Impact of the Change in Payments on the Actual and Perceived Behaviors of Medical Care Providers

Amy Eremionkhale *

October 2018

Abstract

Prior literature established the link between a person aging out of a parent's insurance coverage at age nineteen and a significant decrease in insurance coverage of those nineteen year old young adults. Using the regression discontinuity framework, this paper furthers that research by establishing that although there was no change in the total income received by the medical care providers treating young adults who have aged-out of their parent's insurance, there was a significant change in the amounts received from various sources that comprise the total payment. I examine the impact of the change in the provider's payments by source on the providers' behavior (supply-side) and on the patients' perception of the providers' behavior (demand-side), using a 14 year sample of unmarried young adults from the Medical Expenditure Panel Survey (MEPS). I find that although there is a statistically significant change in the sources of the total payments received by medical care providers from patients crossing the age of nineteen threshold, medical care providers do not change their actual treatment decisions. However, the patients do perceive a statistically significant negative change in the behavior of their medical care providers.

Keywords: Health Insurance, Patient's Perception, Treatment Decisions, Medical Care Providers Behavior, Age-Out Policy.
JEL codes: I10, I11, I12, I13, I18, I28

*Lehigh University, College of Business and Economics, Department of Economics. 621 Taylor Street, Bethlehem PA 18015. (email: aee214@lehigh.edu). I would like to offer my sincerest gratitude to my dissertation committee: Shin-Yi Chou, Todd Watkins, Mary Deily, and Suhui Li. In addition, I am grateful to the conference participants of session N9 at the 44^{th} annual meeting of the Eastern Economic Association for the many helpful comments. All errors are my own.

1 Introduction

The recent repeal of the individual mandate of the Patient Protection Affordable Care Act (PPACA) which was implemented in 2010, has made it important to study the impact of owning and then losing health insurance coverage on both patients and providers. This paper investigates how a change in the payments received by medical care providers affects their treatment decisions, and their behavior as perceived by their patients. Patients' perspectives on their medical treatment experience have received considerable prominence in the evaluation of modern healthcare, with these subjective appraisals being viewed as valuable health outcomes. (Boquiren *et al.* , 2015; Kupfer & Bond, 2012; Squires, 2012; Riiskjær *et al.* , 2010; Freeman, 2002)

To carry out this analysis, I take advantage of the pre-2010 law specifying that young adults aged out of their parent's insurance plan at the age of nineteen. Existing literature shows that there was a sharp drop in their insurance coverage rates (Andrews, 2013; Palmieri, 2017). I use the loss of insurance coverage as a natural experiment that allows for the identification of the change in the payments received by their medical care providers.

I study the treatment and perceptions of a sample of unmarried young adults, excluding full time students, from the Medical Expenditure Panel Survey (MEPS). The sample period begins in 1996, the earliest year available, and ends in 2009; the year before the 2010 Affordable Care Act.

I first establish that although the total payments received by the providers did not change, the amounts received from the different payment sources changed, as the young adults' aged-out of their parent's insurance. I use regression discontinuity

to correct for possible endogeneity of provider payments. Provider payments maybe endogenous because it is likely correlated with unobserved provider and patient preferences. However, the aging-out policy exogenously determines the insurance status of the patients which affects how medical treatments will be paid. This change in status is not related to the physicians preference or patient preference, but rather is determined by the natural process of aging and therefore is an exogenous shock to the payments received by providers. I then investigate the impact of the change in the provider's payments on their treatment decisions and on the patients' perception of the providers' behavior.

In the regression discontinuity framework, I compared those who are just above nineteen and just below nineteen, because these two groups should be very similar within a narrow bandwidth. To confirm the similarity between the two groups I performed a smoothness test of other characteristics within a bandwidth of twelve months just above and just below the age of nineteen. The observable characteristics are smooth across the threshold of age nineteen, as discussed in below.

This paper makes three contributions to the current literature including how changes in providers' payments affects their treatment decisions. I find that although there are statistically significant changes in the amount paid to the providers' payments from the different sources, there is no statistically significant change in the providers' treatment decisions. Secondly, this paper contributes by investigating the patients' perception of their providers' behaviors. I find that there is a statistically significant change in the patients' perception of their providers' behaviors as the payments made to their providers change. This change in perception is for the worse, as

patients perceive that their providers are less respectful of them, spend less time with them, and do not listen to them as much as they did before the change in the providers' payments. This contribution is important because these changed perceptions may affect trust and follow up in the treatment plan. Finally, I make a methodological contribution in applying regression discontinuity to examine the causal relationship between the payments received by providers from the different sources, the treatment decision of the providers, and their patients' perception.

The rest of the paper is organized as follows; Section 2 discusses the dataset and how the analysis sample is built. Section 3 presents the empirical framework and discusses the identification strategy. Section 4 discusses the results of the analysis. The robustness checks of these results are reported and discussed in Section 5. The discussion and summary of this paper are in Section 6. The figures and tables for this paper are at the displayed end the paper, after the references.

2 Data

2.1 Data Description

I use data on individual office visits from the Medical Expenditure Panel Survey (MEPS) for the analysis. The Medical Expenditure Panel Survey (MEPS) is a set of large-scale nationally representative surveys of families and individuals, their medical providers, and employers across the United States (AHRQ, 2009), and is the most complete source of data on the cost and use of health care and health insurance coverage available. MEPS has been used extensively in scientific publications and

published reports, as well as by the Federal and state governments to examine the delivery and financing of health care in the United States (Cohen *et al.* , 2009; AHRQ, 2018; Wang *et al.* , 2006).

I use data from two of the MEPS surveys: a household survey and a survey of medical providers (provider refers to a combination of Physicians and Non-Physicians, e.g. RN, LPN, PA, etc.) The Household Component[1] collects data from a new panel of sample households each year. The data for each panel is collected over two calendar years, in five rounds of interviews. Each round of MEPS-HC interviews collects information pertaining to a specific time period called a reference period (AHRQ, 2015; Cohen *et al.* , 2009; Harrison *et al.* , 2018).

The Office-Based Medical Provider Visits File [2] provides detailed information on office-based provider visits for a nationally representative sample of the civilian non-institutionalized population of the United States (AHRQ, 2014). I combine data from these two survey files using the person identifier, DUPERSID, for each year to develop my sample.

[1]This component results from the household survey. Other event files are Dental Visits files, Other Medical Expenses files, Hospital Inpatient Stays files, Emergency Room Visits files, Outpatient Visits files, Prescribed Medicines File, Home Health files, Appendix to MEPS Event files (AHRQ, 2017).

[2]The Office-Based Provider Public Use Data File contains characteristics associated with the office-based visit, such as, date of the visit, time spent with the provider, types of treatment and services received, types of medicine prescribed , condition codes , expenditures, and sources of payment associated with the visit (AHRQ & Quality, 2014).

2.2 Analysis Sample

The sample pools data from 1996, the earliest available data through 2009, the last year before the implementation of the PPACA. I extract data on unmarried young adults who are not full-time students because the age-out policy did not apply to full-time students (Healthcare.gov, 2012; Anderson *et al.* , 2012).

I am able to measure the age of the young adults used in my analysis in months because MEPS data include the birth month and year of each patient as well as the month and year in which each office-based visit occurred. In the 14 year sample, there are 7,912 office-based visits occurring within the bandwidth of 12 months on either side of age 228 months for the young adults. The threshold age is 228 months (19 years $\times$ 12 months), with observations on young adults in the age range of 216 months and 240 months.

