

Vertical Integration in Health Care Markets: Evidence from Brazil

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Abstract

This paper investigates the effects of vertical integration among health care insurance companies and hospitals in the Brazilian market. We find that vertical integration between an insurance firm and a hospital decreases the total costs of health care plans, which indicates that vertical integration enhances efficiency, a positive outcome on the market. Moreover, we find that this type of vertical integration mainly reduces medical costs, an evidence that it eliminates the agency problem between hospitals and health insurers: a vertically integrated firm is able to cut unnecessary procedures and to reduce the overall medical expenditure.

Keywords: vertical integration, health care, hospitals, health insurance.

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1 Introduction

This paper investigates the effects of vertical integration among hospitals and health care insurance companies. We find that vertical integration between an insurance firm and a hospital decreases total costs and, mainly, overall medical expenditure. This result indicates that vertical integration has a positive effect on the market and may eliminate an agency problem between hospitals and insurance companies. That is, when an insurance firm integrates to a hospital, it is able to cut unnecessary medical procedures.

We built a database for the Unimed System in Brazil to investigate the effect of vertical integration between hospitals and insurance firms. The Unimed System, further described in section 3, is a decentralized health care provider that is present in all states of Brazil and is representative of the overall Brazilian private health care system. We argue that the Unimed System is an excellent case study and the database built allows us to investigate the effects of vertical integration between hospitals and insurance plans on health care costs.

We find that the Unimed insurance firms vertically integrated with health care providers present lower total costs. Furthermore, when the total costs are broken down into three types, medical, administrative and commercial, the integration between an insurer and a hospital has the positive effect of reducing medical costs. However, the effect on administrative and commercial costs was negligible. This result is surprising, since we expected the effect of integration to be more prominent in decreasing administrative costs, due to synergies and the possibility of trimming administrative costs by merging and downsizing departments such as sales, research, marketing, etc.

We argue that the effect of vertical integration on medical costs is due to an agency problem between health care providers and health care plans: hospitals or physicians may inflate costs and request potentially unnecessary exams and procedures in order to profit more (Culyer and Newhouse, 2000; Gaynor and Vogt, 2000; Jacobs and Rapoport, 2003). The strategy of vertical integration is a way to eliminate this inefficiency, since it aligns the incentives between health care providers and insurers (Cuellar and Gertler, 2005).

The remainder of the paper is organized as follows. Section 2 summarizes the economic theory regarding vertical integration and health care. Section 3 reviews the health care market in Brazil and the Unimed System. Section 4 presents the analysis and the estimations performed. Section 5 discusses the results. Section 6 draws conclusions.

2 Vertical Integration and Health Care

Economic theory states that vertical integration has two main possible consequences: anticompetitive effects or efficiency gains. As a result of a vertical integration, there might be an increase in the market power of the integrated firm, causing anticompetitive effects, such as closing the market to rival firms, increasing barriers to entry for new competitors, or even facilitating the formation of horizontal coordination and collusion between rivals

(Cuellar and Gertler, 2005; Gal-Or, 1999; Ordover et al., 1990; Bijlsma et al., 2008). These effects diminish the overall well-being and would be reflected in higher prices or lower quality of final services to consumers.

However, vertical integration also has potential positive effects on the market, reducing transaction costs, enabling better coordination of services within the integrated company, generating economies of scope, reducing problems related to vertical externalities, aligning incentives and reducing agency problems in markets with asymmetric information, such as the health insurance market (Bork, 1993; Coase, 1937; Bijlsma et al., 2008; Gaynor, 2006; Klein et al., 1978; Willianson, 1983, 1989; Riordan and Salop, 1995; Posner, 1976). These effects represent gains in efficiency and reduce the costs of producing goods and services, having the potential to increase the overall well-being.

Among these possible positive consequences, the most relevant to the health supplement market is associated with inefficiencies arising from information asymmetries, since this strategy can reduce the moral hazard problem (Klein et al., 1978; Willianson, 1989) The empirical literature concerning moral hazard produced compelling evidence that this inefficiency affect in a significant way the health care market. However, most of them evaluated the consumers response to incentives in insurance contracts. Few quantitative studies focused on the providers' financial incentives to induce patients' demand for medical services (Einav and Finkelstein, 2017). Since health insurance firms are not able to monitor providers perfectly, they may attempt to perform unnecessary procedures as a means of increasing income arising from medical services. Clemens and Gottlieb (2014), using data from Medicare beneficiary population between 1993 through 2005, found that increases in physicians's reimbursement rate positively affects health care supply, specially elective procedures when compared with discretionary services. Einav et al. (2017), using data from Medicare Provider and Analysis Review form 2000 to 2012, provided evidence that the hospitals decisions concerning the timing of patients discharges is affected by contract design, comparing linear and non-linear payment schedules.

