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ABSTRACT

We analyze the evolution of health insurer costs in Massachusetts between 2010-2012, a period in which the use of physician cost control incentives spread among insurers. We show that the growth of costs and its relationship to the introduction of cost control incentives cannot be understood without accounting for (i) consumers' switching between plans, and (ii) differences in cost characteristics between new entrants and those leaving the market. New entrants are markedly less costly than those leaving (and their costs fall after their entering year), so cost growth of those who stay in a plan is significantly higher than average per-member cost growth. Cost control incentives were used by Health Maintenance Organizations (HMOs). Relatively high-cost HMO members switched to Preferred Provider Organizations (PPOs) while low-cost PPO members switched to HMOs. As a result, the impact of cost control incentives on HMO costs is likely different from their impact on market-wide insurer costs.

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1 Introduction

The path of medical care costs and prices in Massachusetts has been a topic of substantial policy interest since the Coakley Reports (2010, 2011, 2013) documented high price dispersion across hospitals in the state, with some hospitals paid prices twice as high as others for particular procedures. The state passed a major cost-containment law in 2012 that encouraged payment and delivery reforms with the goal of slowing growth below a target of the GDP growth rate. However, even prior to 2012, Massachusetts insurers had been expanding the use of non-fee-for-service, "global" payment mechanisms that shared risk with providers in order to incentivize cost reductions – a setup similar to "shared savings" arrangements in Accountable Care Organizations (ACOs). The use of global payment arrangements by the state's major insurers more than doubled between 2009 and 2012, and there is evidence that global payments have reduced costs in at least one insurer (Song et al. 2012, 2014). Understanding how system-wide health care costs have evolved in this changing insurance environment is a question of substantial interest.

In this paper we use the Massachusetts All-Payer Claims Database (APCD) to analyze the evolution of health care costs from 2010-2012. We focus on the commercially insured population and track changes in average costs per member per month in the three largest insurers (covering 77.5% of the state's commercial insurance market) over this time period. We summarize aggregate cost increases for this population and then consider differential cost changes across insurers.

We begin by documenting the timing of global payment introduction and utilization across both insurers and types of plans. The use of global payments began expanding in 2009, when Blue Cross Blue Shield (BCBS) of MA introduced them under a new "alternative quality contract."[1] Following the perceived success of this program, other insurers started expanding these "alternative" payment contracts.[2] However, BCBS continued to be the leader in adopting alternative payments. By 2012, 80% of BCBS's members in Health Maintenance Organization (HMO)-type plans (including Point-of-Service (POS) plans) were covered under alternative payments, compared to 54% and 38% for its next two largest competitors (Tufts Health Plan and Harvard Pilgrim Health Care, respectively). Importantly, insurers used alternative payments almost exclusively in their HMO-type plans, while almost never using them in Preferred Provider

[1] Seven provider organizations agreed to use these contracts in 2009, followed by four more in 2010. At the same time, BCBS also introduced comprehensive support for participating physician groups, including regular provision of data on the care provided to patients by providers (e.g. hospitals) outside of the group, and organized sessions where the groups met to discuss best practices. See Chernew et al. (2011) for additional details.

[2] Alternative payments technically encompass a broader set of non-fee-for-service payment mechanisms, including limited budgets and bundled payments for episodes of care. However, in pratice, global payments comprised 97% of alternative payment schemes in Massachusetts. We therefore use these terms interchangeably.

Organization (PPO) and other similar plans (including indemnity plans and Exclusive Provider Organization plans). These differences across insurers and plan types provide a natural way of studying whether plans with greater adoption of alternative payment mechanisms experienced slower cost growth.

In studying any change in the health care market, it is important to account for compositional changes in the types of consumers enrolled in different plans and in the market as a whole. Unlike in many other industries, costs in health care are determined by the interaction of the health care system with the types of consumers in the market (e.g., their health needs and illness severity). If sick consumers differentially leave the market or switch into certain plans, it can affect analyses of cost trends and comparisons across plans. We find that accounting for compositional changes in our sample of commercially insured enrollees has a substantial effect on estimated cost growth and, to a lesser extent, on cross-plan comparisons. For example, for BCBS – the largest plan in our data – real costs per member per month *fell* by $2.40 between 2011 and 2012 while the average cost of BCBS consumers who stayed in BCBS for the sample period *increased* by $14.60. The difference, $17, is 5.2% of costs in 2011.

At one level, the importance of accounting for sample composition in analyzing costs is obvious. There is a long tradition in health insurance of studying "adverse selection" – that is, the propensity of certain plans to attract consumers with attributes that make them costly (see Breyer, Bundorf, and Pauly (2012) for a review). There is also widespread awareness that population aging will lead to health care cost growth. However, there has been less attention to this issue in the literature on measuring health care cost growth. Much of this literature focuses on decomposing cost growth into changes in the prices versus quantities of medical services.[3] The most sophisticated methodologies allow a portion of cost changes to arise from changes in observable severity measures, notably age and disease prevalence (e.g., Dunn, Liebman, and Shapiro (2014)). However, even these analyses do not account for the role of unobserved severity, which may have an important effect.

Our main analysis is based on a risk-adjusted decomposition of cost growth for enrollees in the state's top three commercial health insurers' plans.[4] The decomposition accounts for the fact that costs can grow either because of changes in the observable characteristics of the population (e.g., getting older or sicker, partly due to plan choices) or because of cost increases for a given age and sickness level. We present a formal decomposition of cost changes into: (i) changes in the age-gender composition of the population,

[3]See, e.g., Bundorf, Royalty, and Baker (2009); Aizcorbe and Nestoriak (2011); Herrera et al. (2013); Dunn, Liebman, and Shapiro (2014). There is also significant attention in this literature to whether improvements in health care quality might bias measures of prices: see e.g., Cutler et al. (1998, 2001).

[4]As we describe in Section 2, we limit the sample to enrollees in the "big three" insurers (BCBS, Harvard Pilgrim, and Tufts) for data quality reasons. These three insurers cover more than three-fourths of commercial enrollees.