Each observation in the sample represents one office visit, and includes information on the demographics of the patient, the ICD9 condition addressed during that visit, and the payments for care provided, including out-of-pocket payments, payments by private insurance, Medicaid, and other sources. In an effort to minimize the influence of outliers, I exclude visits with total payments greater than \$300, which represented the approximate value for the 95^{th} percentile of the total payments.

3 Empirical Framework and Estimation

3.1 Empirical Framework

The following model is estimated by OLS. The bandwidth is limited to twelve months around the age 228 months threshold, and the regressions take the form:

$$\begin{aligned} Y_{ivrt} \qquad & \alpha_0 \; \alpha_1 \, AO_{iv} \; \alpha_2 \, AO_{iv} \times (age_{iv} - 228\text{months}) \\ & \alpha_3 \, (1 - AO_{iv}) \times (age_{iv} - 228\text{months}) \; \delta \, X_{iv} \; \text{ICD9}_{iv} \; \alpha_t \; \alpha_r \; u_{iv}, \end{aligned} \tag{1}$$

where Y represents an outcome or treatment measures for patient i at visit v in region r in year t. The treatment measures are the payments received by the medical care providers. The total payments received by the provider for each office-based visit are comprised of payments from different sources, including: private insurance, Medicaid, out-of-pocket (from the patients), and other sources. The second measure of payments I use in this analysis, is the sum of the amounts received from private insurance and Medicaid for each visit. This is because the age-out policy affected young adults with coverage from either their parent's private insurance or coverage from Medicaid. In addition to these total payment values, I include the payments received by the providers separated by source in order to better analyze the nuanced changes occurring in the providers' payments. The summary statistics of these variables are shown in the section of table 1.

The outcome variables are comprised of the provider treatment decision measures and the patient perception measures. The provider decisions measured are

indicator variables: “Any Medicine Prescribed", “Lab Tests", and “Other Diagnostic Test/Exam". Respectively, these variables equal one if medicine was prescribed during the visit, or lab tests were done during the visit, and other relatively more time consuming diagnostic tests/exams[3] were performed during the office-based visit.

The patients' perception outcome measures are indicator variables: “Enough Time", “Listen", and “Respect", that equal one if the patient reported that the provider spent enough time with them during the visit, listened to them, and showed them respect during the office-based visit.

AO stands for Age-Out and is an indicator variable that equals one if the individual i is older than 228 months at time of the visit v. The estimated coefficient of this variable, α_1, represents the estimated discontinuity of interest at the age threshold for each of the outcome and treatment variables.

The variable *age* represents the age of the individual i at year t of the visit v measured in months.[4] The use of the month unit of measure is appropriate for this study because many private and some public health plans cover dependents through the last day of the month in which the dependent turns 228 months (Anderson *et al.* , 2012; Collins *et al.* , 2008).[5] Separate age trend terms above $[(AO_{iv}) \times (age_{iv} - 228\text{months})]$ and below $[(1 - AO_{iv}) \times (age_{iv} - 228\text{months})]$ the age cutoff are included in the model and parameterized so that α_2 α_3 if the trend is the same above and

[3]Tests/Exams other than lab-tests, such as in-depth physical exams, and intricate personal information (and behavior) gathering - questioning

[4]Given the bandwidth of twelve months, the individuals in the main analysis are aged 216 months, 217, 218, ..., 228 months, 229, 230, ..., and 240 months at the time of the office-based visit.

[5]A detailed discussion of the Regression Discontinuity (RD) design and its related issues is put forward in Imbens & Lemieux (2008) and Lee & Lemieux (2010).

below the cutoff (Almond *et al.* , 2010).

X_{iv} is a vector of the demographic variables for each individual in the sample. The demographic variables used in this analysis are: race (equals one if the patient is White and zero otherwise), gender (equals one if the individual is female, and zero otherwise), ethnicity (equals one if the patient is Hispanic and zero otherwise). Also includes: employment status (equals one if the patient is employed, either full-time or part-time employed and zero if unemployed), marital status (equals one if patient is married and zero otherwise[6]), and socio-economic status (equals one if the individual is below 124% of the poverty line).

The conditions treated in each visit are represented using ICD-9-CM condition codes which have been aggregated into clinically meaningful categories that group similar conditions (CCCODEX) (AHRQ, 2008)[7]. These conditions are grouped using the Charlson Commorbodity Index (CCI) where the indicator variable, *ICD9*, equals one for the observations for CCI values less than 2, and zero for observations with CCI values greater than or equal to two (Roffman *et al.* , 2016). Finally, the model also includes the year (α_t) and region (α_r) fixed effects. The regions in the sample are Northeast, Midwest, South, and West.

All estimations of equation 1 are weighted using the final person weight, called PERWTF in the household component data of MEPS. The standard errors are clus-

[6]The other categories that comprise of other than married, are Separated, Divorced, Widowed, and Never Married.

[7]ICD9 codes are The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) is the U.S. health system's adaptation of international ICD-9 standard list of six-character alphanumeric codes to describe diagnoses. ICD-9-CM contains a list of codes corresponding to diagnoses and procedures recorded in conjunction with hospital care in the United States (Rouse, 2014).

tered by ages, which are measured in months (Lee & Card, 2008).

The reduced form estimates of the direct impact of the AO_{iv} indicator on the treatment and outcome measures are reported separately. This paper identifies the causal effect of the change in payments on the actual and perceived behaviors of medical care providers by combining the outcome and treatment estimates (Almond *et al.* , 2010).

In the language of instrumental variables, the discontinuity in actual provider behavior and patient perceived provider behaviors are the reduced-form estimates and the discontinuity in provider payments is the first-stage estimate. There are several ways to compute the IV estimator (Cameron & Trivedi, 2017). I compute the estimator as:

$$\beta \quad \frac{\dfrac{dy(\text{outcome})}{dz}}{\dfrac{dy(\text{treatment})}{dz}} \qquad \frac{\dfrac{d(\text{“Any Medicine Prescribed"})}{d(AO)}}{\dfrac{d(\text{payments})}{d(AO)}} \tag{2}$$

$$\frac{\alpha_1(\text{“Any Medicine Prescribed"})}{\alpha_1(\text{payments})}$$

where β is the effect of the change in the providers' payments on the actual and perceived behaviors of the providers. The reduced form estimate of the effect of turning 228 months on the various outcome variables (for instance, the “Any Medicine Prescribed" variable), $dy(\text{outcome})/dz$, is divided by $dy(\text{treatment})/dz$, the reduced form estimate of the effect of turning 228 months on the treatment variable: the

medical care providers' payments.

In this framework, the instrument is the *AO* indicator. For the *AO* indicator to be a valid instrument, there must exist a strong first-stage relationship between the *AO* indicator and the measure of the per-visit provider revenue; note that this relationship will be conditional on our running variable (age in months). Also, the exclusion restriction requires that the only mechanism through which the instrument *AO* indicator affects the actual provider behaviors and patient perception outcomes, conditional on age-in-months falling within the bandwidth, is through its effect on the provider's payments (Cameron & Trivedi, 2017; Almond *et al.* , 2010; About.com, 2014).That is, the only way turning 228 months years old affects actual and perceived medical provider behavior is through its effect on the providers' payments.

3.2 Smoothness Criteria

The existence of smooth observable characteristics validates the exclusion restriction, where the discontinuous change in revenue we observe at the age threshold is due only to the discontinuous change in insurance status at age 228 months and not due to any discontinuous changes in other characteristics (Anderson *et al.* , 2012; Almond *et al.* , 2010; Lee & Lemieux, 2010; Imbens & Lemieux, 2008). The regression discontinuity design requires the assumption that no other variables change discontinuously at the age of 228 months threshold (McCrary, 2007; Zuckerman *et al.* , 2006; Trochim, 1984).

