cap on out-of-pocket costs to protect enrollees against very high costs if they receive expensive care.[24] In terms of coverage, most Medicare Advantage plans include prescription drug coverage (MA-PDs), while for Original Medicare, Part D is not included. HMOs usually only cover care from doctors and hospitals in their network, except in the case of emergency or urgent care, and it usually requires enrollees to receive a referral from their primary care physician before they can get care from a specialist. Original Medicare will cover care from most doctors and hospitals in the country and don't require a referral. In terms of premiums, on top of Part B premiums, individual with Original Medicare plus Medigap as well as Part D coverage pay an average Medigap monthly premiums is \$183, and the Part D base beneficiary premium is \$31.94. The premium for MA-PDs through HMOs is only \$40.11 per month.[25]

If an individual is generally healthy and only sees doctors and other providers in the HMO's network, his out-of-pocket costs may be lower than in Original Medicare. Those Medicare HMOs enrollees are having lower Medicare as well as total personal expenditures compared with Original Medicare enrollees is due to the differences in policy regulations and to the fact that those in HMOs are generally healthy individuals that minimize their OOP. Notice the negative and significant effect of Medicare HMOs on out-of-pocket expenditures. These results are interesting on their own, and I interpret them as showing that individuals are navigating quite impressively the maze of choices and programs available to them, with an implied considerable effort of analysis to choose plans according to their needs.

7 Medicare savings

7.1 Results from Heckman's Sample Selection Model

As presented in Table 12, in which the coefficients on the $Work$ dummy as well as variables indicating whether individuals are covered with employer-provided health insurance through their own work or their spouses ($EPCHI$), are negative and statistically significant in the estimation of Medicare costs.

[24]The maximum out-of-pocket cost for most HMOs in 2015 is \$6,700.

[25]See Kaiser (2013) (2015), CMS(2009)

Given those results, I can quantify the yearly Medicare savings resulting from the fact that workers generate less cost to the Medicare system compared with non workers, as well as the fact that Medicare is a secondary payer for individuals covered by those types of insurance. Since each of the model specifications discussed above addressed different aspects of the two main challenges in a different way, I will report the results of each specification and give a range of Medicare cost savings later in this section. The preferred model specification will still be the Heckman's sample selection model, given that the Inverse Mill's Ratio is significant. I will compare the results from the Heckman's sample selection model to the Two Part Model, the IV specification, and the OLS specification as well as the Random Effects probit model with the Fixed Effect model in the second stage. The savings linked to both effects come from two sources. First, working and Medicare as secondary payer respectively decrease the probability of a positive Medicare cost in the first stage of the sample selection specification. Second, for those with a positive amount of Medicare costs, I observe a decline in the average expenditures due to working or due to Medicare being secondary payer.

In order to accomplish this I first estimate the following Heckman's sample selection model in which I do not include individuals' health insurance coverage besides EPCHI. Variable $EPCHI_{it}$ is the only health insurance dummy in this regression, which is a dummy that takes the value one when the individual has an alternative primary payer of health expenditures from either source. As a result, the $\mathbf{HI}_{it}$ included in equation (2) are excluded from equation (4):

$$\Pr(y_{it} = 1|\mathbf{x}_{it}) = \Phi(\mathbf{x}_{it}\delta_2) \tag{3}$$

$$\ln(Y_{it}|Y_{it} \succ 0) = \beta_0 + \beta_w W_{it} + \beta_c EPCHI_{it} + \beta_h \mathbf{H}_{it} + \beta_x \mathbf{X}_{it} + \beta_y \mathbf{T}_t + \varepsilon_{it} \tag{4}$$

Table 13: The Effects of Working and HI Coverage on Medicare Cost Savings

	First Stage			Second Stage		
Variables	Medicare	Total	OOP	Medicare	Total	OOP
Work	-0.059***	0.001	0	-0.148***	-0.123***	0.039**
	(0.005)	(0.002)	(0.002)	(0.021)	(0.024)	(0.013)
EPCHI	-0.183***	0	0.004	-0.547***	-0.026	0.014

Continued on Next Page…

Table 13 – Continued

	First Stage			Second Stage		
Variables	Medicare	Total	OOP	Medicare	Total	OOP
	(0.008)	(0.003)	(0.004)	(0.047)	(0.042)	(0.023)
Age	0.056***	0.013***	0.013***	0.299***	0.245***	0.183***
	(0.008)	(0.003)	(0.003)	(0.02)	(0.024)	(0.013)
Age^2	-0.000***	-0.000***	-0.000***	-0.002***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lambda				0.621*	-2.148***	-0.635***
				(0.12)	(0.152)	(0.084)
Year Dummies	Yes	No	No	Yes	Yes	Yes
Obs.	96,980	96,980	96,980	80,208	95,288	94,186

Notes: All regressions also contain gender, income dummies, health controls, race, education, marital status, census region dummies not reported. **DRC** dummies only appear in the first stage not reported. Robust Standard errors in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

Table 13 shows the marginal effects from the first stage of the Heckman's sample selection model, the probit specification as well as the results from the second stage. Again, the Inverse Mill's ratio is negative and significant. From the marginal effects of $Work$, and $EPCHI$, as well as the predicted weighted average probability of having positive Medicare costs, which is 81%, I find that the Working variable decreases the average probability of observing a positive Medicare costs by around 7.3% (5.9% divided by 81%), while the $EPCHI$ variable decreases the average probability of observing a positive Medicare costs by around 22.6% (18.3% divided by 81%). From the results of the second stage, the coefficients of $Work$ and $EPCHI$ are also negative and statistically significant correlated with the level Medicare costs. I find that workers without EPCHI spend 14.8% less than non-workers without EPCHI, on average. Those who are covered by EPCHI and therefore have Medicare as secondary payer spend on average 54.7% less compared with those with Medicare as primary payer.

7.2 Medicare Savings from Primary versus Secondary Payer & Individual Working

In order to go from these results to a dollar effect, I compute the average Medicare costs per year in the estimation sample for those with positive Medicare costs, and that is $7,098.[26] Therefore, on average, workers without EPCHI generate $1,050.5 less cost than non-workers without EPCHI per person per year. Those with Medicare as secondary payer spend $3,882.6 less per year per person. Moreover, the Inverse Mill's Ratio from the second stage of the Heckman's sample selection model is negative and significant across the board. This indicates the appropriateness of the sample selection correction strategy. The results from the Heckman's sample selection model suggest that certain individuals select into working and/or different HI coverage, and through the process of medical reimbursement, they generate Medicare costs.

The second step in order to compute the total Medicare savings from the fact that workers without EPCHI generate less cost to Medicare system compared with non workers without EPCHI, requires me to calculate the average yearly number of individuals who are working and not covered by EPCHI, and to see the breakdown between those with zero Medicare costs and those with positive Medicare costs.

Table 14 shows the weighted population of workers not covered by EPCHI in selected years. For example, in 2004, the number of workers without EPCHI is 3.82 million and is 4.57 million in 2010. The average population of workers not covered by EPCHI in the estimation sample, which covers 12 years, is 3.91 million. I then look at the percentage of individuals among these 3.91 million who have positive Medicare costs, and I find that it is 70.84%. That the working effect on the probability of this event reduces the probability by 7.3% means that if the $Work$ variable were to have a zero effect on the probability of observing a positive Medicare cost, the breakdown between positive and zero Medicare costs would show that people with positive expenditures would be 76.42% instead of 70.84%. This means that $Work$ is responsible for an increase in 5.57 percentage points in the proportion of those who have zero Medicare costs. With all these information I are ready to compute the aggregate savings from the pure working effect.

[26]This is the average for the whole estimation sample who have positive expenditures, and comes from the last column of Table 6.

Table 14: Weighted Population (in Millions) by HI Category, Working Status and Year

Year / HI	2004	2006	2008	2010
Workers	4.61	4.87	5.18	5.66
Workers $W\backslash O$ EPCHI	3.82	3.98	4.31	4.57
Medicare $\succ$ 0	0.67%	0.80%	0.80%	0.77%
Medicare = 0	0.33%	0.20%	0.20%	0.23%
Prob(Medicare $\succ$ 0)	0.72%	0.86%	0.87%	0.83%
Diff of Prob	0.05%	0.06%	0.06%	0.06%
EPCHI_R	0.61	0.72	0.67	0.84
EPCHI_S	0.57	0.59	0.59	0.72
EPCHI	**1.18**	**1.30**	**1.26**	**1.56**
Medicare $\succ$ 0	0.56%	0.56%	0.59%	0.46%
Medicare = 0	0.44%	0.44%	0.41%	0.54%
Prob(Medicare $\succ$ 0)	0.73%	0.73%	0.77%	0.60%
Diff of Prob	0.17%	0.17%	0.18%	0.14%
Ave. Medicare Costs	$ 7405.9	$7339.9	$7075.7	$6871.6
Total Medicare Beneficiaries	30.38	30.88	32.70	34,33

Note: Statistics are calculated using cross-section sample weights. Number of observations varies by variable and sample.

The 3.91 million workers without EPCHI in a given year generate two sets of savings. First, given that I now have more individuals with zero Medicare costs, the Medicare system saves $1.55 billion, which results from multiplying the average expenditure of $7,098 times the 3.91 million individuals times the 5.57% who change from the average to zero. Then I have additional savings for those who have positive Medicare costs and see their average costs reduced due to the effect of working. Those savings are $2.91 billion (3.91 million times $1.050.5 per individual, times the 70.84% who have positive Medicare costs) of savings to the Medicare system. This in total add up to $4.46 billion, and represent savings of 0.99% of the total net outlays of the Medicare program in 2010.[27]

I also calculate the total Medicare savings due to the fact that for some

[27] The total Net Mandatory Outlays in 2010 were 446.3 billion dollars as shown in CBO (2011).

individuals Medicare is secondary payer using the same method as I used to calculate the savings from working effect. From Table 14, we can see that the weighted population of Medicare as secondary payer, captured by the EPCHI definition, is 1.18 million in 2004. It varies slightly across years, and is 1.56 million in 2010. The average population of Medicare as secondary payer in the estimation sample, which covers 12 years, is around 1.2 million. I can then look at the percentage of individuals, 54.07%, among these 1.2 million who have positive Medicare costs. Given that the EPCHI effect on the probability of this event is to reduce the probability by 22.6%, this means that if the $EPCHI$ variable were to have a zero effect on the probability of observing a positive Medicare costs, the breakdown between positive and zero Medicare costs would show that the people with positive expenditures is 69.86% instead of 54.07%. This means that the $EPCHI$ is responsible for an increase of 15.79 percentage points in the proportion of those who have zero Medicare costs.