(ii) changes in the population's severity of diagnoses (conditional on age and gender), and (iii) changes in costs for a given age-gender-severity group.

We first perform this decomposition for the actual enrollees in each insurer and plan type (HMO- and PPO-like plans) for each year from 2010-12. This method is similar to those used in past papers decomposing cost growth, though it does not attempt to distinguish between cost changes due to changes in prices versus quantities of services. As in past analyses, the method cannot directly account for changes in unobserved severity. We then restrict the sample to a fixed panel of "stayers," who remain in the data and do not switch plans between each pair of years (2010-11 and 2011-12). We find that cost growth – both before and after controlling for age and severity – is markedly higher for this fixed panel than for the full sample. We also find that analyzing a fixed panel of stayers affects cost comparisons across plans.

In our initial decomposition for the actual enrollee population, we find several patterns. First, real health care costs per member-month are essentially flat over the two year period (after adjusting for inflation). After accounting for a general increase in average costs due to population aging and a small increase in severity, costs (component (iii) of the decomposition) actually decline in most plans. We see differential cost trends across plans (after controlling for age, gender, and severity). BCBS HMO and Tufts HMO – the plans with the greatest use of alternative payment arrangements – have negative cost growth, consistent with physicians responding to cost-control incentives. HMOs have consistently slower (or more negative) cost growth than the PPOs offered by the same insurers.

However, this initial decomposition only imperfectly controls for differential switching, entry, and exit across plans. We show that higher-cost enrollees are more likely to exit the sample (e.g., by aging onto Medicare). Costs for exiters in their final year in the sample are typically 40-50% higher than for stayers in the same plans, and this difference varies across plans. Further, while new enrollees are more expensive in their first year, their costs decline over time so that in their second year, they are typically about 10% less expensive than stayers. In addition, we show that even among people remaining in the sample over time, plan switching has an important effect on costs across plans. Our findings indicate that switching of low-cost enrollees into HMO plans (i.e., "favorable selection" into HMOs) helped reduce their cost growth, particularly for the HMOs that first introduced global payments.

We repeat the risk-adjusted cost growth decomposition for the sample of "stayers": enrollees who remained in the same plan from year to year. We find much larger cost increases for this sample. This occurs partly because a fixed panel of people uniformly grows older over time (while the full population of commercial enrollees continually loses its oldest members to Medicare). Even conditional on age and severity,

however, cost growth is consistently positive for the stayer population.

Focusing on the decomposition for stayers has less effect on the comparisons of cost growth between plans. We still find that HMOs have slower cost growth than PPOs offered by the same insurer, although the gap is narrower in this sample. The differences across HMOs are also similar: earlier adopters of global payments tend to have lower cost growth than other HMOs. We conclude that there is some evidence that the incentives introduced by global payments may have constrained cost growth for their ongoing enrollees. However, HMOs also benefited from attracting lower-cost consumers over the time period we study.

Our results are important for several reasons. First, we point out the potential for changes in the composition of consumers to affect measurement of health care cost growth, particularly for market segments like commercial insurance. Accurately measuring cost growth is important for assessing whether the system constrains cost growth below targets included in legislation in Massachusetts and the Affordable Care Act. Second, we contribute to the literature studying the effectiveness of physician cost control incentives, and global payments in particular (e.g., Song et al. 2012, 2014). We find some evidence that HMOs adopting global payments may have benefited from attracting lower-cost consumers. This may provide an additional incentive to adopt global payments beyond the effect on costs for a fixed enrollee population.

The paper proceeds as follows. Section 2 introduces the data, and Section 3 summarizes overall cost trends. Section 4 compares cost trends across plans using several cost decompositions. The final section concludes.

2 All-Payer Claims Database and Variable Definitions

We use the Massachusetts All-Payer Claims Database (APCD) collected by the state's Center for Health Information and Analysis (CHIA). This is the most comprehensive available dataset on statewide health care use; it contains enrollment and claims data from all private health insurers. We use APCD version 2.0, which contains data from 2009-2012. It is one of the first available datasets in a larger group of state-level APCDs (ongoing in over 30 states) that give researchers unparalleled ability to analyze system-wide health care costs, including among privately insured populations. The claims data include patient diagnoses, procedures, provider and insurer identifiers, and actual prices paid for all medical services rendered.

We focus our analysis on the commercially insured population, excluding government-sponsored programs such as Medicare and Medicaid. We limit attention to primary insurance products and to medical

spending (excluding pharmacy and dental claims). We exclude individuals living outside of Massachusetts or a neighboring state (NH, CT or RI) and individuals observed for less than two months. We further limit the sample to include just the three largest insurers: Blue Cross Blue Shield of MA (BCBS), Harvard Pilgrim Health Care (HPHC), and Tufts Health Plan. Each of these offers both HMO and PPO plans. Together, these three insurers constitute 77.5% of the commercial insurance market. The final dataset includes 2.7 million members per month in 2010 and then decreases somewhat over time (Table 1).

The primary variable considered in our analysis is insurers' medical cost per member-month, adjusted for inflation into 2009 dollars using the CPI for New England states. [5] Our objective is to document and understand the sources of changes in this variable over time.

We construct two additional sets of variables as inputs into the decomposition of cost changes. The first categorizes individuals into "risk groups" based on mutually exclusive combinations of age group, gender and diagnosis severity. For age, we use 13 groupings (0-1, 2-24, five year groups from 25 to 74, and 75+). We use the Johns Hopkins Adjusted Clinical Groups (ACG) risk-adjustment software to define severity groups. The software categorizes each enrollee into one of 93 ACG cells – intended to capture groups with similar expected spending – based on their demographics and diagnoses. Definitions of these groups are provided in Appendix Table 1. We define the ACG for each enrollee-year using the concurrent year of claims since using prior years would require restricting the sample to those continuously enrolled. We then form risk groups defined as the 1,140 unique combinations of age, gender, and ACG categories. To address issues with small cell sizes, we eliminate cells with fewer than 30 member-months in any year and assign these enrollees to residual risk groups defined only by age and gender. These residual groups include just 0.06% of member-months.