These continuity assumptions might not be plausible if the young adults were able to manipulate the running variable; their age (McCrary, 2007; Almond *et al.* , 2010;

Anderson *et al.* , 2012). However, the age of the young adults cannot be reasonably manipulated because we measure age at the monthly level in our analyses (Anderson *et al.* , 2012). This fact implies that most obvious confoundersparticularly high school graduation or commencement of employment, should not bias the estimates. For example, high school graduations occur in June, but nineteenth birthdays are distributed throughout the year. Thus, the high school graduation rate should not change discontinuously in the month following an individual's nineteenth birthday. Table 2 and figure 1 show the check of smoothness. The last two columns of table 2 show that smoothness of these factors exists in this paper's analysis. That is, the observable characteristics of the young adults measured and conditions treated are similar for the group of patients on either side of the 228 month threshold. These columns report regression coefficients and standard errors (SE) from making the observable characteristics the Y variables in equation 1.

The lack of a significant difference in the observable characteristics and further the unobservable characteristics between the two groups of individuals shows the comparability at the baseline around the cutoff age of 228 months.

4 Results

Figure 2 shows the payments by sources received by the medical care providers around the 228 month threshold. The figures show that there is no obvious change the total payment received by the providers for each visit. There does, however, appear to be a significant decrease in the total amount received from private insurance and

Medicaid sources combined. The largest change appears to be the decrease in the amount sourced from private insurance. The payments received from the out-of-pocket source of the patients visually shows a jump across the threshold.

Figure 3 presents the three measures of the providers' actual treatment decisions around the age threshold. There is no obvious increase or decrease in the measures of the providers' treatment decisions. Figure 4 represents the three variables for the patients' perception of their providers' behavior. Here, there does appear to be a clear decrease for all three variables, across the threshold. Inspection of these figures reveal that there may be strong effects in the payments and the patients perceptions, but not in the actual treatment decisions.

4.1 Change in Medical Providers' Payments Across Threshold - Treatment Variable.

The estimated impact of aging out on payment sources is shown in table 3. The results show that there is a statistically significant decrease in the sum of the payments received by medical care providers sourced from private insurance and Medicaid in the amount of \$7.61 across the age threshold. This implies a 16.33% ($\frac{7.614}{46.60}$) reduction in the payments compared to a mean of \$46.60 for the twelve months below the threshold (the "untreated" group in this regression discontinuity design). The total payment from all sources received by the providers' does not change statistically significantly as the young adults age out of their parent's insurance coverage.

There is a statistically significant increase in the medical providers' per-visit revenue sourced from the out-of-pocket payments made by the patients, in the amount

of $5.77. This amount represents a 45.87% increase compared to the mean of $12.58 for the twelve months before the age 228 month threshold. The payments sourced from private insurance decreased statistically significantly by −$9.986. This decrease is a 37.96% drop in the payment sourced from private insurance, compared to the "before" average of $26.31. There is no statistically significant change in the amounts received from the other payment sources. These results are supported by the findings in previous literature on the drop in insurance coverage that occurs across the threshold of age 228 months (Anderson *et al.* , 2012).

Therefore, when there is a loss of insurance coverage induced by the natural experiment (aging-out policy), the medical care providers do not lose a statistically significant amount of their total per-visit revenue. However, the patients pay 45.87% more money out of pocket than they did before aging out, and payments from private insurance companies decrease by a statistically significant 37.96%.

4.2 Change in the Providers' Treatment Decisions

Table 3 presents the estimates of changes in three provider treatment decisions: "Any Medicine Prescribed", "Lab Tests", and "Other Diagnostic Test/Exam". On average, providers prescribed medicine during 28.58% of their office-based visits, as shown in Table 1. The estimated change in the prescribing behavior of medical care providers across the threshold is -0.036. This result is not statistically significant, which implies that there is no discontinuous change in the prescription behavior of medical care providers across the age threshold of 228 months.

The mean of the second treatment variable is 0.2425, which implies that a lab

test occurred for 24.25% of the visits in the sample, as shown in Table 1. The estimated change in the occurrence of lab tests across the threshold is -0.039, and is not statistically significant. This result implies that providers do not change their treatment behavior as it relates to the number of visits where lab tests are performed.

The mean of the third variable “Other Diagnostic Test/Exam" shows that in 11.24% of the visits (as shown in Table 1), some diagnostic test or exams other than lab tests were performed. The estimated change in the occurrence of other diagnostic test and exams during an office-based provider visit is -0.045 with a standard error of 0.036. It is therefore, not statistically significant. That is, medical care providers did not significantly decrease their use of other diagnostic test and exams during visits, across the age threshold.

Overall, medical care providers do not change their treatment decisions as their patients age across the threshold of 228 months.

4.3 Patient Perception of Change in Providers' Behaviors

The mean of the first patient perception variable, enough time, is 40.82% (Table 1). The estimated change in this variable across the age 228 months threshold is -0.079 percentage points with a standard error of 0.031, making it statistically significant at the 5% level of significance, as shown in Table 3. This statistically significant decrease represents a 19.59% ($\frac{0.079}{0.4033}$) decrease relative to the mean of 40.33% from the twelve months prior to 228 months.

The mean of the second variable “Listen" shown in Table 1, indicates that patients felt that they were listened to in 44.52% of the office-based visits. The estimated

change in this patient perception variable is -0.105 percentage points with a standard error of 0.028, which is statistically significant at the 1% level of significance. This estimate represents an approximate decrease of 24.22% in the visits where patients felt the provider listened listen to them, relative to the average of 43.36% from the twelve months below the threshold.

The mean of the third variable, “Respect", shown in Table 1 is 46.21%. The estimated change in this perceived variable is -0.091. It is statistically significant at the 5% level of significance. The estimate represents an approximate decrease of 20.09% in the visits where providers felt respected by their provider, relative to the below 228 month threshold average of 45.30%.

Overall, the results reported in table 3 show that across the threshold of age 228 months, patients felt significantly less satisfied with their provider's behavior. Once they turned 19, the patients felt that the medical providers spent less than enough time with them, they felt less respected, and they felt the providers did not listen to them as much.

4.4 Impact of the Change in Provider Payments on the Actual and Perceived Behavior of Medical Care Providers

This section discusses the analogous instrumental variable estimates, β, which are reported in table 4. It reports on the impact that the changes in the providers' payments by sources has on the actual and perceived behaviors of the provider, across the discontinuity. All specifications include before and after trends, year trends, conditions, and other covariates. The estimated changes are reported for a $10 change

in the payments received by the provider.

The first three columns of table 4 show the effect of the change in total payment on the actual treatment decisions of medical care providers. The standard errors of these βs are derived using the propagation of error (Chemistry-LibreTexts, 2018).[8] The last three columns of table 4 show the effect that the change in the providers' payments by each source, has on the patients' perception of their provider's behavior.

The results show that a \$10 decrease in total per-visit payment does not lead to statistically significant change in any of the measured provider's treatment decisions. The total payment for each visit received by the medical care provider is the only payment measure used to investigate the impact on the actual treatment decision of the providers.

A \$10 decrease in the payments from the sum of private insurance and medicaid sources leads to a statistically significant decrease of 0.1038, 0.1379 and 0.1195 percentage points in the visits where the young adults felt that their provider spent enough time with them, listened to them and respected them, respectively. This result is driven by the estimated change in private insurance payments.