The 1.2 million people with Medicare as secondary payer in a given year also generate two sets of savings. First, because I now have more individuals with zero Medicare costs, the Medicare system saves $1.34 billion, which results from multiplying the average expenditures of $7,098 times the 1.2 million individuals times the 15.79% who change from the average to zero. Then I have additional savings for those who have positive Medicare costs and see their average reduced due to the secondary payer effect. Those savings are of $2.52 billion (1.2 million times $3882.6 per individual, times the 54.07% who have positive Medicare costs) of savings to the Medicare system, which in total add up to $3.86 billion. The $3.86 billion represent savings of 0.86% of the total net outlays of the Medicare program in 2010.

The $4.46 billion as well as the $3.86 billion of Medicare costs savings are the average yearly savings during 1999-2010. The total Medicare savings from these two effects are therefore $8.32 billion. Together, the Medicare savings from working as well as Medicare as secondary payer represent savings of 1.85% of the total net outlays of the Medicare program in 2010.

The previous calculation uses the average number of workers and covered individuals. It is also interesting to see how these savings have changed through the period of analysis. Therefore, I also calculate the year specific Medicare savings using the year specific information in Table 14. The trend of total Medicare savings from working during 1999-2010 is in Figure 3. Figure 4 shows the Medicare savings from Medicare as secondary payer.

I can see an increasing trend of the savings in both Figure 3 and Figure

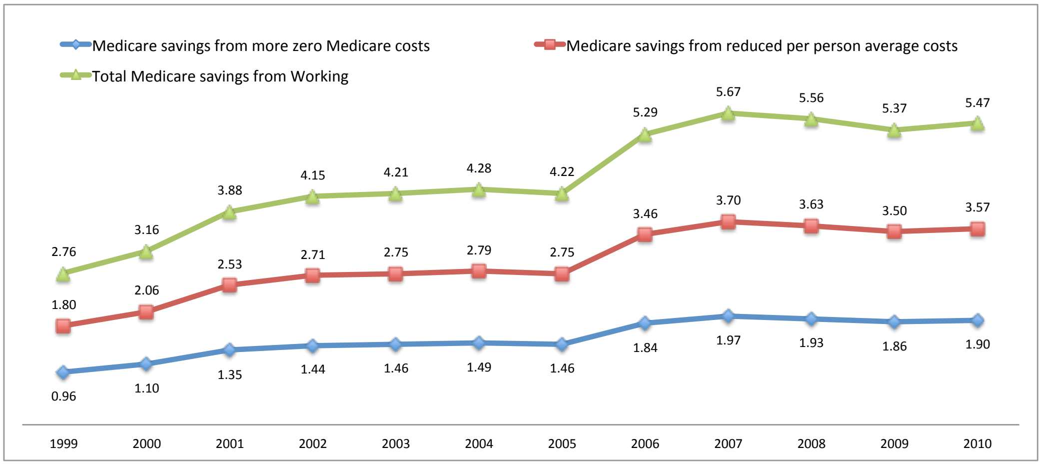

Figure 3: Trend of Medicare Cost Savings from Working (in Billions of Dollars)

4. Comparing with Medicare as secondary payer, working generates slightly higher savings to the Medicare system. Both Figures show the similar flatter patten. The total savings from working as well as Medicare secondary payer effect are 5.29 billion in 1999, and 9.9 billion in 2010. The savings from working as well as the savings from Medicare secondary payer almost doubled from 1999 to 2010.

After I compute the savings from individuals working, I further break down the average yearly changes in Medicare savings into three components: 1) the average yearly increase in LFPR, 2) the average yearly increase in total population ages 65 and older, and 3) the average yearly changes in Medicare costs per person per year. The reason for doing the breakdown is that I want to understand what are the factors contribute to the changes of the savings and the savings. When we understand the factors, it will help to understand that will happen in the future.

Using data from U.S. Census Bureau, the population aged 65 and over has increased from 34.5 million in 1999 to 40.4 million in 2010, an increase of 17%. The average increase in population aged 65 and older is around 1.4% per year. The average increase in Medicare costs per person per year, over the same period, is around 3.17%.[28] As we can see from Figure 3, the

[28]Here, the average Medicare costs is over the full estimation sample, different from the average Medicare costs used to calculating the Medicare costs savings. The average

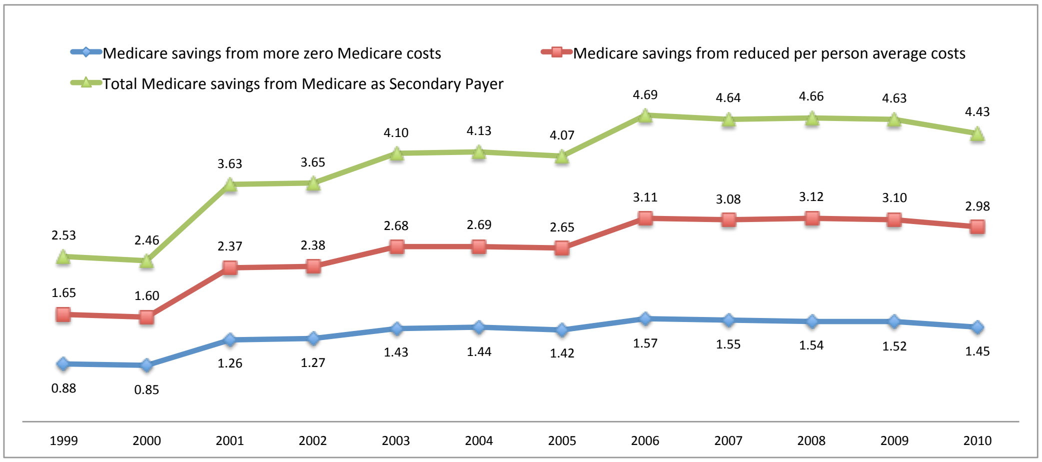

Figure 4: Trend of Medicare Cost Savings from Medicare as Secondary Payer (in Billions of Dollars)

savings from individuals working is $2.76 billion in 1999 and $5.47 billion in 2010. The average yearly increase is 6.84%. So the average yearly increase in populations aged 65 and older accounts for 20.5% of the average yearly increases in the Medicare savings from individuals working. The average increase in the Medicare costs per person per year accounts for around 46.3%, and the rest, 33.2%, comes from the average yearly increase LFPR.

7.3 Sensitivity Analysis of the Results

Table 15 presents the results of several specifications of the log of individuals' Medicare costs as the dependent variable. Column 1 presents the results of the OLS regression. In that case I include the true zeros in the sample when estimating the model instead of separating the equations as in the Heckman's sample selection model. Again, the result is that the coefficients of interest grow too large in absolute terms, reflecting the need to increase (make it more negative) the effect of the $EPCHI$ variable. This is because more than half of those with employer-provided health insurance have expenditures equal to zero. Column 2 presents the results from the second stage of the TPM. The first stage of TPM is not presented because it is identical to the first

Medicare costs used in calculating the savings are over the proportion of estimation sample who have positive Medicare costs in a given year.

stage of the Heckman's sample selection model shown in Table 14. TPM do separate the zero and positive Medicare costs, but don't allow correlation between the correlation between the probability of having positive Medicare costs and the level of the costs. There is also no correction for the possible correlation in TPM. Column 3 presents the results of the IV specification over positive Medicare costs to make the results comparable to the second equation of the Heckman Sample Selection model. The exclusion restrictions used are marital status and individuals' DRC and FRA. The Kleibergen Paaprk Wald F-statistics and Hansen J-Statistic show that both exclusion restrictions are robust and exogenous. However, the results of IV are very sensitive to the exclusion restrictions that I am using. Again, the result of the first stage of IV is identical to that of the Heckman's sample selection model shown in Table 14. Column 4 shows the results from the second stage of the Heckman's sample selection model, which is the same as in Table 14. Column 5 shows the results of fixed effect (FE) model over positive Medicare costs. The fixed effect takes care of the unobserved individual characteristics. As mentioned earlier, the IV specification and panel data specification help address the possible endogeneity issue. The result of the $Work$ dummy from IV is not significant and positive, suggests that working dummy is endogenous, and there is no potential savings from working in IV estimation. The result of the $EPCHI$ dummy from Heckman's sample selection model lies between IV and FE specification. These suggest the results from my preferred specification are unlikely an over-estimate of the relationship that I am studying. I also used the specification of the random effect probit model to compare the results with the first stage of the Heckman's sample selection model. The predicted probability of having positive Medicare costs is 73.07% from the random effect probit model. The marginal effect of $Work$ and $EPCHI$ variable on Medicare costs is 0.008 and 0.016, respectively. Both significant at the 1% level. Using the marginal effect of $Work$ and $EPCHI$, I can calculate that $Work$ and $EPCHI$ variable decreases the average probability of observing a positive Medicare cost by around 1.0% and 2.0%, respectively. These numbers will be used in calculating the Medicare savings later. Comparing the different results in Table 15, we can see that the OLS specification has the largest EPCHI negative effects, followed by IV, TPM, Heckman's sample selection model and the FE specification.