The second set of variables categorizes types of insurance plans. We focus on distinguishing between enrollees in Health Maintenance Organizations (HMOs) and similar contracts (Point of Service (POS) plans and Exclusive Provider Organizations (EPOs)) versus Preferred Provider Organizations (PPOs) and indemnity plans. (For the remainder of the paper, we refer to the first set of plan types collectively as "HMOs" and the second as "PPOs.") We address the problem that some consumers are enrolled in multiple products by assigning consumers to the plan in which they were enrolled for the majority of the months of a year (with ties assigned to PPOs). In our final sample, 71% of people are enrolled in HMOs, and 29% are enrolled in PPOs.

[5] Medical costs do not include prescription drug or dental costs, since not all plans cover thse benefits. In cases where physicians are paid using alternative payment arrangements, our data contain the fee-for-service component of the payment rather than later reconciliations with respect to shared savings.

3 Overall Cost Trends

We begin by assessing aggregate cost changes in Massachusetts over time. Table 1 sets out, for each year 2010-12, average spending (insurer plus patient contribution) per member per month, and the percent change in spending between years. We also provide data for 2009 for HPHC and Tufts; BCBS is excluded for this year because a data anomaly prevented the linking of its claims and enrollment file for a subset of its members. The number of enrollees in the full sample declined from 2.7 million to 2.6 million over the three years we consider, probably due in part to an aging population shifting onto Medicare. Average inflation-adjusted spending per member per month increased by about 0.1% per year from 2010-12.

These figures differ from those published in a 2014 report by CHIA and Massachusetts' Health Policy Commission (CHIA 2014). That report considered the three largest commercial insurers and documented a 2.9% annual growth in medical claims-based spending. However, we adjust for inflation, while they report nominal dollar increases. This distinction explains almost the entire difference between these figures. We conclude that the growth rate in inflation-adjusted per member per month spending was a little less than the growth in the growth of U.S. real GDP per capita during this period (which was about 1.4%), and so quite low by historical standards.

4 Differential Trends Across Insurers

The cost growth rates set out in Table 1 differ across insurers. For example, BCBS costs fell in both years between 2010-12 (by 0.73% in the first year and 0.75% in the second) while HPHC's costs fell by around 2% between 2009-2011 but rose (by 5.7%) from 2011-12. These differences are particularly interesting because as noted, insurers were differentially expanding their use of alternative payment mechanisms for physicians during this time. BCBS HMO in 2009 introduced its Alternative Quality Contract, under which several large provider organizations shifted to global payments. Other insurers followed. Table 2 shows the share of commercial HMO members under these alternative payment mechanisms starting in 2012, the first year for which comprehensive data are available (CHIA 2015). By 2012, BCBS HMO had the highest share under alternative payments (at about 80%), followed by Tufts (at 54%) and then HPHC (at 38%). By contrast, based on the same data source, PPO plans almost never used these payment arrangements during our data period.

Our next step is to consider the variation in cost growth across insurers-plan type combinations and

assess the reasons for this variation. If cost growth is slower for plans using global payments, this is suggestive evidence of physicians responding to incentives to reduce costs. However, there are other possible explanations. As noted, physician upcoding is possible because spending targets are often risk-adjusted based on patients' observed diagnoses in claims data. There may also be differential selection – due either to enrollees entering or exiting the sample (i.e, entering or leaving the three largest commercial insurance plans in Massachusetts) or to consumers switching plans.

4.1 Cost Decomposition Method

Our first step to account for selection is a risk-adjusted decomposition of cost growth. Categorizing patients with the ACG grouper enables us to compare patients in the same "risk group" – i.e., with the same severity of reported diagnoses and in the same age-gender group – and ask how their costs differ by insurer and over time. Define the average per-enrollee cost in severity (ACG) group g and age-gender group a at time t to be $C_{a,g,t}$. Then if $s_{a,g,t}$ is the share of members at time t who are in group (a, g), the per-enrollee cost to the insurer is $C_t = \sum_{a,g} C_{a,g,t} s_{a,g,t}$.

We decompose the cost changes for stayers over time into portions attributable to: (i) changes in the cost of treating a given severity and age-gender group, (ii) changes due to differences in the distribution of enrollees across severities conditional on age and gender, and (iii) changes due to age and/or gender. The intuition is that any differential selection (on observed severity and age) should affect parts (ii) and (iii), leaving (i) as a clean measure of cost growth for a group of enrollees with fixed severity.[6]

More formally we note that, since $\frac{s_{a,g,t}}{s_{a,t}}$ is the fraction of people *within group a* that belong to classification g, we can write the cost change over time as:

$$C_{t+1} - C_t = \underbrace{\sum_{a,g} s_{a,g,t} \left(C_{a,g,t+1} - C_{a,g,t}\right)}_{\text{1. Cost effect}} + \underbrace{\sum_{a,g} s_{a,t} \cdot \left(\frac{s_{a,g,t+1}}{s_{a,t+1}} - \frac{s_{a,g,t}}{s_{a,t}}\right) C_{a,g,t+1}}_{\text{2. Shift in share across } g \text{ conditional on } a} + \underbrace{\sum_{a} \left(s_{a,t+1} - s_{a,t}\right) \cdot C_{a,t+1}}_{\text{3. Shift in share across } a \text{ groups}}. \tag{4.1}$$

The first term of the decomposition measures the contribution of changes in cost per group; the third measures the contribution of changes in the age-gender distribution; and the second measures changes in the

[6]Note, however, that the decomposition is an identity and the cost component is that part we can not explain by our severity and age/gender groupings. So any error in the construction of those two components will be transmitted, with opposite sign, to our cost component.

distribution across severity groups conditional on age and gender.

4.2 Cost Decomposition for Full Sample

The results of the cost decomposition for the full sample from 2010-12 are reported in Table 3. The column labeled "Total $ Change" lists the average change in spending per member per month for the relevant sample across years. The remaining columns of Table 3 decompose this change into our three components.