An increase of \$10 in the patients' out-of-pocket payments received by the provider leads to a statistically significant decrease in the visits where patients' felt their provider spent enough time with them by 0.1369 percentage points. The results show that there is a statistically significant decrease of 0.1819 percentage points in the visits where patients felt listened to and a statistically significant decrease of

[8]Propagation of Error (or Propagation of Uncertainty) is defined as the effects on a function by a variable's uncertainty. It is a calculus derived statistical calculation designed to combine uncertainties from multiple variables, in order to provide an accurate measurement of uncertainty.

0.1577 percentage points in the visits where patients felt respected by the providers, as the payments they made out-of-pocket to their providers increased by $10.

In sum, there is no change in the providers' actual treatment decisions as the payments from the various sources change. However, the patients perceive a difference in the behavior of their medical care providers, as the sources of the payments received by the providers change.

5 Robustness Checks

In this section, I discuss the sensitivity of my results to alternative bandwidths (section 5.1), and the sensitivity of the results to the outliers of the payments limits (section 5.2).

5.1 Bandwidth Sensitivity

The OLS estimates of the treatment and outcome variables are qualitatively the same for a wide range of bandwidths. Table 5 repeats the results for a twelve-month bandwidth, then reports the estimates with nine-month and fifteen-month bandwidths.

Overall, the estimated discontinuities shown in table 5 are qualitatively similar across the nine month to 15 month bandwidth. When the bandwidth is nine months, the change in the total payments is $-\$2.165$, the change in payments sourced from private insurance and Medicaid combined is $-\$9.052$, the change in out-of-pocket payments is $4.917, and the change in payments sourced from private insurance is

−\$10.255. When the bandwidth expands to fifteen months on either side of the threshold, the total payments, the payments sourced from Medicaid and private insurance combined, the out-of-pocket payments, and the private insurance payments change by $\$1.327, -\$7.046, \$5.366$, and $-\$10.366$, respectively. These are similar to the changes estimated with the main bandwidth of twelve months.

5.2 Outlier Sensitivity

Changing the limit with which I determined the outliers removed from my analysis sample does not change the qualitative estimates of the treatment and outcome variables using the reduced form equation 1. In table 6, I show that these point estimates for an analysis sample without the outliers in the 80^{th} percentile (approximately \$100) and the 90^{th} percentile (approximately \$200) of the total payment variable, are qualitatively similar.

6 Discussion

This paper finds that there is a statistically significant drop by 16.33% in payments that results from the drop in private and public (Medicaid) insurance coverage, with the drop of 37.96% in payments sourced from private insurance. On the other hand, there is a statistically significant increase of 45.87% in the out-of pocket source of payment. These results are reflective of the drop in insurance coverage among the young adults occurred due to young adults aging out of their parents insurance at age 228 months (Collins *et al.* , 2008; Schwartz & Damico, 2010; Palmieri, 2017). Despite

the change in the sources of the total payment, my results showed that there was no change in the actual treatment decisions of the medical care providers. However, my further results indicate that patients did perceive a change in the behavior of their medical care providers, namely, the patients felt that their providers did not spend enough time with them, the patients felt less respected, and the patients felt less listened to by their medical care providers.

Combining the results from the reduced form estimates of the treatment and outcome variables allowed for the causal estimation of the effect of the change in payments on the actual and patient-perceived behaviors of the medical care providers. As the sources of the payments received by medical care providers changed, their actual treatment decisions did not change. However, the patients' perception of their providers' behaviors changed as these payment sources changed. Implying that the patient's expected more from their medical care providers as the out-of-pocket payments they made increased.

The relatively recent repeal of the individual mandate portion of the Patient Protection and Affordable Care Act (PPACA) will allow for a drop in the level of private health insurance coverage that currently exists in the economy, mostly from the non-elderly adult population, of which the nineteen year old's are a relevant proxy (Anderson *et al.* , 2012). This would, as estimated in this paper, thus lead to significant changes in the sources of the payments received by medical care providers. Therefore, given that the patient's perception of their providers is increasingly considered a cornerstone of effective health care delivery (Clever *et al.* , 2008), my results shown and discussed above highlight the importance of considering how these patient

perceptions change as the payment structure of their medical care providers' changes.

References

About.com. 2014. *The Importance of Exclusion Restrictions in Instrumental Variables*.

AHRQ. 2008 (July). *MEPS HC-104 - Medical Conditions*.

AHRQ, Agency for Healthcare Research. 2009 (Aug). *Medical Expenditure Panel Survey Background*.

AHRQ, Agency for Healthcare Research. 2014. *Medical Expenditure Panel Survey Public Use File Details*.

AHRQ, Agency for Healthcare Research. 2015. *Medical Expenditure Panel Survey Survey Questionnaires*.

AHRQ, Agency for Healthcare Research. 2017 (Nov). *Medical Expenditure Panel Survey Download Data Files*.

AHRQ, Agency for Healthcare Research. 2018. *Medical Expenditure Panel Survey Home*.

AHRQ, Agency for Healthcare Research, & Quality. 2014. *Medical Expenditure Panel Survey Public Use File Details*.

Almond, Douglas, Doyle, Jr., Joseph J., Kowalski, Amanda E., & Williams, Heidi. 2010. Estimating Marginal Returns to Medical Care: Evidence from At-risk Newborns*. *The Quarterly Journal of Economics*, **125**(2), 591–634.

Anderson, Michael, Dobkin, Carlos, & Gross, Tal. 2012. The Effect of Health Insurance Coverage on the Use of Medical Services. *American Economic Journal: Economic Policy*, **4**(I), 1–27.

Andrews, Michelle. 2013 (Oct). *Options For Young Adults: Stay On The Folks' Plan, Move To The Marketplace Or Go Without*.

Boquiren, Virginia M., Hack, Thomas F., Beaver, Kinta, & Williamson, Susan. 2015. What Do Measures of Patient Satisfaction with the Doctor Tell Us? *Patient Education and Counseling*, **98**(12), 1465–1473.

Cameron, Adrian Colin, & Trivedi, Pravin K. 2017. *Microeconometrics Methods and Applications*. Cambridge University Press.

Chemistry-LibreTexts. 2018 (Mar). *Propagation of Error*.

Clever, Sarah L., Jin, Lei, Levinson, Wendy, & Meltzer, David O. 2008. Does Doctor-Patient Communication Affect Patient Satisfaction with Hospital Care? Results of an Analysis with a Novel Instrumental Variable. *Health Services Research*, **43**(5p1), 1505–1519.

Cohen, Joel W., Cohen, Steven B., & Banthin, Jessica S. 2009. The Medical Expenditure Panel Survey. *Medical Care*, **47**(Supplement), S44–S50.

Collins, Sara R., Schoen, Cathy, Kriss, Jennifer L., Gould, Elise M., & Mahato, Bisundev. 2008. Rite of Passage? Why Young Adults Become Uninsured and How New Policies Can Help. *Commonwealth Fund Issue Briefs*, **38**(Jan), 1–24.

Freeman, Tim. 2002. Using Performance Indicators to Improve Health Care Quality in the Public Sector: A Review of the Literature. *Health Services Management Research*, **15**(2), 126–137.

Harrison, Jordan M., Lagisetty, Pooja, Sites, Brian D., Guo, Cui, & Davis, Matthew A. 2018. Trends in Prescription Pain Medication Use by Race/Ethnicity Among US Adults With Noncancer Pain, 2000–2015. *American Journal of Public Health*, **108**(6), 788–790.