Vertical integration may mitigate the moral hazard problem, restructuring the financial incentives and aligning the interests between medical providers and operators of health insurance, who will maximize the profits of the two activities together (Klein et al., 1978). In this sense, vertical integration may reduce the health insurance medical costs.

Since the theory concerning the impact of vertical integration is ambiguous, empirical studies are crucial to evaluate the impact of these integrations and their desirability in a specific market. Nevertheless, empirical research on vertical integration in the health care market is recent and there are few studies that specifically address integration between health insurance firms and health care providers.

Ciliberto and Dranove (2006), Cuellar and Gertler (2005) and Baker et al. (2014) investigate the overall effect of integration between hospitals and physicians. Using data from Arizona, Florida, and Wisconsin between 1994 and 1998, the results of Cuellar and Gertler (2005) indicate that there are anticompetitive effects in this type of vertical integration, which was associated with an increase in hospital prices, especially when there was an exclusive relationship between physicians and hospitals in less competitive markets. Baker et al.

(2014), using hospital claims from Truven Analytics MarketScan in the period 2001-07, also find as an effect of vertical integration an increase in hospital prices and providers' power bargain. Ciliberto and Dranove (2006) analyze if vertical integration between hospitals and physicians, using information from California between 1994 to 2001. They found that neither integration nor disintegration had a relevant impact on prices. Instead, their results showed lower prices in vertically integrated hospitals in rural areas¹. Ho (2009) evaluate the welfare effects of market entry of vertically integrated insurers. Adopting a consumer demand model for hospitals and health insurers, he found an increase in social surplus associated with the entry of a vertically integrated insurers into 28 markets.

Although neither economic theory nor empirical analyses are able to give a clear explanation for the effects of vertical integration on the health insurance market, vertical integration would nevertheless increase the market power of the integrated firm, particularly in cases where companies hold a substantial market share and in industries that face difficulties in importing substitutes and high barriers to entry (Gaynor, 2006).

In the next section, we argue that the health insurance market presents these characteristics, which makes the analysis of the effects of vertical integration on this market even more relevant.

3 The Legal Framework of Health Care in Brazil

Public and private health care coexist in Brazil. The Brazilian Federal Constitution ensures the right to health care to all individuals, being a duty of the state to provide it, with universal access guaranteed to all Brazilian citizens². At the same time, it also establishes the right for private business to operate in the health sector. Therefore, both the public and private sectors provide health care goods and services.

Public health services are offered through the Unified Health System (Sistema Único de Saúde – SUS), which, by law, is obliged to offer comprehensive coverage and universal access to the entire population. The services are paid for directly by public funds and thus access to these services represents no additional or particular financial burden on patients. Theoretically, all Brazilian citizens are covered by this national public health care system. However, long waiting periods and quality issues regarding services provided by SUS foster a private health care sector, which includes health insurance companies and out-of-the-pocket payments. It is estimated that 25% of the Brazilian population is covered by private health care insurance, which corresponds to 27% of the total health expenditures in 2006 (OECD, 2008 apud Cechin (2008)). Therefore, private health insurance plays a key role in the Brazilian health care sector.

The legal framework for the private health sector in Brazil, including health insurance companies, is recent and mainly set forth by Laws 9.656 of 1998 and 9.961 of 2000, which established guidelines for health insurers to operate in this market (Andrade et al., 2000).

¹The sample of this of type of hospitals was small, so these effects are imprecisely estimated.

²Federal Constitution, Art. 196-200.

Law 9.961 created the National Agency of Supplemental Health (Agência Nacional de Saúde Suplementar – ANS), responsible for regulating the private health care market.

These laws establish regulatory safeguards for beneficiaries of health care plans, defining a list of mandatory procedures for contracts, which is revised almost every year, in order to include new treatments and diagnoses. Furthermore, ANS establishes limits on cream-skimming strategies, prohibiting insurance companies from rejecting clients on the base of age or denying coverage to patients with pre-existing conditions.

This regulatory framework also imposes restrictions on health care plan pricing strategies, adopting a system similar to collective health care plans, where the premium is calculated according to the aggregate risk of the portfolio of firms (Santos, 2008). In addition, the legal framework establishes age as being the single criterion for price discrimination, according to the following categories: 0-18 years, 19-23 years, 24-28 years, 29-33 years, 34-38 years, 39-43 years, 44-48 years, 49-53 years, 54-59 years, 59 years or over. Moreover, ANS imposes limits on grace periods during which health care plans may deny coverage of some procedures and prohibits them from setting limits on coverage. Lastly, ANS also monitors the financial soundness of health care insurance firms, requiring economic and financial guarantees, such as minimum capital, provisions, as well as solvency margins (Andrade et al., 2000).