There are sizable differences in cost changes across insurers. The total cost change from 2010-12 is negative for BCBS HMO and PPO plans and for Tufts HMO; it is positive for HPHC HMO and PPO and for Tufts PPO. The cost reductions for BCBS and Tufts stem from the cost component of the decomposition: this is negative for all BCBS and Tufts plans over the two-year period (ranging from -$12.83 for BCBS HMO to -$1.47 for BCBS PPO) while it is positive for HPHC's plans ($2.85 for the HMO and $11.49 for the PPO). The other components of the cost decomposition are largely consistent in sign across plans, although their magnitudes differ. All plans except BCBS PPO have a shift in enrollment towards higher-cost severities given age (term 2 of the decomposition), and all have a shift towards older age groups, both of which tend to increase costs in this time period.

For BCBS, the shift in shares across severity groups given a is positive for the HMO and negative for the PPO ($2.27 compared to -$3.45). This is consistent with upcoding in HMOs by physicians who have an incentive to increase the number and severity of diagnoses listed in the patient's record, even if there is no change in actual patient severity. For example, if physicians list a larger number of diagnoses in the patient's record after the move to alternative payment arrangements, this will result in a larger number of diagnoses per patient and a resulting movement of patients to ACGs that are coded as a higher severity level.[7] The difference in the 'shift in shares' components between BCBS' HMO and its PPO implies that the difference in their HMO and PPO growth rates of total cost greatly underestimates the differences in costs conditional on severity, gender, and age. That difference is over $11 per member per month.

For every insurer in the table, the cost component is more negative for the insurer's HMO than its PPO. This finding, together with the fact that the largest reductions in the cost component are achieved in BCBS HMO and Tufts HMO, the plans with the earliest implementation of global payment arrangements, are

[7]The Johns Hopkins ACG grouper software begins by aggregating individual patient ICD-9 codes into 32 Aggregate Diagnosis Groups (ADGs) based on duration and severity of the condition, diagnostic certainty, types of health care services likely to be used, and the degree to which specialty care is likely to be required. See the Johns Hopkins ACG Software System Technical Reference Guide, Version 10.0, December 2011. The software then uses a clearly defined algorithm to place individuals into 93 discrete ACG categories based on their assigned ADGs, age and gender. These categories are listed in the Appendix with their associated Resource Utilization Bands, which are assigned based on expected spending required for each category.

suggestive evidence that physicians may be responding to the incentives generated by alternative payment mechanisms. However, part of the differences we see in the indices in Table 3 are attributable to: (i) consumers switching plans (possibly in response to the changes in plan characteristics such as global capitation), and (ii) differences in the numbers of entrants and exiters and the costs of these two groups. The next two sections separate out the contribution of these phenomena to our cost measures.

4.3 Contributions of Entry and Exit.

We begin by considering the contribution of entrants and exiters to cost growth in each plan. Table 4 investigates the differences between the full sample and the set of enrollees entering and exiting the sample, separately by insurer and plan type.[8] We provide cost statistics on entrants (those entering commercial insurance) and exiters (those moving out of the sample, e.g., into Medicare, Medicaid, or uninsurance, or by dying) in comparison to those for "stayers," defined as enrollees neither entering, exiting, nor switching plans from 2011-12. Enrollees switching plans but remaining in the sample are excluded from this table. We limit attention to BCBS and HPHC for brevity; numbers for Tufts are qualitatively similar. Exiters from every plan have higher costs than either stayers or entrants. For example, the average 2011 cost of BCBS HMO stayers was $300.71 (standard error $1.40), compared to an average of $388.18 (S.E. $4.76) for exiters in 2012 and $433.44 (S.E. $6.07) for exiters in 2011. The magnitudes differ across insurers and plan types, but the pattern persists.

Two additional facts are clear from this table. First, new entrants to the sample have higher costs in the first year than in their second year in the plan, consistent with pent-up demand for medical care being satisfied in year one. For example, for BCBS HMO 2011 entrants, the figures are $331.29 (S.E. $7.22) and $282.41 (S.E. $3.92) in 2011 and 2012 respectively. Conversely, exiters have particularly high costs in their last year in the data. For example, exiters from BCBS HMO in 2012 have 2011 costs of $388.18 (S.E. $4.76) and 2012 costs of $428.38 (S.E. $7.94).

We conclude that the low overall cost growth rate is generated in part by lower-cost enrollees entering and more-expensive enrollees leaving the sample over time.[9] Next we turn to the contribution of individuals who switched plans to differential cost growth among plans, and then come back to the cost growth of 'stayers' (those who were in the same plan in two consecutive years).

[8] The analyses of entry, exit and switching use a slightly different data sample from the cost decompositions in Tables 3 and 7. For example we simplify by dropping enrollees who switch plans more than once. For this reason the aggregate cost numbers in Tables 1, 3 and 7 differ slightly from those in Tables 4-6.

[9] This is partly offset by the high cost growth of exiters in their last two years in-sample.

4.4 Differential Switching Across Plans

We now assess the role of consumer switching between the three carriers in the data. Plan switching is common in our sample: 12% of enrollees switch plans between 2011 and 2012. This is larger than the fraction switching usually found in this literature.[10] However, this is a period in which there are changes in the characteristics of plans (and possibly also in the plans offered), and consumers may be more sensitive to these changes than to the premium changes that have been the focus of the prior switching literature. In addition, most of the literature focuses on switching made by consumers among a given set of options, while our switching number may also capture employers' choices to change the menu of plans available to their workers. 16% of BCBS HMO and Tufts HMO enrollees switch plans at the end of 2011; these two plans account for about half the sample. Switching often takes place between plans within the same carrier. For example, over half of switchers from BCBS HMO move to BCBS PPO, while the rest move across carriers.