Healthcare.gov. 2012 (Sep). *Health Insurance Coverage For Children and Young Adults Under 26.*

Imbens, Guido W., & Lemieux, Thomas. 2008. Regression Discontinuity Designs: A Guide to Practice. *Journal of Econometrics*, **142**(2), 615–635.

Kupfer, Joel M., & Bond, Edward U. 2012. Patient Satisfaction and Patient-Centered Care. *Jama*, **308**(2), 139.

Lee, David S., & Card, David. 2008. Regression Discontinuity Inference with Specification Error. *Journal of Econometrics*, **142**(2), 655–674.

Lee, David S, & Lemieux, Thomas. 2010. Regression Discontinuity Designs in Economics. *Journal of Economic Literature*, **48**(2), 281–355.

McCrary, Justin. 2007 (January). *Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test.* Working Paper 334. National Bureau of Economic Research.

Palmieri, Ginny. 2017 (Nov). *Benefit Spotlight: Milestone Birthdays That Matter For Dental and Vision Coverage.*

Riiskjær, Erik, Ammentorp, Jette, Nielsen, Jørn Flohr, & Kofoed, Poul-Erik. 2010. Patient surveys—A key to organizational change? *Patient Education and Counseling*, **78**(3), 394–401.

Roffman, Caroline E, Buchanan, John, & Allison, Garry T. 2016. Charlson Comorbidities Index. *Journal of Physiotherapy*, **62**(3), 171.

Rouse, Margaret. 2014 (Dec). *What is ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification) ? - Definition from WhatIs.com.*

Schwartz, Karyn, & Damico, Anthony. 2010 (Mar). *Aging Out of Medicaid: What Is the Risk of Becoming Uninsured?*

Squires, Sharon. 2012. Patient satisfaction: How to get it and how to keep it. *Nursing Management (Springhouse)*, **43**(4), 26–32.

Trochim, William. 1984. *Research Design for Program Evaluation: The Regression-Discontinuity Design.* SAGE Publications, Inc.

Wang, Li Yan, Zhong, Yuna, & Wheeler, Lani. 2006. Asthma Medication Use in School-Aged Children. *Journal of Asthma*, **43**(7), 495–499.

Zuckerman, Ilene H., Lee, Euni, Wutoh, Anthony K., Xue, Zhenyi, & Stuart, Bruce. 2006. Application of Regression-Discontinuity Analysis in Pharmaceutical Health Services Research. *Health Services Research*, **41**(2), 550–563.

Table 1: Sample Summary Statistics

	Entire Sample		Before 228 Months	
	Mean	Std. Dev.	Mean	Std. Dev.
	(1)	(2)	(3)	(4)
Payment Variables:				
Total Payment From All Sources ($)	67.31	57.99	68.85	57.38
Total Payment from Private Insurance & Medicaid ($)	42.72	53.92	46.60	54.98
Payment by Sources:				
Out-of-Pocket ($)	14.68	33.74	12.58	28.56
Private Insurance ($)	21.96	42.84	26.31	46.12
Medicaid ($)	20.84	44.58	20.43	44.40
Others ($)	9.83	31.75	9.53	31.27
Outcome Variables - Treatment Decisions:				
Any Medicine Prescribed	0.2859	0.45	0.2998	0.46
Lab Tests	0.2425	0.43	0.2331	0.42
Other Diag Test/Exam	0.1124	0.32	0.1179	0.32
Outcome Variables - Patients' Perception:				
Enough Time	0.4082	0.49	0.4033	0.49
Listen	0.4453	0.50	0.4336	0.50
Respect	0.4621	0.50	0.4530	0.50
Control Variables:				
Female	0.6527	0.48	0.6342	0.49
Nonwhite	0.1830	0.39	0.1819	0.39
Hispanic	0.2781	0.45	0.2514	0.43
Employed	0.7424	0.44	0.7243	0.45
Below 124% of Poverty Line	0.3991	0.49	0.3975	0.49
ICD9	0.4847	0.50	0.4971	0.50

Notes: The number of observations for the entire sample is 7912, and for the sample before 228 months is 3826.

Table 2: Means Before & After Cutoff: Smoothness Tests

	Mean Below Cutoff	Mean After Cutoff	Regression estimates of discrete jump at 228 months (1 year bandwidth)	S.E. for difference estimates in RD
	(1)	(2)	(3)	(4)
Female	0.63	0.67	0.03	[0.032]
Nonwhite	0.18	0.18	-0.01	[0.022]
Hispanic	0.25	0.29	0.04	[0.024]
Employed	0.72	0.76	0.04	[0.035]
Below 124% of Poverty Line	0.40	0.40	0.01	[0.015]
ICD9	0.50	0.47	0.02	[0.037]

Notes. The standard errors are clustered at the age level, measured in months. The differences and their related standard errors are estimated using McCary (2008), by regressing each of these demographic variables in the same framework as our regression disconuity estimates. These difference estimates are also weighted using the individual sample weights assigned in MEPS. The model is estimated on a sample within 12 months above and below the age 228 months threshold. The controls used in this model include year indicators for the years 1996 to 2009, and the region indicators for Northeast, West, Midwest, and South regions.

Table 3: Reduced Form Estimates

	Age >228 months (α_1) (1)	SE (2)
Payment Variables:		
Total Payment From All Sources ($)	0.899	[3.462]
Total Payment from Private Insurance & Medicaid ($)	-7.614***	[2.148]
Payment by Sources:		
Out-of-Pocket ($)	5.771***	[2.018]
Private Insurance ($)	-9.986***	[2.325]
Medicaid ($)	2.474	[2.150]
Others ($)	2.640	[1.894]
Outcome Variables - Treatment Decisions:		
Any Medicine Prescribed	-0.036	[0.029]
Lab Tests	-0.039	[0.035]
Other Diag Test/Exam	-0.045	[0.036]
Outcome Variables - Patients' Perception:		
Enough Time	-0.079**	[0.031]
Listen	-0.105***	[0.028]
Respect	-0.091**	[0.034]
Year Controls	Yes	
Region Controls	Yes	
Condition Control	Yes	
Observations	7,912	
Weighted	Yes	
Bandwidth	12 Months	

Notes. The standard errors are clustered at the age level, measured in months. Clustered standard errors in brackets (*** p<0.01, ** p<0.05, * p<0.1). The model is estimated on a sample within 12 months above and below the age 228-month threshold. The control variables used in these regression models include year indicator variables for the years 1996 to 2009, region indicator variables for the Northeast, West, Midwest, and South regions. The demographic variables of the individuals in the sample controlled in the model are gender, race, socio-economic status, ethnicity, and employment status. The conditions addressed during each visit as categorized by ICD9 codes are also controlled for in the model. The data are weighted using the reported final person weight assigned to each individual. The data is sourced from MEPS administered by AHRQ.