Table 15: The Results from Multiple Model Specifications on Medicare Costs

	OLS (1)	TPM (2)	IV (3)	Heckman Selection (4)	FE (5)
Working	-0.591***	-0.220***	1.014	-0.148***	-0.172***
	(0.046)	(0.014)	(0.569)	(0.021)	(0.035)
EPCHI	-2.061***	-0.693***	-0.627**	-0.547***	-0.257***
	(0.086)	(0.072)	(0.115)	(0.047)	(0.061)
F Stat.			42.29		
J test			0.38		
Lambda				0.621***	
				(0.12)	
Year Dummies	Yes	Yes	Yes	Yes	Yes
Obs.	96,980	80,208	80,208	72,780	69,410

Notes: All regressions, except for IV regression, also contain age, age square, gender, income dummies, health controls, race, education, marital status, census region dummies as well as **DRC** dummies not reported. Robust Standard errors clustered at the individual level are in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

Given that each of the specifications is addressing the two empirical challenges in a different way, I calculated the average Medicare savings per year from working as well as from the secondary payer effect under each specification using the results in Table 15. The same methods of calculation are used. For the case of OLS specification, I am only able to calculate the Medicare savings resulting from reduced per person Medicare costs. The Medicare savings under each model specification are presented in Table 16.

As we can see from Table 16, the savings from working range from $1.55 billion per year to $16.4 billion, while the savings from Medicare as secondary payer range from $1.27 billion per year to $17.55 billion. The average savings from working and EPCHI varies between $4.84 (the RE effect probit & FE) billion to $33.95 billion (OLS).

Table 16: Medicare Cost Savings from Working and EPCHI in Billions

Savings from Working	More Zeros Costs	Less Per Person Costs	Total
OLS		16.4	16.4
TPM	1.55	4.33	5.88
IV	1.55	0	1.55
Sample Selection	1.55	2.91	4.46
RE Probit& FE	0.19	3.38	3.57
Savings from EPCHI	**More Zeros Costs**	**Less Per Person Costs**	**Total**
OLS		17.55	17.55
TPM	1.34	3.19	4.27
IV	1.34	2.17	3.7
Sample Selection	1.34	2.52	3.86
RE Probit& FE	0.09	1.18	1.27

Note. Robust Standard errors clustered at the individual level are in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

8 Conclusions

I use the MCBS individual claims data to analyze the relationship between labor supply, employer-provided health insurance coverage and Medicare costs. This endeavor is not only innovative but also essential to understanding how a number of recent developments affecting Older Americans affect the important Medicare System. Changes in the Social Security system such as increases in the full retirement age and the delayed retirement credits, in the debt structure of Older American households, as well as in the increased longevity of Americans have led to considerable increases in labor supply in the last couple of decades. Given the connection of work with employer-provided health insurance coverage, it has become even more important to understand how work and health insurance coverage affect Medicare costs.

My findings, using a variety of econometric specifications, show sizable negative and significant effects of work and health insurance coverage on

Medicare costs. They allow me to compute aggregate implied savings resulting from the significant number of Americans who work and are covered by employer-provided health insurance while on Medicare. I am also able to quantify the aggregate effect that comes from delaying enrollment into Medicare, which is also correlated with work and health coverage. Additionally, I am able to break down the Medicare savings from individuals working into three components: the average yearly increase of population aged 65 and over, the average yearly increase in LFPR, and the average yearly increase in Medicare costs per person per year.

The Medicare savings in a given year resulting from the fact that around 3.91 million Older Americans keep working after age 65 are $4.46 billion. The savings from the fact that Medicare is secondary payer versus primary payer for around 1.2 million Americans every year is around $3.86 billion. The average yearly increase in population aged 65 and over accounts for 20.5% of the average yearly increase in the Medicare cost savings from individuals working. The average yearly increase in the Medicare costs per person per year accounts for around 46.3%, and the rest, 33.2%, comes from the average yearly increase in LFPR. Given all these three factors are going up, so my story continues, it also makes my question become more important in the future. The average savings from EPCHI and working varies between $4.84 billion to $33.95 billion based on different model specifications. However, I choose the specification that allows for correlation between the likelihood of incurring on Medicare costs and the total amount of Medicare costs for the Medicare system as the preferred specification, which results in total average savings of $8.32 billion.

As mentioned early, workers pay Medicare taxes that further strengthen the Medicare program is not addressed in this paper, but will be part of the future research. Given these findings, any of the following will affect Medicare costs through the effects I have described in this research: reform of Social Security, health insurance, or tax code; changes in the debt structure of Older American households; and any developments that affect labor force participation and/or health insurance coverage.

Chapter 2

9 Introduction

Social Security Old Age Benefits (OA) and Medicare are the two largest Social Insurance programs in our country, and the nature of their relationship has been at the core of considerable research in the Economics of Aging, as well as much public policy debate. In the last years, with the implementation of the 1983 Amendments to the Social Security system, which included an increase in the Full Retirement Age (FRA), we have seen a sharp increase in the proportion of Americans claiming OA Benefits at the current FRA, 66, and a drop of those claiming at age 65 (Annual Statistics Supplement, Social Security). This can be interpreted as an apparent contradiction with the very convincing findings of, for example, Rust and Phelan (1997), regarding the explanation, through the availability of Medicare at age 65, for the large OA benefits claiming peak at age 65.

Coupled with this development, we have seen the continuation of the increases in labor force participation of Older Americans. While the evolution of OA Benefits claiming and labor force participation increases, have been well documented and modeled in the last decade (See for example Bentez-Silva and Heiland 2007 and 2008), much less research has characterized the fact that Medicare is also a choice, and a non-trivial proportion of Americans delay their enrollment in Medicare (Levy and Weir 2007 study the take-up of Medicare Part D). Figure 1, using the Medicare Current Beneficiary Survey (MCBS) shows the evolution over the 1992 to 2010 period of the proportion of Medicare enrollees who delay Medicare Part A (which covers hospitalizations, other facilities care, and home health care). Similarly, Figure 2 shows the proportion of individuals who delay Medicare Part B (which covers doctor visits, surgeries, lab tests, and other services) for the same period of times.

As we can see, a small (and declining in this period) percentage of individuals delays Part A, and there are more female delayers then male delayers. This should not come as a surprise given that for most Americans Medicare Part A is free, and for those who do not have enough quarters of coverage is only accessible through high premiums.

More interesting is the evolution of Medicare Part B, which has increased considerably in the period to 8.34% in 2010 from 3.4% in 1992 for male enrollees (3.9% in 2010 and 1.23% in 1992 for female enrollees). Notice that

Part B is not free and requires a (standard) premium of $121.8 a month (as of 2016), and therefore those who are covered by current Employer Provided Health Insurance could rationally consider the delay of Part B without affecting in a substantial way the level of care they would receive. This increase is likely linked with the increases in labor supply among Older Americans, which have been repeatedly linked with the reforms resulting from the 1983 Amendments. At the same time the labor supply increases can be linked to the delays in claiming we have been observing in the last decade.

Figure 3 shows the proportion of Medicare beneficiaries who have delayed both Part A and B in part 5 years, which has not followed a very clear trend in the same period at around 3%. This proportion should be taken with caution since by the nature of how the MCBS collects the information on entitlement dates and types of entitlements, those who have delayed both parts of the Medicare system can only be counted retroactively.

While the evidence on the fact that a non-trivial proportion of Americans are delaying Medicare, especially Part B, is compelling, the overall proportions might seem small and only marginally in line with the sharp shift in claiming to the new FRA. However, a key aspect of the Medicare choice, which makes it very different from OA Benefits claiming, is that the government imposes penalties to those who delay Medicare enrollment but are not covered with current Employer Provided Health Insurance (EPCHI). While Social Security allows Americans to claim OA benefits at any time between their 62nd and 70th birthday, only using actuarially fair adjustment factors to account for the expected number of years on the rolls, the Medicare system imposes penalties to anyone who enrolls on Medicare more than 12 months after the end of the initial enrollment period (IEP). The 7-months IEP ends when the individual reaches age 65 and three months. The rationale for these penalties has not been carefully discussed in the literature, but it is easy to conjecture that it is linked with the desire of preventing individuals from generating higher Medicare costs (once they enroll) if they delay their Medicare enrollment with the result that their health deteriorates due to lack of access to health care, or presumably to guard against adverse selection from individuals waiting until a negative health shock to decide on a plan.

In this chapter I empirically addresses the evolution of delay enrollments into Medicare, as well as the role of delay enrollment on Medicare costs, taking into account the existence of enrollment penalties and the recent evolution of labor supply among Older Americans. In doing so, I am also able to quantify the companion savings resulting from the delays in enrollment into

Medicare at around $5.18 billion per year from 1999 to 2010. The contribution of this chapter is it provides an empirical analysis on Medicare delay enrollment as well as quantify the Medicare savings from delay enrollment.

The reminder of this chapter is organized as follows: Section 2 provides background in Medicare delay enrollment and related penalties; Section 3 describes how I define Medicare enrollment delayers and calculate the years of delay; Section 4 provides the empirical analysis using MCBS data sets; Section 5 shows how I calculate the Medicare savings from delay enrollment; Section 6 provide an empirical analysis on how labor supply and employer provided health insurance (EPCHI) would affect the probability of delaying Medicare enrollment; and Section 7 provides a final discussion and conclusions.

10 Medicare Eligibility, Enrollment, and Late Enrollment Penalties

This section provides background on Medicare eligibility, enrollment, and late enrollment penalties. Understanding those background will help to understand individuals incentives and how the late enrollment penalty works. For the purpose of this study, I will focus on individuals who are eligible for Medicare because of aging. So the following background applied to individuals who are aged 65 and older.

10.1 Medicare Eligibility

Most people get Medicare Part A for free, but some have to pay a premium for this coverage. Individuals are eligible for premium-free Part A if they or their spouse paid Medicare taxes for at least 10 years while working. For individuals who are not eligible for premium-free PartA, they may be able to buy PartA if they are 65 or older, and you have (or are enrolling in) PartB and meet the citizenship and residency requirements. [29]

[29] When you turn 65, you may be eligible for free Medicare Part A based on your spouse's work history if: 1) You are currently married and your spouse is at least 62 and is eligible for Social Security benefits (either retirement or disability). In addition, you must have been married for at least one year before applying. If youve worked at least 10 years in Medicare-covered employment but arent yet 62 when your spouse turns 65, he/she wont be eligible for premium-free PartA until your 62nd birthday. In this case, your spouse

1) Individuals are eligible for premium-free Part A at 65 if: 1) they already get retirement benefits from Social Security or the Railroad Retirement Board, 2) they are eligible to get Social Security or Railroad benefits but haven't filed for them yet, 3) You or your spouse had Medicare-covered government employment. The monthly Medicare Part A premium in 2016 is 1)$226, if you or your spouse worked between 7.5 and 10 years; 2)$411, if you or your spouse worked fewer than 7.5 years.