Cross-plan switchers will affect plan cost trends if switchers have different costs from non-switchers. In our sample, switchers from HMO to PPO plans tend to be high-cost, and switchers from PPO to HMO plans tend to be low-cost. Table 5 provides examples for BCBS HMO and HPHC PPO. Stayers in BCBS HMO have 2011 costs of $300.71 on average (SE $1.40). In contrast, switchers from other PPOs to BCBS HMO have average 2011 costs of $252.82 (SE $19.14), while switchers from BCBS HMO to another PPO have average costs of $340.90 (SE $7.08). Approximately the reverse pattern exists for HPHC PPO. In particular, the enrollees who switch away to HMOs have significantly lower 2011 costs than those who stay in the plan. These switching patterns are consistent with the alternative payments used by HMOs prompting older and sicker enrollees to move to PPOs that do not use them (of course, there are other important differences between HMOs and PPOs). We next consider the overall magnitude of the selection effects across different insurers.

4.5 The Impact of Entry, Exit and Switching on Cost Growth

Table 6 assesses how much the 2011-2012 cost growth figures for the full sample change when we remove exiters and entrants and/or consumers switching plans. We show the change in average per member per month costs, by plan, for stayers only; for stayers plus entrants and exiters; for stayers plus switchers; and for the full sample. In each case the change in costs from year t to year $t+1$ in our sample, $\Delta C_{t,t+1}$, is

[10] For example, this is a much larger switching percentage than that recorded in Handel (2013).

defined as:

$$\Delta C_{t,t+1} = \frac{\sum_r C_{r,t+1} s_{r,t+1}}{\sum_r s_{r,t+1}} - \frac{\sum_r C_{r,t} s_{r,t}}{\sum_r s_{r,t}}.$$

where r references a particular group (stayers, exiters, entrants and switchers) and we define:

- $s_{r,t}$ = Share of plan j's enrollment (in member-months) who are in group r
- $C_{r,t}$ = Average monthly cost of plan j's enrollment who are in group r

The difference in cost growth between the full sample and stayers can be interpreted as a measure of how much switching, entry and exit affect a plan's costs. The difference between the full sample and stayers + entrants/exiters can be interpreted as a measure of how much plan switching affects costs.

We draw two conclusions from the table. As expected, cost increases in all plans are much greater for stayers than for the full sample, and most of the difference is accounted for by exiters and entrants. For example, costs per member per month for the full sample in BCBS HMO fell by $3.95 from 2011-12, while the equivalent change for stayers was an increase of $15.86. Adding back entrants and exiters brings cost growth down to -$3.03, very close to the change for the full sample.

Second, a comparison of rows 1 and 3 of the table shows that differential switching helps explain the differences in cost growth across plans in the full sample. Row 3 includes the sample of plan switchers and the stayers sample, while row 1 contains just stayers. Removing switchers tends to increase cost growth for HMOs (e.g. an increase from $7.96 to $15.86 for BCBS HMO) while it reduces cost growth for PPOs (e.g. a reduction from $16.81 to $12.43 for BCBS PPO), hence reducing the disparity in growth rates between types of plans. The increase in cost growth is particularly large for BCBS HMO and for Tufts HMO, the two plans with the greatest use of alternative payment arrangements in 2012.[11]

4.6 Cost Decomposition for Stayers

The previous analyses indicate the importance of selection (entry, exit and plan switching) for cost growth. We now repeat the original cost decomposition for the sample of enrollees who stay with a plan from year to year (stayers).

The results of this cost decomposition for 2010-12 are provided in Table 7. As before, the column labeled "Total $ Change" lists the average change in spending per member per month for the relevant sample across

[11] The cost growth data in Tables 4-6 differ somewhat from those in Tables 3 and 7 due to differences beween the underlying data samples. In particular, our switching and entry/exit analyses drop enrollees who switch plans multiple times.

years; in this case it corresponds to the "Stayers" column of Table 6. The results look quite different from Table 3. The high cost of exiters relative to other enrollees means that cost growth from 2010-12 is much higher for the sample of stayers than for the full sample in every plan. For example, for BCBS HMO, the total cost change for the full sample (Table 3) is -$6.51; for stayers it is $29.20. There are sizable differences across insurers: the equivalent figures for HPHC's PPO are $21.89 and $56.38.

The remaining columns of Table 7 decompose these changes into our three components, which sum to the numbers in the "Total $ Change" column. Nearly every component is larger (more positive) here than it was in the full sample. For all but one plan and year, there is an annual cost increase of $6-$10 per enrollee per month due to aging of the population of stayers. A second source of cost increases is an increase in the proportion of stayers who are in higher-cost severity groups conditional on age and gender (term 2 of the cost decomposition). The magnitude of this component is quite comparable across insurers, generating a $15-$20 cost increase over the two years. There is no longer any evidence of upcoding in BCBS HMO: the shift in shares across severity groups given age and gender is now essentially the same for BCBS HMO as for its PPO.

The cost component of the decomposition, which in the full sample was negative for two HMOs and the BCBS PPO, is now positive for all plans when summed over 2010-12. That is, costs conditional on severity group and age are increasing for stayers in every plan. The increases are smaller for HMOs than for PPOs, consistent with the global payments offered by HMOs having a cost reducing effect. For example, for BCBS, the HMO cost component for 2010-12 is $0.65, while that for the PPO is $2.03. For HPHC the equivalent figures are $10.32 and $19.52 for the HMO and PPO respectively. Note that, for BCBS, the difference between its HMO and PPO is much smaller than in the full sample.[12] This is consistent with the finding above that switching of higher-cost enrollees from HMOs to PPOs was one cause of the lower HMO cost growth in the full sample. Removing switchers brings HMO cost growth closer to that for PPOs.

We note that the HMO with the highest growth in the cost component ($10.32 between 2010-12) is HPHC, consistent with it having the latest and lowest-share application of global payments of all HMOs. Tufts HMO's cost component grew by $4.84, while that for BCBS HMO grew by $0.65. Thus the available evidence suggests that the physician incentives generated by global payments may have had a negative impact on cost growth.

[12] In the full sample, BCBS HMO saw a cost reduction of $12.83, while the PPO had a cost reduction of $1.46.

5 Conclusion

This paper presents data on cost changes in the three largest commercial insurers in Massachusetts from 2010-12, a period when all three HMO plans introduced global payment arrangements for their physicians. There are large differences in cost growth across insurers and plan types. We demonstrate that accounting for exiters, entrants and switchers is essential to understanding cost growth and differential cost growth across plans.