Table 4: Impact of the Change in Payments on the Actual and Perceived Behaviors of Medical Care Providers

	Outcome Variables Providers' Treatment Decisions:			**Outcome Variables Patients' Perception:**		
$(\frac{\alpha_1^{(outcome)}}{\alpha_1^{(treatment)}} \times \$10)$	Any Medicine Prescribed	Lab Tests	Other Diag Test/Exam	Enough Time	Listen	Respect
	(1)	(2)	(3)	(4)	(5)	(6)
Payment Variables:						
Total Payment - All Sources ($)	-0.4004	-0.4338	-0.5006	-0.8788	-1.1680	-1.0122
	(1.5755)	(1.7015)	(1.9544)	(3.3994)	(4.5093)	(3.9114)
Total Payment - Private Ins & Medicaid ($)				0.1038**	0.1379***	0.1195**
				(0.0501)	(0.0535)	(0.0560)
Payment by Sources:						
Out-of-Pocket ($)				-0.1369**	-0.1819**	-0.1577**
				(0.0720)	(0.0800)	(0.0807)
Private Insurance ($)				0.0791**	0.1051***	0.0911**
				(0.0361)	(0.0372)	(0.0401)
Medicaid ($)				-0.3193	-0.4244	-0.3678
				(0.3045)	(0.3858)	(0.3479)
Others ($)				-0.2992	-0.3977	-0.3447
				(0.2447)	(0.3044)	(0.2788)
Year Controls	Yes					
Region Controls	Yes					
Condition Control	Yes					
Observations	7912					
Weighted	Yes					
Bandwidth	12 Months					

Notes. The standard errors are reported in brackets below the estimated coefficients. These standard errors are clustered at the age level, measured in months. Clustered standard errors in brackets (*** p<0.01, ** p<0.05, * p<0.1). The effect to the change in payments on actual and perceived behaviors are calculated as Wald estimators. That is, the estimated outcome variables are divided by the estimated treatment variable. The standard errors for those Wald estimates are calculated using propagation of error formulas. The model is estimated on a sample within 12 months above and below the age 228 month threshold. The controls used in this model include year indicators for the years 1996 to 2009, and the region indicators for Northeast, West, Midwest, and South regions.

Table 5: Robustness Checks - Bandwidth Sensitivity

	Age >228 months		Age >228 months		Age >228 months	
	(1)	(2)	(3)	(4)	(5)	(6)
Payment Variables:						
Total Payment From All Sources ($)	0.899	[3.462]	-2.165	[3.269]	1.327	[3.172]
Total Payment from Private Insurance & Medicaid ($)	-7.614***	[2.148]	-9.052***	[2.189]	-7.046***	[2.192]
Payment by Sources:						
Out-of-Pocket ($)	5.771***	[2.018]	4.917**	[1.886]	5.366***	[1.508]
Private Insurance ($)	-9.986***	[2.325]	-10.255***	[2.554]	-10.366***	[2.242]
Medicaid ($)	2.474	[2.150]	1.205	[2.441]	3.361	[1.983]
Others ($)	2.640	[1.894]	1.969	[2.060]	2.966*	[1.679]
Outcome Variables - Treatment Decisions:						
Any Medicine Prescribed	-0.036	[0.029]	0.016	[0.033]	-0.054*	[0.028]
Lab Tests	-0.039	[0.035]	-0.047	[0.041]	-0.036	[0.030]
Other Diag Test/Exam	-0.045	[0.036]	-0.06	[0.036]	-0.033	[0.033]
Outcome Variables - Patients' Perception:						
Enough Time	-0.079**	[0.031]	-0.063*	[0.031]	-0.080***	[0.027]
Listen	-0.105***	[0.028]	-0.090***	[0.030]	-0.110***	[0.025]
Respect	-0.091**	[0.034]	-0.089**	[0.034]	-0.089***	[0.028]
Year Controls	Yes		Yes		Yes	
Region Controls	Yes		Yes		Yes	
Condition Control	Yes		Yes		Yes	
Observations	7912		6323		8553	
Weighted	Yes		Yes		Yes	
Bandwidth	12 Months		9 Months		15 Months	
Outliers Dropped - Total payments	>$300		>$300		>$300	

Notes. The standard errors are reported in brackets next to the estimated coefficients. These standard errors are clustered at the age level, measured in months. Clustered standard errors in brackets (*** p<0.01, ** p<0.05, * p<0.1). The model is estimated on a sample within 12 months above and below the age 228 months threshold. The control variables used in these regression models include year indicator variables for the years 1996 to 2009, region indicator variables for the Northeast, West, Midwest, and South regions. The demographic variables of the individuals in the sample controlled in the model are gender, race, socio-economics status, ethnicity, and employment status. The conditions addressed during each visit as categorized by ICD9 codes are also controlled for in the model. The data is weighted using the reported final person weight assigned to each individual. The data is sourced from MEPS administered by AHRQ.

Table 6: Robustness Checks - Outlier Sensitivity

	Approx. 95^{th} Percentile Age >228 months		Approx. 85^{th} Percentile Age >228 months		Approx. 90^{th} Percentile Age >228 months	
	(1)	(2)	(3)	(4)	(5)	(6)
Payment Variables:						
Total Payment From All Sources ($)	0.899	[3.462]	0.661	[1.848]	0.691	[1.733]
Total Payment from Private Insurance & Medicaid ($)	-7.614***	[2.148]	-3.378**	[1.544]	-6.499**	[2.615]
Payment by Sources:						
Out-of-Pocket ($)	5.771***	[2.018]	4.087***	[1.177]	4.693***	[1.498]
Private Insurance ($)	-9.986***	[2.325]	-4.747**	[2.265]	-8.119**	[3.036]
Medicaid ($)	2.474	[2.150]	1.451	[1.641]	1.729	[2.053]
Others ($)	2.640	[1.894]	-0.131	[1.107]	2.389	[1.449]
Outcome Variables - Providers' Behaviors:						
Any Medicine Prescribed	-0.036	[0.029]	-0.042	[0.033]	-0.044	[0.031]
Lab Tests	-0.039	[0.035]	-0.045	[0.035]	-0.032	[0.033]
Other Diag Test/Exam	-0.045	[0.036]	-0.03	[0.040]	-0.034	[0.037]
Outcome Variables - Patients' Perception:						
Enough Time	-0.079**	[0.031]	-0.070*	[0.040]	-0.070*	[0.034]
Listen	-0.105***	[0.028]	-0.105***	[0.029]	-0.097***	[0.027]
Respect	-0.091**	[0.034]	-0.087**	[0.041]	-0.087**	[0.035]
Year Controls	Yes		Yes		Yes	
Region Controls	Yes		Yes		Yes	
Condition Control	Yes		Yes		Yes	
Observations	7912		6291		7578	
Weighted	Yes		Yes		Yes	
Bandwidth	12 Months		12 Months		12 Months	
Outliers Dropped - Total payments	>$300		>$100		>$200	

Notes. The standard errors are clustered at the age level, measured in months. Clustered standard errors in brackets (*** p<0.01, ** p<0.05, * p<0.1). The model is estimated on a sample within 12 months above and below the age 228 months threshold. The control variables used in these regression models include year indicator variables for the years 1996 to 2009, region indicator variables for the Northeast, West, Midwest, and South regions. The demographic variables of the individuals in the sample controlled in the model are gender, race, socio-economics statsus, ethnicity, and employment status. The conditions addressed during each visit as categorized by ICD9 codes are also controlled for in the model. The data is weighted using the reported final person weight assigned to each individual. The data is sourced from MEPS administered by AHRQ.