The eligibility rules for Part B depend on whether a person is eligible for premium-free Part A or whether the individual has to pay a premium for Part A coverage. Individuals who are eligible for premium-free Part A are also eligible for enroll in Part B once they are entitled to Part A.

Individuals who must pay a premium for Part A must meet the following requirements to enroll in Part B: 1) be age 65 or older; 2) be a U.S. resident; and 3)be either a U.S. citizen, or be an alien who has been lawfully admitted for permanent residence and has been residing in the United States for 5 continuous years prior to the month of filing an application for Medicare.

10.2 Medicare Enrollment

1) Individuals already receiving Social Security retirement benefit[30] and residing in the United States (except residents of Puerto Rico) are automatically enrolled in both premium-free Part A and Part B. For those who are automatically enrolled, they have the choice whether they want to keep or refuse Part B coverage, since they have to pay a monthly premium for Part B coverage. People living in Puerto Rico who are eligible for automatic enrollment are only enrolled in premium-free Part A; they must actively enroll in Part B to get this coverage.

2) Individuals who are not receiving a Social Security retirement benefit are not automatically enrolled. These individuals must file an application for Medicare by contacting the Social Security Administration. Individuals who

should still apply for PartB at 65 to avoid paying a higher PartB premium. However, if youre still working and your spouse is covered under your group health plan, he/she could delay PartB enrollment without paying higher premiums. 2) You are divorced and your former spouse is eligible for Social Security benefits (either retirement or disability). In addition, you must have been married for at least 10 years and you must be single. 3) You are widowed and you were married for at least nine months before your spouse died. In addition, you must be single.

[30] or railroad retirement benefit (RRB)

previously did not enroll in Part A or Part B, or who terminated their Part A or Part B enrollment, may enroll (or re-enroll) in either or both during the General Enrollment Period (GEP), which is January 1 to March 31 of each year.[31]

3)Individuals do not have to enroll in Medicare Part A if they aren't eligible for premium-free PartA. However, if individuals choose to buy Part A, they must also have Medicare Part B and pay monthly premiums for both. But Individuals can enroll in Part B without having Part A.

10.3 Medicare Late Enrollment Penalties

1) Beginning in 1985, premium-paying individuals who do not purchase Part coverage beyond their IEP because of age are subject to a 10% premium penalty for each 12 months they are late in enrolling. The 10% penalty premium penalty was limited to twice the number of years enrollment was delayed. Therefore, if enrollment were delayed 1 year, the penalty would be assessed for 2 years. Individuals who are eligible for premium free Part A can enroll in Part A anytime once their IEP starts without paying a PartA late enrollment penalty.

2) The Part B delayed enrollment penalty provision was included in the original Medicare legislation enacted in 1965. The penalty is an increase of 10% in the Part B premium for each 12-month period the individual delays enrollment in Medicare Part B. The individual carries this penalty with his Medicare costs for as long as he has Medicare Part B.

3) Effective November 1984, a special enrollment period (SEP) is available for individuals aged 65 and over who did not enroll in Medicare Part A and/or Part B when first eligible. If individuals are covered under a group health plan based on current employment, they have a Special Enrollment Period to sign up for Part A and/or Part B any time as long as they or their spouse is working, and they are covered by a group health plan through the employer or union based on that work. They also have an 8-month Special Enrollment Period to sign up for Part A and/or Part B that starts the month after the employment ends or the group health plan insurance based on current

[31] People who enroll in Medicare through the Buy-In or a Medicare Savings Program do not have to wait for the next general enrollment period to enroll. Complete the County Agency Section of the Medicare Buy-In Referral Letter (DHS-3439) and send it to the person along with a county-addressed return envelope. Request return of the form, completed by SSA when they apply for Medicare within 30 days.

employment ends, whichever happens first. Usually, individuals don't pay a late enrollment penalty if they sign up during a Special Enrollment Period.[32]

11 Identifying Medicare Delayers and Calculating Years of Delay

The Medicare Current Beneficiaries Survey used in chapter 1 are used in the analysis of this chapter. Again, Medicare Part A and Part B are addressed. Four aspects of Medicare delay enrollment need to be understand and addressed: 1) how does delay enrollment change over time; 2) who are the delayers in each year; 3) who ever delayed any part or both parts of Medicare; 4) for those who delay, how long they are delaying. As a result, several notations about delayers are used in this chapter for varies purposes. Three assumptions are made to identify delayers as well as further calculate years of delay enrollment: 1)individuals are always enrolled once they enroll in Medicare. For example, a Part A enrollee can not be a Part B enrollee next period, he can keep Part A or enroll both Part A and B next period. Furthermore, for a Part A and Part B enrollee, his will always be a A and B enrollee afterwards.[33]; 2)I put a lower bound at the years they delayed enrollment by comparing their current enrollment status with their initial enrollment date.[34]; 3) For those who have both Part A and Part B coverage by the time I first observe them, I assume those individuals' also have both Part A and Part B coverage when they first enrolled given the first assumption.

Based on the estimation sample from chapter 1, and the above three assumptions, I lost less than 0.1% of observations because I observe them disenrolled Medicare once they enrolled. As a result, I left with 44,334 sample person, or 97352 person-year observations for analysis in this chapter.

The way to identify whether an individual ever delayed any part of both

[32]COBRA and retiree health plans aren't considered coverage based on current employment. Individuals are not eligible for a Special Enrollment Period when that coverage ends. This Special Enrollment Period also doesn't apply to people with End-Stage Renal Disease (ESRD).

[33]In reality, individuals could get rid of Medicare coverage after they enroll.

[34]This will underestimate the years they delayed Medicare enrollment, but I fell more comfortable with underestimate compared with overestimate. I know it will be higher, but not lower.

parts of Medicare is by looking at his entitlement date as well as his current annual Medicare coverage status. A person's annual Medicare coverage status in MCBS falls into the following three mutual exclusive categories: Medicare Part A only, Medicare Part B only, both Medicare Part A and Part B. The estimation sample is classified into four mutual exclusive categories: Medicare non-delayers, Part A delayers (*Delay_A*), Part B delayers (*Delay_B*) and Part A+B delayers (*Delay_AB*). So a IEP enrollee could be a Medicare delayers if his annual coverage is only Part A or Part B.

Table 17: Definition of Medicare delayers

	Medicare Coverage	
	Entitlement date	First observed
Medicare non-delayers	Within IEP	Part A and B
Ever Delay A (*Delay_A*)	Within IEP	Only Part B
Ever Delay B (*Delay_B*)	Within IEP	Only Part A
Ever Delay A + B (*Delay_AB*)	Beyond IEP	A, B or A+B

The way to identify whether an individual is a *current delayers* in each year is by looking at his current annual Medicare coverage status. As a result, in a given year, the Medicare Part B delayers are those who have only Medicare Part A coverage; the Medicare Part A delayers are those who have only Medicare Part B coverage. To identify the Medicare Part A and Part B delayers in a given year is not as straight forward as Part A or Part B delayers. The reason is because there is only one Medicare entitlement date in MCBS, and there is no information available between the year of entitlement and the year of first observed in MCBS. The best I can do is to count among those Medicare Part A and Part B delayers, how many of them are entitled to Medicare in each year. When I understand who are the delayers in each year, I am able to plot the trend of Medicare delay enrollment. Figure 4 shows the Part A, Part B as well as Part A and B delayers in each year, pooling males and females together. These numbers are used in calculating the Medicare cost savings from delaying Medicare enrollment.

Years of delayed enrollment is calculated separately for Part A delayers, Part B delayers as well as Part A + B delayers. I could observe the changes of annual Medicare coverage for some sample person across years of observations. For these individuals, I could calculate the exactly years of delaying Medicare enrollment. For other individuals without changes in annual Medicare coverage, I put a lower bound for their years of delay according to assumption 2 stated before. Table 3 shows the years of delay for individuals who delayed Part A or Part B. As we can see from Table 3, most people delayed Part A or Part B for 10 years or less.

Table 18: Years of Delay Enrollment-Part A or Part B (1999-2010)

Years	Delay Part A	Delay Part B
1	6.39%	17.74%
2	1.18%	4.22%
3	4.69%	9.20%
4	10.75%	19.01%
5	8.95%	10.76%
6	5.95%	6.50%
7	4.67%	6.15%
8	5.38%	5.26%
9	4.11%	3.29%
10	8.18%	1.76%
Cum.	60.25%	83.89%
11	5.00%	3.07%
12	4.10%	1.92%
13	7.31%	1.52%
14	2.23%	1.68%
15	1.15%	1.65%
16	5.01%	1.46%
17	0.46%	0.74%
18	1.57%	0.46%
19	1.38%	0.76%
20	2.24%	0.72%
Cum:	90.69%	97.88%

Notes: Statistics are calculated using cross-section sample weights.

12 Delay Enrollment and Medicare Costs: An Empirical analysis

Two questions need to be addressed in order to understand the role of delay enrollment on Medicare costs: 1) whether any delay would significantly affect Medicare costs, whether particular part of delay enrollment would significantly affect Medicare costs; and 2) whether years of delay would significantly affect Medicare costs.

Table 4, Table 5 show the second stage estimation results using the Heckman Sample Selection model, which also is the preferred model specification in Chapter 1, after including delay enrollment dummies in the Medicare costs regression and after conditioning on health insurance, as well as a battery of socio-demographic variables. The left panel of both Tables is the results conditioning on health status, the right panel is the results without any health controls. The Lambda in both tables are significant, suggests the Heckman sample selection model is appropriate.