We show that HMOs, which adopted global payments during the time period of study, have slower cost growth than PPOs. Some of the difference is accounted for by favorable selection into HMOs, plausibly a result of HMOs advertising their new payment schemes. After removing plan switchers, entrants and exiters from the sample, we see substantially higher cost growth for all plans. Growth in costs conditional on severity group, age and gender is now positive in every case. But the finding of higher cost growth for PPOs than HMOs remains. Insurers whose HMOs use more global payments have lower cost growth than other insurers' HMOs.

If this suggestive evidence is correct, it indicates that insurers may have a two-fold incentive to expand global payments: they both lower costs for existing enrollees and may lead to favorable selection for the insurer. However, our ability to draw strong conclusions is limited by the small number of insurers and the difficulty of disentangling global payment use from other shocks that may differentially affect HMOs and PPOs and different insurers. We would ideally like to test whether favorable selection for HMOs grew stronger when global payments were introduced in 2009-10, but we are constrained by a lack of data for all insurers prior to 2010.

Further research is needed to study the introduction of global payments in the context of larger changes in market structures and integration between hospitals and physicians, all of which are likely to have affected costs. We are engaged in ongoing work towards this end to evaluate the relationship of physician incentives to changes in market structure, prices, and referrals.

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Table 1

Enrollment and Spending Data, 2009-2012

Sample	Year	Avg. Number of Members (000s)	Total Spending PMPM ($)	% Change PMPM Spend.
All Insurers	**2010**	2726.5	$326.1	-
	2011	2649.5	$323.0	-0.96%
	2012	2581.9	$326.8	1.16%
BCBS	**2010**	1569.3	$329.0	-
	2011	1504.6	$326.5	-0.73%
	2012	1446.7	$324.1	-0.75%
HPHC	**2009**	614.6	$329.5	-
	2010	646.8	$329.3	-0.05%
	2011	643.4	$323.0	-1.92%
	2012	645.7	$341.4	5.70%
Tufts HP	**2009**	512.5	$303.9	-
	2010	510.4	$313.5	3.16%
	2011	501.5	$312.5	-0.32%
	2012	489.5	$315.4	0.93%

Notes: Massachusetts All-Payer Claims Data, commercial insurers only, 2010-2012.

Table 2

Share of Commercial HMO/POS Members under Alternative Payment Mechanisms

Insurer	2012	2013	2014
BCBS	79.9%	90.4%	90.6%
Tufts	54.1%	60.0%	60.0%
HPHC	37.8%	36.3%	64.7%

Source: Massachusetts Center for Health Information and Analysis (2015), "Annual Report on the Performance of the Massachusetts Health Care System: Data Book"

Table 3

Cost Growth Decomposition by Insurance Plan, Full Sample

Insurance Plan		Year	Total $ Change	Cost Component	Shift in shares across g given a	Shift in shares across a
BCBS	HMO	2010-11	-2.779	-7.326	2.072	2.475
		2011-12	-3.730	-5.501	0.201	1.570
		Total 2010-12	-6.509	-12.827	2.273	4.045
	PPO	2010-11	-2.205	-0.038	-0.543	-1.624
		2011-12	-2.188	-1.429	-2.903	2.144
		Total 2010-12	-4.393	-1.467	-3.446	0.520
HPHC	HMO	2010-11	-4.122	-7.699	2.074	1.473
		2011-12	12.657	10.553	0.879	1.136
		Total 2010-12	8.535	2.854	2.953	2.609
	PPO	2010-11	-16.507	-17.657	-1.513	2.663
		2011-12	38.398	29.151	7.024	2.222
		Total 2010-12	21.891	11.494	5.511	4.885
Tufts HP	HMO	2010-11	-2.623	-4.393	-0.140	1.910
		2011-12	-3.582	-7.180	2.179	1.420
		Total 2010-12	-6.205	-11.573	2.039	3.330
	PPO	2010-11	2.342	-5.292	4.135	3.499
		2011-12	13.429	-2.273	11.844	3.859
		Total 2010-12	15.771	-7.565	15.979	7.358

Notes: Decomposition of $ cost changes per member per month into component parts.

Table 4

Average Costs of Entrants, Exitors and Stayers, 2011 and 2012, Examples

		Stayers	2011 Entrants	2012 Entrants	2012 Exiters	2011 Exiters
BCBS HMO	**Avg Cost 2011**	300.71	331.29		388.18	433.44
	SE	*1.40*	*7.22*		*4.76*	*6.07*
	Share	*0.53*	*0.05*		*0.09*	*0.08*
	Avg Cost 2012	316.58	282.41	348.73	428.38	
	SE	*1.49*	*3.92*	*6.97*	*7.94*	
	Share	*0.62*	*0.08*	*0.05*	*0.07*	
BCBS PPO	**Avg Cost 2011**	318.71	350.57		434.58	376.75
	SE	*2.48*	*9.47*		*9.01*	*7.47*
	Share	*0.62*	*0.06*		*0.09*	*0.11*
	Avg Cost 2012	331.14	280.30	303.87	481.76	
	SE	*2.15*	*4.98*	*6.02*	*11.36*	
	Share	*0.53*	*0.08*	*0.09*	*0.05*	
HPHC HMO	**Avg Cost 2011**	306.12	332.08		380.61	424.00
	SE	*1.91*	*7.96*		*7.77*	*8.37*
	Share	*0.63*	*0.04*		*0.07*	*0.07*
	Avg Cost 2012	334.31	284.45	399.67	451.24	
	SE	*2.27*	*5.11*	*11.36*	*12.01*	
	Share	*0.65*	*0.08*	*0.05*	*0.04*	
HPHC PPO	**Avg Cost 2011**	339.66	427.41		494.90	473.12
	SE	*4.55*	*27.35*		*25.17*	*19.06*
	Share	*0.68*	*0.04*		*0.05*	*0.07*
	Avg Cost 2012	397.54	345.32	427.30	646.32	
	SE	*5.60*	*16.74*	*22.57*	*39.78*	
	Share	*0.62*	*0.06*	*0.05*	*0.03*	

Notes: Shares are percentages of enrollment in the full sample. Shares in table do not sum to one due to excluded groups, such as switchers.