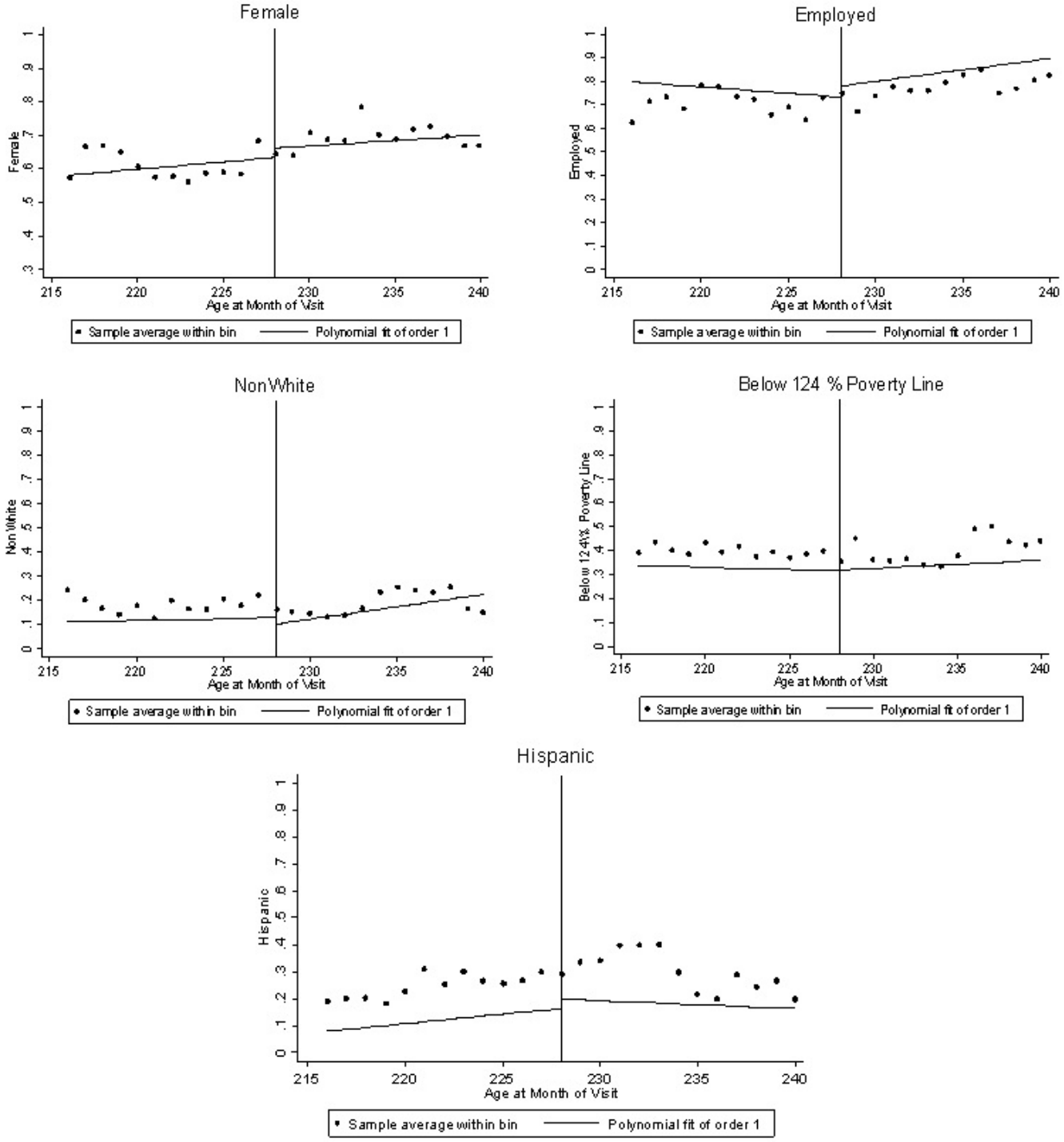

Figure 1: Covariates around 228 months

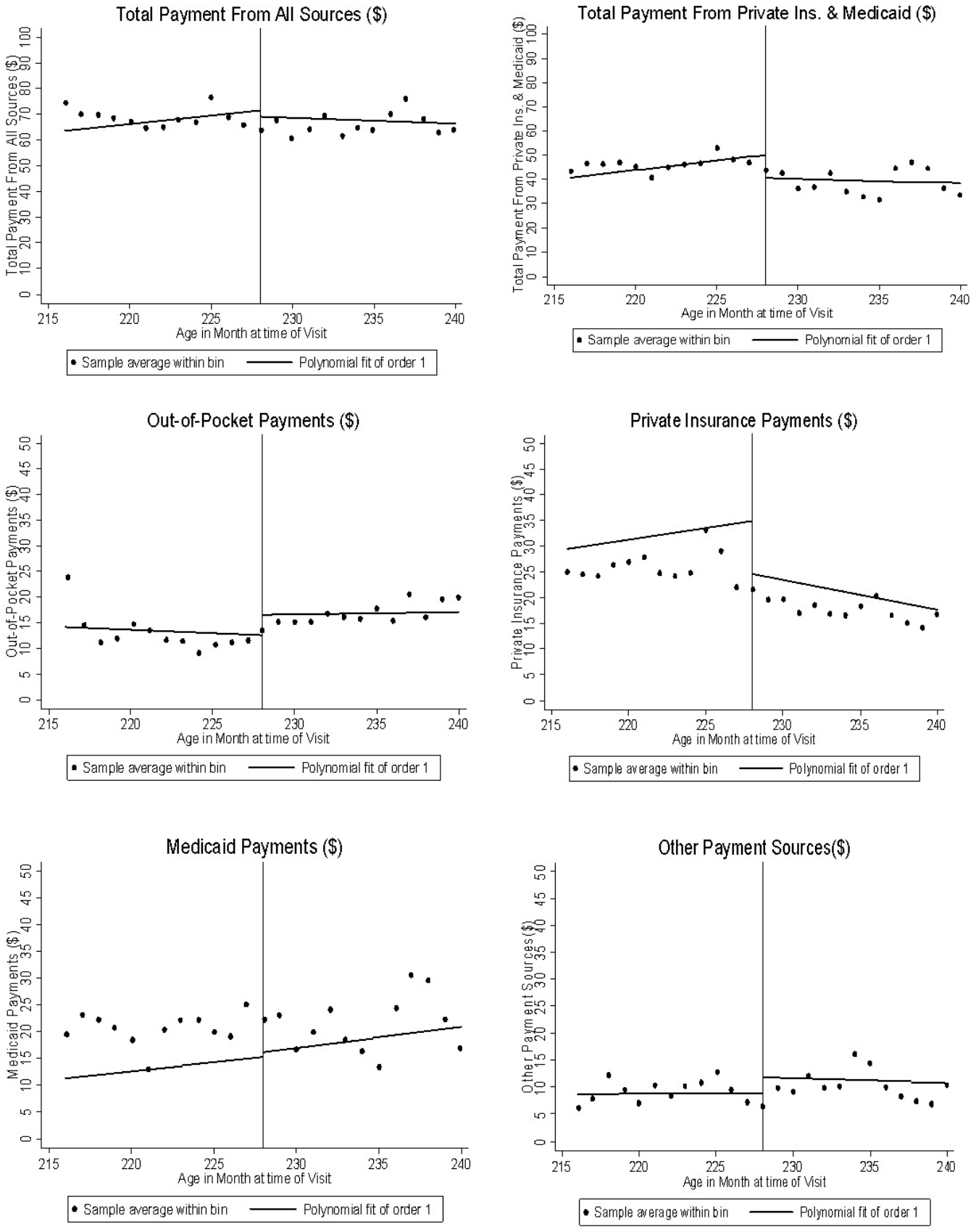

Figure 2: Payments around 228 months

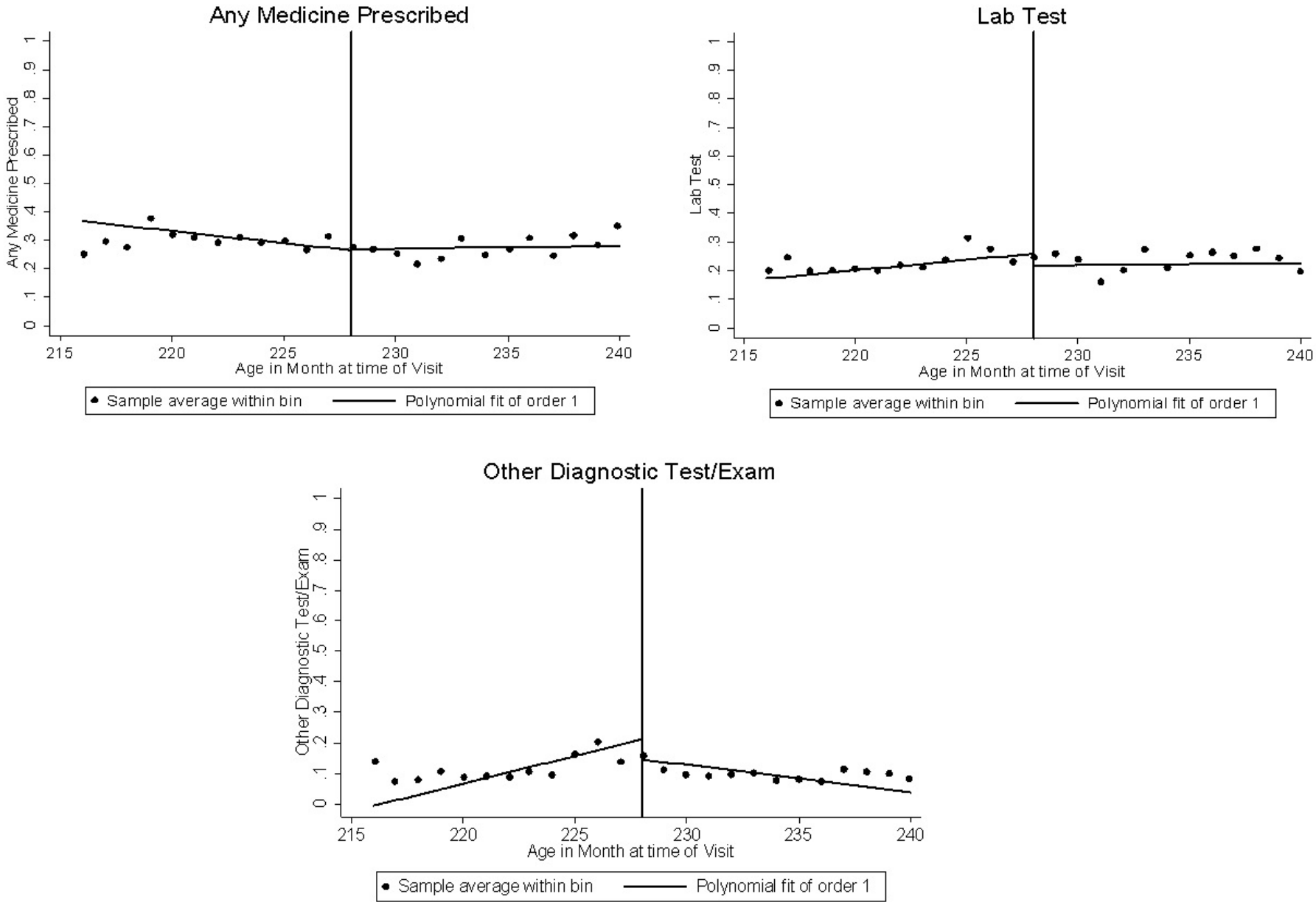