Dummy *Delay* equals to 1 if any of the following dummies equals to 1: *Delay_A*, *Delay_B* and *Delay_AB*. *EPCHI_Delay*, *EPCHI_B*, *EPCHI_AB* are the intersect terms of *EPCHI* dummy and *Delay* dummy, *EPCHI* with *Delay_B*, and *EPCHI* with *Delay_AB*, respectively. Since EPCHI don't play a role on Medicare Part A late enrollment penalty, there is no intersect term of EPCHI and delay Part A. These intersect terms capture those who delay without facing late enrollment penalties due to SEP. As we can from Table 4 and Table 5, any delay as well as delay enrollment in Part B have an negative and significant effect on Medicare costs. The intersect terms of EPCHI and delay dummies have the most negative coefficients on Medicare costs, which suggesting the justifiability of the rule that individuals covered by EPCHI having a SEP that prevent them paying delay enrollment penalties. Government well aware that those EPCHI enrollees will not generating higher costs to the Medicare system after delay. In line with the results in chapter 1, *Work* and *EPCHI* dummies are negative and significant correlated with Medicare costs.

As stated before, the likely rationale behind the Medicare late enrollment penalties is to prevent individuals from generating higher Medicare costs if they delay their Medicare enrollment and their health deteriorates because of not covered by health insurance, or presumably to guard against adverse selection from individuals waiting until a negative health shock to decide on a plan. The argument of the Government is that individuals health status are correlated with delay enrollment, so when we address the effects of delay enrollment on Medicare costs without direct health control, we are allowing this correlation through omitted variable bias. When without health controls, we see the coefficients of delay dummies as well as the delay-EPCHI intersect terms go more toward positive compared with including health controls in both Table 4 and Table 5, which supports the government's point. When without health controls, *Delay* will lower the Medicare costs by 14.5% and *EPCHI_Delay* lowers the Medicare costs by 81.5% in Table 4; *EPCHI_B* and *EPCHI_AB* lower the Medicare costs by 90.2% and 50.5%, respectivelly, in Table 5.

Table 19: Second Stage of Heckman Sample Selection Model Regression Results of Any Delay Enrollment on Medical Expenditures in The MCBS

	Any delay enrollment on Medicare Costs					
	(1) With Health Controls			(2) Without Health Controls		
	Medicare	Total	OOP	Medicare	Total	OOP
Work	-0.211***	-0.115***	0.060***	-0.255***	-0.144***	0.046***
	(0.024)	(0.023)	(0.013)	(0.024)	(0.024)	(0.013)
EPCHI	-0.580***	0.038	0.044	-0.591***	0.031	0.042
	(0.043)	(0.049)	(0.028)	(0.043)	(0.051)	(0.028)
Delay	-0.168***	-0.108***	-0.277***	-0.145**	-0.102***	-0.273***
	(0.046)	(0.028)	(0.017)	(0.046)	(0.03)	(0.017)
EPCHI_Delay	-0.864***	-0.096	0.156**	-0.815***	-0.103	0.151**
	(0.215)	(0.089)	(0.05)	(0.217)	(0.092)	(0.050)
Good Health	0.360***	0.238***	0.156***			
	(0.015)	(0.016)	(0.009)			
Fair Health	0.629***	0.401***	0.201***			
	(0.022)	(0.023)	(0.013)			
Poor Health	1.038***	0.623***	0.213***			
	(0.035)	(0.038)	(0.022)			
Lambda	0.758***	-2.111***	-0.692***	0.701***	-2.190***	-0.708***
	(0.152)	(0.147)	(0.082)	(0.152)	(0.155)	(0.084)
Obs.	72,763	95,241	95,241	72,763	95,241	95,241

Notes: All regressions also contain age, age square, gender, income dummies, health controls, race, education, marital status, number of kids not reported. Robust Standard errors are in parentheses.
*** Significant at 1 percent.
** Significant at 5 percent.
* Significant at 10 percent.

The effects of health control is to make coefficients more towards positive or make the coefficient become insignificant. The robustness of the coefficients stay negative and significant for $Delay$, $EPCHI\_Delay$, $EPCHI\_B$ and $EPCHI\_AB$, suggests that delay itself plays an role on Medicare costs, which are unobservable to us once we control for health status, health insurance and labor supply. The results from Table 4 and Table 5 also suggests that the Medicare late enrollment penalties are playing its role.

Heckman Sample Selection model is also used to address whether years of delay enrollment would affect Medicare costs (see results on Table A.1 in appendix). Lambda are significant across all regressions and panels, suggesting the Heckman selection model is appropriate. The coefficients of years of delay Part A are not significant, except for delaying one year. Those who only delay Part A are probably those who don't qualify for premium-free Part A, and those who delay for just 1 year are probably those who are experiencing a huge health shock and need Part A coverage immediately. As a results, they impose an increase on Medicare costs. Years of delaying Part B are negative and significant correlated with Medicare costs at 1 year, 5 years and 8 years. Years of delaying both Part A and B is positive and significant with Medicare costs at 7 years and 10 years and up.

Table 20: Second Stage of Heckman Sample Selection Model Regression Results of Particular Delay Enrollment on Medical Expenditures in The MCBS

	Separated delay enrollment on Medicare Costs					
	(1) With Health Controls			(2) Without Health Controls		
	Medicare	Total	OOP	Medicare	Total	OOP
Work	-0.203***	-0.110***	0.064***	-0.247***	-0.139***	0.049**
	(0.023)	(0.023)	(0.017)	(0.024)	(0.024)	(0.017)
EPCHI	-0.586***	0.035	0.081*	-0.596***	0.028	0.077*
	(0.043)	(0.048)	(0.035)	(0.043)	(0.05)	(0.036)

Delay_A	-0.012	-0.171	-1.613***	0.005	-0.152	-1.603***
	(0.092)	(0.102)	(0.075)	(0.092)	(0.106)	(0.078)
Delay_B	-0.380*	-0.314***	-0.174***	-0.278	-0.307***	-0.168***
	(0.189)	(0.049)	(0.036)	(0.189)	(0.051)	(0.037)
Delay_AB	-0.008	-0.006	-0.356***	-0.004	-0.002	-0.352***
	(0.031)	(0.034)	(0.025)	(0.031)	(0.035)	(0.026)
EPCHI_B	-0.923***	0.076	0.038	-0.902***	0.071	0.037
	(0.262)	(0.100)	(0.074)	(0.266)	(0.104)	(0.076)
EPCHI_AB	-0.527*	-0.061	0.329*	-0.505*	-0.077	0.319*
	(0.213)	(0.175)	(0.129)	(0.214)	(0.182)	(0.133)
Good Health	0.361***	0.238***	0.169***			
	(0.016)	(0.016)	(0.012)			
Fair Health	0.632***	0.400***	0.203***			
	(0.022)	(0.023)	(0.017)			
Poor Health	1.040***	0.624***	0.204***			
	(0.035)	(0.037)	(0.027)			
Lambda	-0.787***	-2.058***	-1.521***	0.714***	-2.135***	-1.570***
	(0.153)	(0.143)	(0.106)	(0.153)	(0.152)	(0.112)
Obs.	72,763	95,241	95,241	72,763	95,241	95,241

Notes: All regressions also contain age, age square, gender, income dummies, health controls, race, education, marital status, number of kids not reported. Robust Standard errors are in parentheses.

*** Significant at 1 percent.

** Significant at 5 percent.

* Significant at 10 percent.

Table 6 shows the descriptive statistics of mean weighted health status among individuals who delay enrollment and those who do not. Health status has five values: 1,2,3,4,5 represents excellent, very good, good, fair, poor, respectively. So the bigger the number, the worse the health status. Again, age is top coded at 90. I use mean-comparison tests to see whether the mean health status of each subgroup of delayers, is statistically different from the mean health of non-delayers. Those whose mean health status is statistically different from non-delayers are marked with star. As we can see from Table 6, the mean health are not statistically different between all delayers and non-delayers at all ages except age 65, 66 and 89. When we look into all the delayers, the mean health of those who delay both Part A and B are not statistically different from non-delayers. The most statistical differences come from those who delay Part A, and those who delay Part A have worse

Table 21: Weighted Health Status by Age and Medicare Delay Enrollment

Age	65	66	67	68	69	70	71	72	73
Non-Delayers	2.38	2.38	2.31	2.38	2.39	2.38	2.42	2.51	2.5
Delay A	3.07*	2.6	3.06*	3.07*	2.85*	2.8*	3.16*	3.2*	3.07*
Delay B	2.14*	2.16*	2.11*	2.23*	2.21*	2.34	2.26	2.2*	2.05*
Delay A+B	2.2	2.27	2.42	2.46	2.54	2.36	2.52	2.57	2.57
All Delayers	2.18*	2.19*	2.21	2.33	2.35	2.37	2.44	2.45	2.43
Age	74	75	76	77	78	79	80	81	82
Non-Delayers	2.5	2.53	2.54	2.6	2.58	2.58	2.59	2.66	2.66
Delay A	3.15*	3.39*	3.12	3	3.23	3.36*	1.66	3.46*	3.44
Delay B	2.15	2.57	2.48	2.29	2.46	2.49	2.52	2.72	2.68
Delay A+B	2.5	2.63	2.48	2.49	2.6	2.71	2.7	2.77	2.73
All Delayers	2.45	2.67	2.52	2.49	2.61	2.7	2.63	2.8	2.74
Age	83	84	85	86	87	88	89	90	
Non-Delayers	2.72	2.69	2.72	2.7	2.67	2.74	2.71	2.57	
Delay A	2.7	2.84	2.93	3.01	2.74	3.57	4.56*	2.48	
Delay B	2.55	2.61	2.64	2.94	3.22	2.92	2.9	2.54	
Delay A+B	2.84	2.77	2.84	2.99*	2.9	2.89	2.83	2.6	
All Delayers	2.8	2.75	2.83	2.99*	2.91	2.92	2.89	2.59	

Notes: Statistics are calculated using cross-section sample weights. Number of observations varies by variable and sample. The significance level is 5%.

health than non-delayers at 60th and early 70th. On the contrary, Part B delayers have better health than non-delayers.

From the results in Table 4, 5 as well as the descriptive statistics in Table 6, we see that there are health differences between delayers and non-delayers, yet delayers lower the Medicare costs given the differences in health status.