Table 5

Switching Patterns Example: BCBS HMO cost breakdown 2011-2012

		Switchers into Plan			Switchers out of Plan		
	Stayers	**From Own PPO**	**From Other HMO**	**From Other PPO**	**To Own PPO**	**To Other HMO**	**To Other PPO**
Avg Cost 2011	300.71	299.17	287.09	252.82	343.00	297.67	340.90
SE	*1.40*	*29.98*	*8.61*	*19.14*	*4.16*	*3.39*	*7.08*
Avg Cost 2012	316.58	283.66	316.35	290.14	331.28	292.55	351.92
SE	*1.49*	*7.93*	*5.27*	*12.51*	*46.78*	*5.77*	*10.73*

Example: HPHC PPO cost breakdown 2011-2012

		Switchers into Plan			Switchers out of Plan		
	Stayers	**From Own HMO**	**From Other HMO**	**From Other PPO**	**To Own HMO**	**To Other HMO**	**To Other PPO**
Avg Cost 2011	339.66	296.30	297.69	305.16	232.07	283.94	355.02
SE	*4.55*	*18.51*	*19.40*	*19.53*	*7.97*	*17.24*	*27.80*
Avg Cost 2012	397.54	349.00	340.92	347.21	261.94	295.94	384.98
SE	*5.60*	*11.06*	*12.52*	*14.42*	*21.32*	*22.70*	*31.53*

Notes: Costs per member per month for stayers and switchers, examples.

Table 6

Change in Costs 2011-12, by Plan

Group	BCBS HMO	BCBS PPO	HPHC HMO	HPHC PPO	Tufts HMO	Tufts PPO
Stayers	15.86	12.43	28.19	57.88	17.03	26.66
Stayers & Entrants/Exiters	-3.03	-8.68	15.59	40.00	-2.35	11.18
Stayers & Switchers	7.96	16.81	22.81	52.44	8.93	27.85
Full Sample	-3.95	-2.81	13.36	37.47	-4.26	13.24
Diff Full Sample - Stayers	-19.81	-15.24	-14.83	-20.41	-21.30	-13.42
Diff Full Sample - (Stayers & Entrants/Exiters)	-0.92	5.87	-2.24	-2.53	-1.91	2.05

Notes: Cost changes from 2011-12, $ per member per month, for samples defined in text.

Table 7

Cost Growth Decomposition by Insurance Plan, Stayers Only

Insurance Plan		Year	Total $ Change	Cost Component	Shift in shares across g given a	Shift in shares across a
BCBS	HMO	2010-11	13.154	-1.601	8.381	6.374
		2011-12	16.445	2.253	7.492	6.700
		Total 2010-12	29.199	0.652	15.873	13.074
	PPO	2010-11	19.152	1.183	10.847	7.122
		2011-12	13.404	0.843	4.506	8.056
		Total 2010-12	32.556	2.026	15.353	15.178
HPHC	HMO	2010-11	11.924	-3.910	10.036	5.797
		2011-12	26.913	14.228	5.790	6.895
		Total 2010-12	38.837	10.318	15.826	12.692
	PPO	2010-11	-1.651	-17.945	8.193	8.102
		2011-12	58.031	37.465	10.658	9.908
		Total 2010-12	56.380	19.520	18.851	18.010
Tufts HP	HMO	2010-11	15.459	-0.069	9.900	5.628
		2011-12	17.547	4.905	6.452	6.191
		Total 2010-12	33.006	4.836	16.352	11.819
	PPO	2010-11	14.842	0.565	7.581	6.696
		2011-12	28.053	13.507	14.099	0.446
		Total 2010-12	42.895	14.072	21.680	7.142

Notes: Decomposition of $ cost changes per member per month into component parts.

Appendix Table 1: Adjusted Clinical Group (ACG) Descriptions and Resource Utilization Bands (RUB)

Groups	ACG	ACG Code Description	RUB
Chronic	700	Asthma	2
	900	Chronic Medical: Stable	2
	1000	Chronic Specialty: Stable	2
	1200	Chronic Specialty: Unstable	2
	800	Chronic Medical: Unstable	3
Acute Minor	200	Acute Minor, Age 2 to 5	1
	300	Acute Minor, Age 6+	1
	100	Acute Minor, Age 1	2
	1800	Acute Minor/Acute Major	2
	1900	Acute Minor, Likely to Recur, Age 1	2
	2000	Acute Minor, Likely to Recur, Age 2 to 5	2
	2100	Acute Minor, Likely to Recur, Age 6+, w/o Allergy	2
	2200	Acute Minor, Likely to Recur, Age 6+, w/ Allergy	2
	2300	Acute Minor/ Chronic Medical: Stable	2
	2400	Acute Minor/ Eye and Dental	2
	2500	Acute Minor/ Psychosocial, w/o Psychosocial Unstable	2
	3400	Acute Minor/ Likely to Recur/ Eye and Dental	2
	2600	Acute Minor/ Psychosocial, w/ Psychosocial Unstable, w/o Psychosocial Stable	3
	2700	Acute Minor/ Psychosocial, w/ Psychosocial Unstable, w/ Psychosocial Stable	3
	2900	Acute Minor/ Acute Major/ Likely to Recur Age 1	3
	3000	Acute Minor/ Acute Major/ Likely to Recur Age 2 to 5	3
	3100	Acute Minor/ Acute Major/ Likely to Recur Age 6 to 11	3
	3200	Acute Minor/ Acute Major/ Likely to Recur Age 12+, w/o Allergy	3
	3300	Acute Minor/ Acute Major/ Likely to Recur Age 12+, w/ Allergy	3
	3500	Acute Minor/ Likely to Recur/ Psychosocial	3
	3600	Acute Minor/ Acute Major/ Likely to Recur/ Chronic Medical: Stable	3
	3700	Acute Minor/ Acute Major/ Likely to Recur/ Psychosocial	3
Acute Major	400	Acute Major	2
	500	Likely to Recur, w/o Allergies	2
	600	Likely to Recur, w/ Allergies	2
	2800	Acute Major/ Likely to Recur	3
2-3 ADG	3800	2-3 Other ADG Combinations, Age 1 to 17	2
	3900	2-3 Other ADG Combinations, Males Age 18 to 34	3
	4000	2-3 Other ADG Combinations, Females Age 18 to 34	3
	4100	2-3 Other ADG Combinations, Age 35+	3
4-5 ADG	4210	4-5 Other ADG Combinations, Age 1 to 17, no Major ADGs	3
	4220	4-5 Other ADG Combinations, Age 1 to 17, 1+ Major ADGs	3
	4310	4-5 Other ADG Combinations, Age 18 to 44, no Major ADGs	3
	4320	4-5 Other ADG Combinations, Age 18 to 44, 1 Major ADG	3
	4410	4-5 Other ADG Combinations, Age 45+, no Major ADGs	3
	4420	4-5 Other ADG Combinations, Age 45+, 1 Major ADG	3
	4330	4-5 Other ADG Combinations, Age 18 to 44, 2+ Major ADGs	4
	4430	4-5 Other ADG Combinations, Age 45+, 2+ Major ADGs	4
6-9 ADG	4510	6-9 Other ADG Combinations, Age 1-5, no Major ADGs	3
	4610	6-9 Other ADG Combinations, Age 6 to 17, no Major ADGs	3