Figure 3: Actual Change in the Providers' Treatment Decisions around 228 months

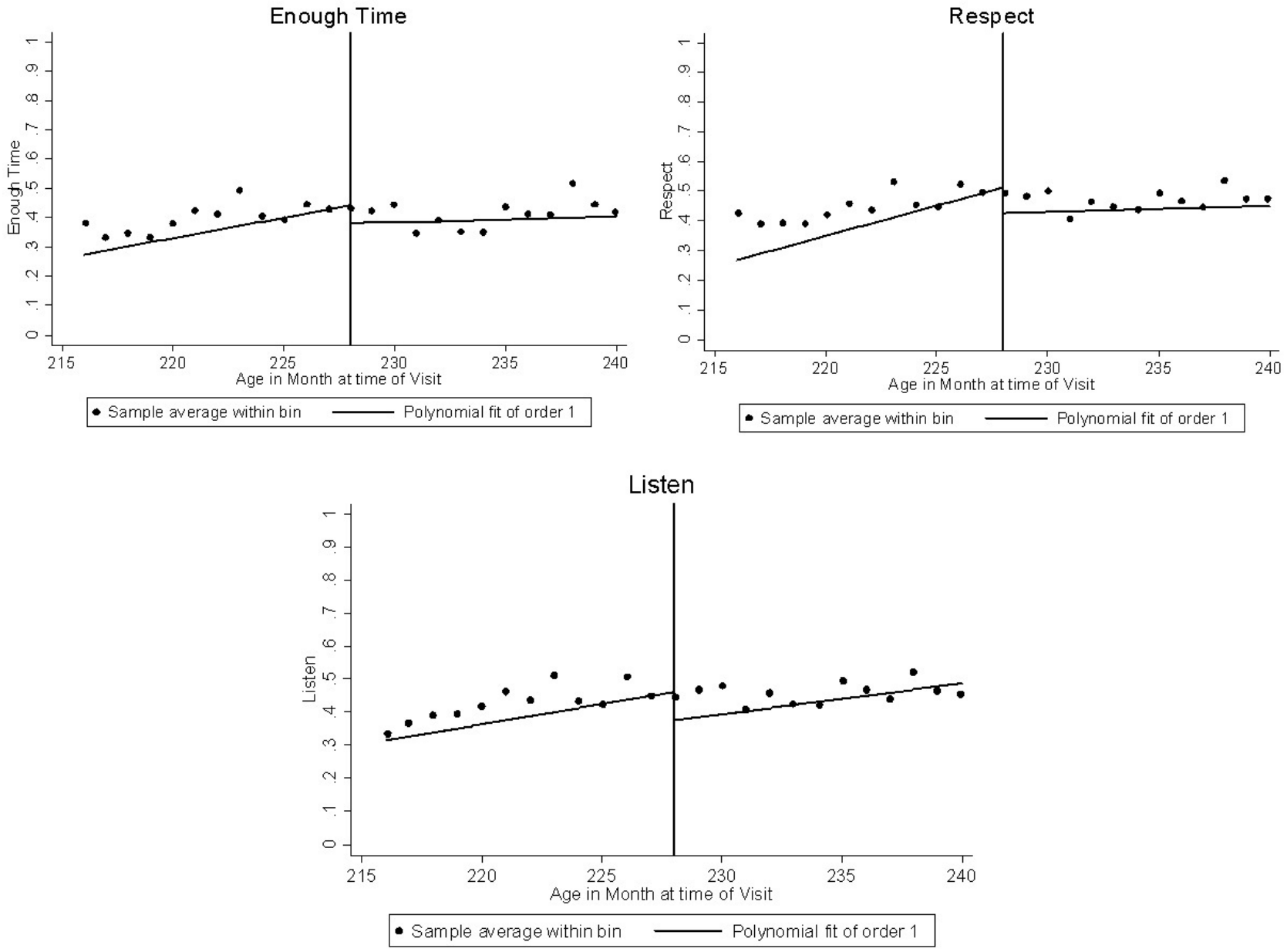

Figure 4: Perceived Change in the Providers' Behavior around 228 months by Patients