13 Medicare Savings from Delay Medicare enrollment

As explained in section 3, Medicare current delayers in each year is used when calculating the Medicare costs savings. The total savings is the sum of savings from delay Part A, delay Part B and delay Part A + B. The detail as follows: I first calculate savings from delaying Part A, delaying Part B and delaying Part A+B separately by ages for each year from 1999 to 2010. I then sum over the twelve years and all three delays, and then take the average to get the year average Medicare cost savings corresponding to delay enrollment. The following equation corresponding to the calculation:

$$Total\ \ savings = \sum_{i=65}^{90} \sum_{j=1999}^{2010} \sum_{k=A,B,A+B} (Number\ \ of\ \ delayers_{i,j,k} \times Weighted\ Average\ \ Medicare\ Costs\ of\ Non\text{-}delayers_{i,j,k}) \quad (5)$$

in which i represents age, which runs from age 65 to age 90; j represents year of observations, which runs from 1999 to 2010; k represents delay Part A, Part B or Part A+B. The total savings calculated using equation (1) is the savings from twelve years (1999-2010), the average savings per year is obtained by taking the average of the total savings. Notice that the weighted average Medicare costs are those who enroll during their IEP and who only have Part A, Part B or both parts by age and year when we calculate the savings from delay Part A, Part B and both parts, respectively.

Table 22: Number of Current Delayers and Mean Medicare costs: 2005 MCBS

	Number of Current Delayers			Average Medicare costs of IEP Enrolle		
Age	Part A	Part B	Part AB	Part A	Part B	Part AB
65	8410	312825	13375	$0.00	$252.99	$1216.42
66	33451	231279		$0.00	$4102.60	$3967.77
67	13776	156483	13974	$0.00	$1261.37	$4771.70
68		115087		$1890.41	$0.00	$5208.99
69	20221	108919	20746	$3029.25	$7375.00	$4850.24
70	23621	92374	12570	$0.00	$3221.58	$5068.54
71	7446	68403	12701	$0.00	$5325.60	$5001.42
72	15943	24773		$781.52	$1768.50	$3980.12
73	7110	57200	7110	$203.95	$0.00	$4274.30

Notes: Medicare costs are calculated using cross-section sample weights from MCBS. Number of observations varies by variable and sample.

Table 7 is the number of current delayers and weighted average Medicare costs by age and Medicare coverage status from those who enroll in Medicare at initial enrollment period in 2005. As we can see from Table 7, there in no delayers in certain ages, or the corresponding average Medicare costs are zeros corresponding to some delayers. As a result, the corresponding savings are zero if number of current delayers or average Medicare costs is zero. Majority of delayers are Part B delayers, and the majority of the delay enrollment savings also comes from delaying Part B. The average Medicare savings from delayed enrollment in a given year resulting from my calculation show savings of $5.11 billion, in which savings from delaying Part B account for 81%, savings from delaying Part A account for 14%, and the rest is the savings from delaying both Part A and B. The 5.11 billion is about 1.14% of the net mandatory outlays of the Medicare system in 2010.[35]

14 Work and health insurance coverage linked with delay enrollment

It is interesting to understand how work and health insurance coverage also comes into play in the cost savings linked with delayed enrollment. I have estimated a simple binary model of delayed enrollment as a function of my battery of controls and the working and insurance indicators, as shown in Table 8. Marginal effects rather than the directly estimated coefficients are represented. The predicted probability of delaying Medicare enroll is 9.1%, given the marginal effect of $Working$ and $EPCHI$ variable shown in Table 8, we can see that working will increase the probability of delay enrollment by 55%, and EPCHI will increase the probability of delay enrollment by 186%.[36] So together, working and EPCHI will increase the probability of delay enrollment by 241%. My finding indicating that a sizable part of the savings in Medicare costs from delayed enrollment can be traced back to the employment decisions of individuals and the health insurance coverage they have while working. The huge effect of $EPCHI$ on delay enrollment suggests that individuals are well aware that those who covered by EPCHI will not paying any late enrollment penalties.

[35] The total Net Mandatory Outlays in 2010 were 446.3 billion dollars as shown in CBO (2011).

[36] With or without direct health control, the results stays the same.

Table 23: Probit Model Regression Results of Delay Enrollment

Variables	Medicare Costs
Work	0.050***
	(0.004)
EPCHI	0.169***
	(0.005)
Good Health	0.008**
	(0.003)
Fair Health	0.004
	(0.004)
Poor Health	0.002
	(0.007)
Obs.	96,927

Notes: All regressions also contain age, age square, gender, income dummies, health controls, race, education, marital status, number of kids not reported. Robust Standard errors are in parentheses.
*** Significant at 1 percent.
** Significant at 5 percent.
* Significant at 10 percent.

14.1 Conclusion

I use the MCBS individual claims data to empirically addresses the evolution of delay enrollments into Medicare, as well as the role of delay enrollment on Medicare costs, taking into account the existence of enrollment penalties and the recent evolution of labor supply among Older Americans. This endeavor is not only innovative but also essential to understanding the role of late enrollment penalties and how delay enrollment affect the Medicare System.

My findings, using Heckman sample selection model, show negative and significant effects of delay enrollment, and the joint effect of EPCHI and delay on Medicare costs. The richness of MCBS allows me to observe the *current delayers* in each year. They allow me to compute aggregate implied savings resulting from delaying enrollment into Medicare, which is also correlated with work and health coverage. The Medicare savings in a given year resulting from individuals delay Medicare enrollment are $5.11 billion, in which 81% of the savings come from delaying Part B enrollment, 14% comes from delaying Part A, and the rest comes from delaying both Part A+B. My findings also shows that years of delaying Part B matters to Medicare costs in a positive and significant ways, suggesting the current penalties might be reconsidered by policy makers.

I should mention that I do not include in my calculation of savings due to delayed enrollment the fact that some individuals die before even enrolling in Medicare, providing a cost saving silver lining to the government. I have not tried to compute these possible savings because to truly tackle the problem I would have to expand my research to compute the savings or costs linked to early death as well as longer than expected longevity among those never enrolled and also among those eventually enrolled. A careful analysis of the effects of mortality on Medicare costs is out of the scope of this research but part of my future research.

This empirical analysis is conditional on current delay enrollment penalties. Also, health evolve differently for those who delay and those who don't, health is a function of delay enrollment decisions. In order to fully understand the delay enrollment penalties, the delay enrollment decisions as well as the evolution of health, we need a structure model. All these analysis is out of the scope of this research but part of my future research.

Both chapters are linked to the evolution of labor supply of Older Americans. Some recent studies find that older workers with jobs that give them a high degree of control and influence or a sense of achievement and independence tend to be healthier.[37] Assuming healthier Older Americans generate lower Medicare costs, this is another factor through which I can expect that the increases in labor supply will lower Medicare costs.

[37] See Schmitz (2015).

Appendices

A More Estimation Results

More estimations results for Table 12 and Table 13 from Heckman's sample selection model are provided below:

Table A.1: Marginal Effects of Working and HI Coverage on Medical Spending: First Stage

Variables	Medicare Costs (1)	Total Medical (2)	Out-of-Pocket Exp. (3)
Good Health	0.019***	0.006***	0.010***
	(0.003)	(0.001)	(0.002)
Fair Health	0.033***	0.011***	0.012***
	(0.005)	(0.002)	(0.002)
Poor Health	0.038***	0.008	0.007
	(0.008)	(0.005)	(0.004)
Ever Smoke	0.006	0	0.001
	(0.004)	(0.001)	(0.002)
Smoker	-0.033***	-0.010***	-0.016***
	(0.005)	(0.002)	(0.002)
No Schooling	-0.001	-0.008	-0.013**
	(0.015)	(0.004)	(0.005)
Less than 8th	-0.01	-0.005*	-0.007**
	(0.006)	(0.002)	(0.002)
Some High School	-0.001	-0.003	-0.004
	(0.005)	(0.002)	(0.002)
Some College	-0.009*	0.003	0.003
	(0.004)	(0.002)	(0.002)
College	0.003	0.006*	0.010***
	(0.006)	(0.003)	(0.003)
Graduate School	0.003	0.009**	0.015***
	(0.007)	(0.003)	(0.004)
Married	0.018	0.008**	0.010**

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Table A.1 – Continued

Variables	Medicare Costs (1)	Total Medical (2)	Out-of-Pocket Exp. (3)
	(0.01)	(0.003)	(0.004)
Widow	0.017	0.004	0.007
	(0.01)	(0.003)	(0.004)
Divorced	0	0.006	0.007
	(0.011)	(0.003)	(0.004)
Separated	-0.019	0.004	0.004
	(0.018)	(0.005)	(0.006)
Black	-0.035***	-0.008***	-0.009***
	(0.006)	(0.002)	(0.002)
Hispanic	-0.051***	0	-0.019***
	(0.01)	(0.004)	(0.003)
Other Race	-0.049***	-0.005	-0.011**
	(0.01)	(0.003)	(0.003)
Male	-0.026***	-0.009***	-0.012***
	(0.004)	(0.001)	(0.002)
Income_5K_10K	0.021**	0.004	-0.001
	(0.008)	(0.003)	(0.003)
Income_10K_15K	0.023**	0.009**	0.010**
	(0.008)	(0.003)	(0.003)
Income_15K_20K	0.035***	0.011***	0.011***
	(0.008)	(0.003)	(0.003)
Income_20K_25K	0.038***	0.009**	0.011**
	(0.008)	(0.003)	(0.004)
Income_25K_30K	0.040***	0.015***	0.019***
	(0.009)	(0.003)	(0.004)
Income_30K_35K	0.042***	0.014***	0.017***
	(0.009)	(0.003)	(0.004)
Income_35K_40K	0.052***	0.025***	0.030***
	(0.01)	(0.004)	(0.005)
Income_40K_45K	0.042***	0.023***	0.030***
	(0.01)	(0.004)	(0.005)
Income_45K_50K	0.031**	0.018***	0.024***
	(0.011)	(0.004)	(0.006)