Groups	ACG	ACG Code Description	RUB
	4710	6-9 Other ADG Combinations, Males, Age 18 to 34, no Major ADGs	3
	4720	6-9 Other ADG Combinations, Males, Age 18 to 34, 1 Major ADGs	3
	4810	6-9 Other ADG Combinations, Females, Age 18 to 34, no Major ADGs	3
	4820	6-9 Other ADG Combinations, Females, Age 18 to 34, 1 Major ADGs	3
	4910	6-9 Other ADG Combinations, Age 35+, 0-1 Major ADGs	3
	4520	6-9 Other ADG Combinations, Age 1-5, 1+ Major ADGs	4
	4620	6-9 Other ADG Combinations, Age 6 to 17, 1+ Major ADGs	4
	4730	6-9 Other ADG Combinations, Males, Age 18 to 34, 2+ Major ADGs	4
	4830	6-9 Other ADG Combinations, Females, Age 18 to 34, 2+ Major ADGs	4
	4920	6-9 Other ADG Combinations, Age 35+, 2 Major ADGs	4
	4930	6-9 Other ADG Combinations, Age 35+, 3 Major ADGs	5
	4940	6-9 Other ADG Combinations, Age 35+, 4+ Major ADGs	5
10+ ADG	5010	10+ Other ADG Combinations, Age 1 to 17, no Major ADGs	3
	5020	10+ Other ADG Combinations, Age 1 to 17, 1 Major ADGs	4
	5040	10+ Other ADG Combinations, Age 18+, 0-1 Major ADGs	4
	5050	10+ Other ADG Combinations, Age 18+, 2 Major ADGs	4
	5030	10+ Other ADG Combinations, Age 1 to 17, 2+ Major ADGs	5
	5060	10+ Other ADG Combinations, Age 18+, 3 Major ADGs	5
	5070	10+ Other ADG Combinations, Age 18+, 4+ Major ADGs	5
Pregnancy	1712	Pregnancy, 0-1 ADGs, Not Delivered	2
	1722	Pregnancy, 2-3 ADGs, no Major ADGs, Not Delivered	3
	1732	Pregnancy, 2-3 ADGs, 1+ Major ADGs, Not Delivered	3
	1742	Pregnancy, 4-5 ADGs, no Major ADGs, Not Delivered	3
	1752	Pregnancy, 4-5 ADGs, 1+ Major ADGs, Not Delivered	3
	1762	Pregnancy, 6+ ADGs, no Major ADGs, Not Delivered	3
	1711	Pregnancy, 0-1 ADGs, Delivered	4
	1721	Pregnancy, 2-3 ADGs, no Major ADGs, Delivered	4
	1731	Pregnancy, 2-3 ADGs, 1+ Major ADGs, Delivered	4
	1741	Pregnancy, 4-5 ADGs, no Major ADGs, Delivered	4
	1751	Pregnancy, 4-5 ADGs, 1+ Major ADGs, Delivered	4
	1761	Pregnancy, 6+ ADGs, no Major ADGs, Delivered	4
	1771	Pregnancy, 6+ ADGs, 1+ Major ADGs, Delivered	4
	1772	Pregnancy, 6+ ADGs, 1+ Major ADGs, Not Delivered	4
Infants	5312	Infants: 0-5 ADGs, no Major ADGs, Normal Birth Weight	3
	5332	Infants: 6+ ADGs, no Major ADGs, Normal Birth Weight	3
	5311	Infants: 0-5 ADGs, no Major ADGs, Low Birth Weight	4
	5322	Infants: 0-5 ADGs, 1+ Major ADGs, Normal Birth Weight	4
	5331	Infants: 6+ ADGs, no Major ADGs, Low Birth Weight	4
	5342	Infants: 6+ ADGs, 1+ Major ADGs, Normal Birth Weight	4
	5321	Infants: 0-5 ADGs, 1+ Major ADGs, Low Birth Weight	5
	5341	Infants: 6+ ADGs, 1+ Major ADGs, Low Birth Weight	5
Psychosocial	1300	Psychosocial, w/o Psychosocial Unstable	2
	1400	Psychosocial, w/ Psychosocial Unstable, w/o Psychosocial Stable	3
	1500	Psychosocial, w/ Psychosocial Unstable, w/ Psychosocial Stable	3
Other	5200	Non-Users	0
	1100	Eye and Dental	1
	1600	Preventive/Administrative	1
	5110	No Diagnosis or Only Unclassified Diagnosis	1