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Table A.1 – Continued

Variables	Medicare Costs (1)	Total Medical (2)	Out-of-Pocket Exp. (3)
Income_50plus	0.043***	0.026***	0.031***
	(0.009)	(0.003)	(0.004)
Age	0.010***	0.002**	0.003**
	(0.002)	(0.001)	(0.001)
Age^2	-0.000***	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)
Number of Kids	0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)
DRC35	0.004	0.010**	0.007*
	(0.007)	(0.003)	(0.004)
DRC40	0.004	0.007*	0.004
	(0.008)	(0.003)	(0.004)
DRC45	0.017	0.006	0.007
	(0.009)	(0.004)	(0.004)
DRC50	0.027*	0.011*	0.013*
	(0.011)	(0.005)	(0.005)
DRC55	0.015	0.006	0.008
	(0.012)	(0.005)	(0.006)
DRC60	0.012	0.005	0.006
	(0.013)	(0.006)	(0.006)
DRC65	0.011	0.004	0.004
	(0.016)	(0.006)	(0.007)
DRC65_FRA2	0.017	0.002	0.000
	(0.016)	(0.007)	(0.007)
DRC70_FRA4	-0.001	0.005	0.004
	(0.017)	(0.007)	(0.008)
DRC70_FRA6	0.005	0.007	0.003
	(0.019)	(0.007)	(0.008)
DRC75_FRA8	0.069***	0.002	-0.001
	(0.02)	(0.008)	(0.009)
DRC75_FRA10	0.084***	0.007	0.004
	(0.022)	(0.009)	(0.01)
DRC80_FRA66	0.096***	-0.004	-0.011

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Table A.1 – Continued

Variables	Medicare Costs (1)	Total Medical (2)	Out-of-Pocket Exp. (3)
	(0.022)	(0.008)	(0.009)

Note. Robust Standard errors clustered at the individual level are in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

Table A.2: Working and HI Coverage on Medical Spending: Second Stage

Variables	Medicare Costs (1)	Total Medical (2)	Out-of-Pocket Exp. (3)
Good Health	0.335***	0.242***	0.156***
	(0.015)	(0.017)	(0.009)
Fair Health	0.602***	0.409***	0.211***
	(0.02)	(0.024)	(0.013)
Poor Health	1.003***	0.644***	0.230***
	(0.033)	(0.04)	(0.021)
Ever Smoke	0.085***	0.057***	0.026**
	(0.014)	(0.016)	(0.009)
Smoker	-0.245***	-0.172***	-0.144***
	(0.023)	(0.026)	(0.014)
No Schooling	0.044	-0.035	-0.344***
	(0.057)	(0.067)	(0.037)
Less than 8th	-0.074***	-0.084**	-0.154***
	-0.022	-0.026	-0.014
Some High School	-0.070***	-0.041	-0.055***
	(0.019)	(0.023)	(0.012)
Some College	0.075***	0.025	0.064***
	(0.017)	(0.019)	(0.01)
College	0.102***	0.068*	0.170***
	(0.022)	(0.027)	(0.014)
Graduate School	0.109***	0.115***	0.207***

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Table A.2 – Continued

Variables	Medicare Costs (1)	Total Medical (2)	Out-of-Pocket Exp. (3)
	(0.026)	(0.031)	(0.017)
Married	0.01	-0.01	0.046
	(0.039)	(0.046)	(0.025)
Widow	0.064	0.038	0.091***
	(0.039)	(0.046)	(0.025)
Divorced	0.081	0.019	0.055*
	(0.044)	(0.051)	(0.028)
Separated	0.049	-0.004	-0.055
	(0.08)	(0.09)2	(0.05)1
Black	0.105***	-0.01	-0.170***
	(0.025)	(0.028)	(0.015)
Hispanic	0.02	-0.154**	-0.311***
	(0.049)	(0.051)	(0.028)
Other Race	-0.121**	-0.122**	-0.304***
	(0.042)	(0.046)	(0.025)
Male	0.079***	0.018	-0.153***
	(0.016)	(0.018)	(0.01)
Income_5K_10K	-0.029	0.015	-0.028
	(0.036)	(0.042)	(0.023)
Income_10K_15K	0.054	0.08	0.134***
	(0.036)	(0.042)	(0.023)
Income_15K_20K	0.092*	0.123**	0.217***
	(0.038)	(0.044)	(0.024)
Income_20K_25K	0.122**	0.169***	0.295***
	(0.038)	(0.045)	(0.024)
Income_25K_30K	0.133***	0.171***	0.344***
	(0.04)	(0.047)	(0.025)
Income_30K_35K	0.127**	0.180***	0.370***
	(0.042)	(0.049)	(0.027)
Income_35K_40K	0.186***	0.201***	0.407***
	(0.044)	(0.052)	(0.028)
Income_40K_45K	0.205***	0.254***	0.439***
	(0.046)	(0.054)	(0.029)

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Table A.2 – Continued

Variables	Medicare Costs (1)	Total Medical (2)	Out-of-Pocket Exp. (3)
Income_45K_50K	0.209***	0.248***	0.475***
	(0.048)	(0.057)	(0.031)
Income_50plus	0.223***	0.268***	0.540***
	(0.04)	(0.047)	(0.026)
Age	0.042***	0.044***	0.038***
	(0.006)	(0.007)	(0.004)
Age^2	-0.000***	-0.000***	-0.000***
	(0)	(0)	(0)
Number of Kids	0	0.001	-0.002
	(0.003)	(0.004)	(0.002)
N	93,909	93,735	93,735

Note. T-statistics are in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

B The results of EPCHI on Medicare costs

The following table showing the regression results similar to table 11 and table 12, the only difference is instead looking at the effect of Medicare secondary payer, captured by dummy $EPCHI$, I look into the effects of $EPCHI\_R$ and $EPCHI\_S$ on Medicare costs. There are about 7 million sample person are covered by EPCHI through their spouse current employer, and 70% of them are not working.

Table B.1: The Effects of Working and HI Coverage on Medicare Cost Savings

	First Stage			Second Stage		
Variables	Medicare	Total	OOP	Medicare	Total	OOP
Work	-0.042***	0.002	0	-0.127***	-0.095***	0.002

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Table B.1 – Continued

Variables	First Stage Medicare	First Stage Total	First Stage OOP	Second Stage Medicare	Second Stage Total	Second Stage OOP
	-0.005	-0.002	-0.002	-0.022	-0.022	-0.013
EPCHI_R	-0.106***	0.023***	0.030***	-0.277***	0.223***	-0.356***
	-0.01	-0.004	-0.005	-0.067	-0.061	-0.035
EPCHI_S	-0.051***	0.030***	0.039***	-0.01	0.253***	-0.444***
	-0.011	-0.005	-0.006	-0.061	-0.063	-0.037
EPRHI_R	0.130***	0.035***	0.043***	0.364***	0.378***	-0.422***
	-0.006	-0.002	-0.003	-0.035	-0.035	-0.02
EPRHI_S	0.099***	0.035***	0.041***	0.435***	0.411***	-0.571***
	-0.01	-0.004	-0.006	-0.045	-0.05	-0.029
EPUHI	-0.282***	0.027***	0.033***	0.237*	-0.128***	-0.656***
	-0.006	-0.002	-0.003	-0.096	-0.035	-0.02
HMO	0.026***	0.029***	0.032***	0.255***	0.218***	-0.467***
	-0.008	-0.003	-0.004	-0.039	-0.044	-0.025
HMO_Other	0.228***	0.030***	0.035***	0.396***	0.351***	-0.152***
	-0.007	-0.002	-0.003	-0.041	-0.035	-0.02
PriHMO	0.175***	0.019***	-0.005*	0.419***	0.335***	-1.348***
	-0.008	-0.002	-0.003	-0.043	-0.041	-0.023
Medigap	0.140***	0.026***	0.035***	0.321***	0.305***	-0.045
	-0.015	-0.006	-0.007	-0.065	-0.073	-0.042
Medicaid	0.020***	0.007***	0.010***	0.315***	0.231***	0.155***
	-0.003	-0.001	-0.002	-0.014	-0.016	-0.009
Other_HI	0.038***	0.011***	0.012***	0.566***	0.394***	0.213***
	-0.005	-0.002	-0.002	-0.02	-0.022	-0.013
Good Health	0.020***	0.007***	0.005**	0.315***	0.231***	0.155***
	-0.003	-0.001	-0.002	-0.014	-0.016	-0.009
Fair Health	0.038***	0.011***	0.008**	0.566***	0.394***	0.213***
	-0.005	-0.002	-0.002	-0.02	-0.022	-0.013
Poor Health	0.040***	0.004	0.010*	0.950***	0.611***	0.236***
	-0.008	-0.004	-0.004	-0.032	-0.036	-0.021
Age	0.047***	0.009***	0.014***	0.251***	0.248***	0.209***
	-0.006	-0.002	-0.003	-0.02	-0.022	-0.013
Age^2	-0.000***	-0.000***	-0.000***	-0.002***	-0.002***	-0.001***

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Table B.1 – Continued

Variables	First Stage Medicare	Total	OOP	Second Stage Medicare	Total	OOP
	0	0	0	0	0	0

Notes: All regressions also contain gender, income dummies, health controls, race, education, marital status, census region dummies not reported. **DRC** dummies only appear in the first stage not reported. Robust Standard errors in parentheses.
* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

C Years of Delay Enrollment on Medicare Costs

The following table providing empirical results on whether years of delay enrollment will affect Medicare costs. The left panel are the results with direct health status control, the right are the results without direct health control.

Table C.1: Second stage of Heckman Sample Selection Model Regression Results of Years of Delay Enrollment on Medical Expenditures

	(1) With Health Controls			(2) Without Health Controls		
	Medicare	Total	OOP	Medicare	Total	OOP
	Years of Delay Part A					
Work	-0.200***	-0.110***	0.063***	-0.244***	-0.139***	0.049**
	(0.023)	(0.023)	(0.017)	(0.023)	(0.024)	(0.018)
EPCHI	-0.662***	0.047	0.109***	-0.668***	0.039	0.104***
	(0.042)	(0.041)	(0.031)	(0.042)	(0.042)	(0.031)
D_A_1 Yr.	1.110*	0.373	-1.330**	1.067*	0.363	-1.334**
	(0.466)	(0.568)	(0.425)	(0.466)	(0.589)	(0.438)
D_A_2 Yr.	0.315	-0.348	0.018	0.09	-0.477	-0.06
	(1.177)	(1.446)	(1.082)	(1.177)	(1.501)	(1.117)

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Table C.1 – Continued

	(1) With Health Controls			(2) Without Health Controls		
	Medicare	Total	OOP	Medicare	Total	OOP
D_A_3 Yr.	0.45	-0.239	-1.794***	0.361	-0.28	-1.809***
	(0.42)	(0.512)	(0.383)	(0.421)	(0.531)	(0.395)
D_A_4 Yr.	0.464	0.142	-1.613***	0.515	0.182	-1.586***
	-0.303	-0.357	-0.267	-0.304	-0.37	-0.275
D_A_5 Yr.	0.013	-0.115	-1.127***	-0.013	-0.119	-1.125***
	(0.276)	(0.325)	(0.243)	(0.277)	(0.337)	(0.251)
D_A_6 Yr.	0.142	-0.097	-1.990***	0.167	-0.064	-1.958***
	(0.333)	(0.394)	(0.295)	(0.334)	(0.409)	(0.304)
D_A_7 Yr.	0.125	0.102	-1.428***	0.333	0.258	-1.363***
	(0.389)	(0.458)	(0.343)	(0.39)	(0.475)	(0.353)
D_A_8 Yr.	-0.73	-0.649	-1.653***	-0.613	-0.625	-1.663***
	(0.437)	(0.484)	(0.362)	(0.438)	(0.502)	(0.373)
D_A_9 Yr.	-0.671	-1.03	-2.077***	-0.683	-1.035	-2.072***
	(0.476)	(0.547)	(0.409)	(0.477)	(0.568)	(0.422)
D_A_10 Yr.	0.557	0.123	-3.139***	0.523	0.109	-3.141***
	(0.321)	(0.381)	(0.285)	(0.322)	(0.395)	(0.294)
D_A_11 Yr.	-0.16	-0.19	-1.499***	-0.138	-0.162	-1.489***
	(0.131)	(0.15)	(0.112)	(0.131)	(0.156)	(0.116)
Delay_B	-0.506*	-0.295***	-0.167***	-0.393*	-0.288***	-0.163***
	(0.199)	(0.042)	(0.032)	(0.2)	(0.044)	(0.033)
Delay_AB	-0.025	-0.008	-0.343***	-0.02	-0.004	-0.339***
	(0.031)	(0.033)	(0.025)	(0.031)	(0.035)	(0.026)
Good Health	0.361***	0.238***	0.169***			
	(0.016)	(0.016)	(0.012)			
Fair Health	0.631***	0.400***	0.203***			
	(0.022)	(0.022)	(0.017)			
Poor Health	1.041***	0.624***	0.203***			
	(0.035)	(0.037)	(0.028)			
Lambda	0.776***	-2.045***	-1.530***	0.702***	-2.122***	-1.578***
	(0.153)	(0.143)	(0.107)	(0.153)	(0.151)	(0.112)
	Years of Delay Part B					
Work	-0.206***	-0.115***	0.060***	-0.250***	-0.144***	0.046**

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Table C.1 – Continued

	(1) With Health Controls			(2) Without Health Controls		
	Medicare	Total	OOP	Medicare	Total	OOP
	(0.024)	(0.023)	(0.017)	(0.024)	(0.024)	(0.018)
EPCHI	-0.687***	0.022	0.089**	-0.692***	0.014	0.084**
	(0.043)	(0.042)	(0.031)	(0.044)	(0.043)	(0.032)
D_B_1 Yr.	-1.445***	-0.103	-0.013	-1.211**	-0.082	-0.004
	(0.427)	(0.134)	(0.099)	(0.432)	(0.139)	(0.102)
D_B_2 Yr.	-0.234	-0.379	-0.166	0.004	-0.332	-0.138
	(0.916)	(0.311)	(0.229)	(0.929)	(0.322)	(0.236)
D_B_3 Yr.	-0.319	-0.239	-0.016	-0.286	-0.257	-0.027
	-0.292	-0.165	-0.122	-0.295	-0.171	-0.126
D_B_4 Yr.	-0.327	-0.139	-0.091	-0.256	-0.131	-0.085
	(0.26)	(0.101)	(0.074)	(0.262)	(0.104)	(0.077)
D_B_5 Yr.	-1.058**	-0.293*	-0.187*	-1.017**	-0.306*	-0.191*
	(0.389)	(0.116)	(0.086)	(0.393)	(0.12)	(0.089)
D_B_6 Yr.	-0.255	-0.371*	-0.263*	-0.231	-0.362*	-0.253*
	(0.427)	(0.145)	(0.107)	(0.432)	(0.15)	(0.11)
D_B_7 Yr.	-0.700*	-0.202	-0.017	-0.595	-0.178	-0.001
	(0.352)	(0.163)	(0.12)	(0.355)	(0.168)	(0.124)
D_B_8 Yr.	-1.659***	-0.3	-0.104	-1.614***	-0.335	-0.122
	(0.474)	(0.201)	(0.148)	(0.48)	(0.208)	(0.153)
D_B_9 Yr.	-0.435	0.067	0.079	-0.465	0.028	0.058
	(0.62)	(0.258)	(0.19)	(0.628)	(0.267)	(0.196)
D_B_10 Yr.	0.275	0.198	-0.14	0.495	0.232	-0.119
	(0.66)	(0.334)	(0.247)	(0.669)	(0.346)	(0.254)
D_B_10 Yr. Up	0.101	-0.269**	-0.048	0.2	-0.257**	-0.039
	(0.216)	(0.094)	(0.069)	(0.218)	(0.097)	(0.071)
Delay_A	-0.007	-0.168	-1.610***	0.019	-0.144	-1.599***
	(0.093)	(0.104)	(0.076)	(0.093)	(0.107)	(0.079)
Delay_AB	-0.021	-0.005	-0.341***	-0.016	-0.002	-0.337***
	(0.031)	(0.034)	(0.025)	(0.031)	(0.035)	(0.026)
Good Health	0.361***	0.238***	0.168***			
	(0.016)	(0.016)	(0.012)			
Fair Health	0.632***	0.400***	0.203***			
	(0.022)	(0.023)	(0.017)			

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Table C.1 – Continued

	(1) With Health Controls			(2) Without Health Controls		
	Medicare	Total	OOP	Medicare	Total	OOP
Poor Health	1.040***	0.623***	0.204***			
	(0.035)	(0.038)	(0.028)			
Lambda	0.795***	-2.094***	-1.545***	0.738***	-2.168***	-1.593***
	(0.163)	(0.146)	(0.108)	(0.164)	(0.154)	(0.113)
	Years of Delay Part A + B					
Work	-0.201***	-0.111***	0.060***	-0.245***	-0.140***	0.045**
	(0.023)	(0.023)	(0.016)	(0.023)	(0.024)	(0.017)
EPCHI	-0.663***	0.047	0.098***	-0.669***	0.039	0.093**
	(0.042)	(0.041)	(0.029)	(0.042)	(0.042)	(0.03)
D_AB_1 Yr.	0.063	0.07	-0.062	0.038	0.057	-0.067
	(0.071)	(0.079)	(0.057)	(0.071)	(0.082)	(0.058)
D_AB_2 Yr.	-0.126	-0.085	-0.142*	-0.113	-0.072	-0.13
	(0.088)	(0.099)	(0.071)	(0.089)	(0.102)	(0.073)
D_AB_3 Yr.	-0.101	-0.071	-0.123	-0.113	-0.071	-0.116
	(0.118)	(0.13)	(0.094)	(0.118)	(0.135)	(0.097)
D_AB_4 Yr.	0.188	-0.031	-0.173	0.205	-0.019	-0.172
	(0.112)	(0.128)	(0.092)	(0.113)	(0.132)	(0.094)
D_AB_5 Yr.	-0.23	0.01	-0.042	-0.265	0.007	-0.033
	(0.175)	(0.195)	(0.14)	(0.175)	(0.201)	(0.144)
D_AB_6 Yr.	0.296	0.166	-0.682***	0.275	0.157	-0.676***
	(0.191)	(0.219)	(0.157)	(0.191)	(0.226)	(0.162)
D_AB_7 Yr.	0.606**	0.409	-0.312	0.622**	0.435	-0.3
	(0.212)	(0.248)	(0.178)	(0.213)	(0.257)	(0.183)
D_AB_8 Yr.	0.377	0.128	-0.227	0.391	0.146	-0.218
	(0.297)	(0.343)	(0.247)	(0.298)	(0.355)	(0.254)
D_AB_9 Yr.	-0.049	-0.038	-1.087***	-0.113	-0.059	-1.084***
	(0.287)	(0.339)	(0.244)	(0.287)	(0.351)	(0.251)
D_AB_10 Yr.	-0.112	0.611	-0.193	-0.135	0.637	-0.168
	(0.395)	(0.422)	(0.304)	(0.397)	(0.437)	(0.312)
D_AB_10 Yr. Up	0.361*	0.188	-0.640***	0.381*	0.197	-0.629***
	(0.162)	(0.182)	(0.131)	(0.162)	(0.189)	(0.135)
Delay_A	-0.01	-0.167	-1.590***	0.013	-0.143	-1.580***

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Table C.1 – Continued

	(1) With Health Controls			(2) Without Health Controls		
	Medicare	Total	OOP	Medicare	Total	OOP
	(0.092)	(0.102)	(0.073)	(0.092)	(0.105)	(0.075)
Delay_B	-0.498*	-0.294***	-0.157***	-0.392	-0.288***	-0.153***
	(0.199)	(0.043)	(0.031)	(0.2)	(0.044)	(0.032)
Good Health	0.360***	0.238***	0.168***			
	(0.016)	(0.016)	(0.012)			
Fair Health	0.631***	0.401***	0.204***			
	(0.022)	(0.022)	(0.016)			
Poor Health	1.039***	0.624***	0.204***			
	(0.035)	(0.037)	(0.027)			
Lambda	0.771***	-2.053***	-1.478***	0.702***	-2.126***	-1.520***
	(0.153)	(0.144)	(0.103)	(0.154)	(0.152)	(0.108)
Obs.	72736	95,241	95,241	72736	95,241	95,241

Notes: All regressions also contain age, age square, gender, income dummies, health controls, race, education, marital status, number of kids not reported. Robust Standard errors are in parentheses.
*** Significant at 1 percent.
** Significant at 5 percent.
* Significant at 10 percent.

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