This recent regulatory framework has had a significant impact on the Brazilian private health insurance market. By defining a mandatory list of minimum procedures, by limiting cream-skimming and price discrimination, and by imposing guidelines and requiring financial guarantees, ANS has significantly raised the cost of health insurance companies, which may have driven smaller companies out of the market, increasing concentration (Vianna, 2003). Over a ten years period, the number of firms active in the health insurance market has decreased 30%, from 2,639 companies in 1999 to 1,697 in 2009.

Almeida (2009) reports that between 2003 and 2006, about 75% of municipalities had a Herfindahl-Hirschman Index (HHI) of over 1800 points, relative to the number of beneficiaries. This value is taken as a threshold by antitrust authorities in Brazil and in the USA as a necessary condition to assume the existence of market power (CADE, 2016; USDoJ, 1984).

In this sense, these new laws may have reinforced a tendency towards greater market concentration and higher barriers to entry for new competitors. These characteristics might enable the exercise of market power by a company holding a dominant position, increasing the possibility of negative effects of vertical integration.

4 The Empirical Procedure

Studies on mergers and acquisitions typically focus on measuring the impact of the merger on two dimensions 1) the final price paid by the consumer, and/or 2) the firms' costs. The first is related to non-competitive effects, and the second to gains of efficiency regarding

reduction of costs and gains of scope. Our analysis concerns the second aspect³, which although is not capable of assessing the entire effect of vertical integration on consumers, contributes to the empirical literature by verifying whether this strategy has pro-competitive effects that could be passed on to consumers.

Therefore, we analyze the effect of vertical integration between health plans and hospitals on the costs of the health insurance firms. If we observe that this type of integration reduces costs, then there is evidence that it provides gains of efficiency.

First, we further describe the Unimed System and the data used. Then we present the estimation and the results. We run three different estimations: fixed effects, random effects and first differences.

4.1 The Unimed System

The empirical analysis conducted in this paper used information on health plan companies under the Unimed brand. These companies, classified by ANS as medical cooperatives, provide health insurance and require a contractually pre-determined payment. Unimed cooperatives are part of the overall Unimed System, organized as follows: doctors from a given municipality or neighboring municipalities are affiliated to an individual Unimed, which is autonomous. These units are linked to a state or regional federation, which are part of the National Confederation of Cooperatives, called Unimed Brazil, which only plays a coordinating role, directing the activities of cooperatives and consolidating the Unimed brand, and does not commercialize health plans.

Although a singular Unimed unit has a high degree of administrative and managerial independence, some strategic decisions are centralized at Unimed Brazil, such the creation of new cooperatives and the permanence of any cooperative in the system. Unimed Brazil also performs a geographic segmentation to minimize overlapping market areas among cooperatives. Thus, individual Unimed are placed in different geographic markets and do not compete with each other for consumers.

The main reason for only using data only from Unimed companies was their availability. Due to the characteristics of the Unimed System, the available data allows us to properly estimate the effects of vertical integration on the costs of these health insurances companies. The relevant health services and health insurance markets are defined by Antitrust Authority in Brazil usually as local in nature. However, health insurance accounting data in the ANS database are only available in a consolidated and aggregated form, regardless of the provider and geographic location. Thus, the effects of a vertical integration between a given hospital and a health care provider cannot be determined for a given nationwide health insurance firm. Therefore, a reduction of costs in a certain region may be offset by a cost increase in another region.

³To be able to estimate the effects of vertical integration on health insurance prices, it would be necessary to include variables regarding the market power of health insurance companies, to control for market concentration. Unfortunately, the information concerning the number of health plans per provider and municipality was not available.

The Unimed data does not present this problem. Although they are part of the Unimed System, which operates nationwide, each firm has full autonomy and acts as an individual health care insurer, reporting its own accounting data to ANS. Furthermore, each individual Unimed firm commercializes health insurance locally, in a group of municipalities. This allows the measurement of the effects of vertical integration on the costs of each Unimed firm, because the relevant geographic market for health plans and health services, in the case of Unimed, coincides with the data available.

Although Unimed cooperative data is limited when compared to all health care companies registered in the ANS database, the greater geographical distribution of the Unimed in the Brazilian market mitigates this problem. The Unimed system is present in 83%⁴ of Brazilian municipalities, providing health care insurance to more than 16 million consumers⁵.

Also according to ANS, in 2009, health care insurance firms under the Unimed brand account for more than 90% of private companies listed as medical cooperatives.⁶ In 2009, medical cooperatives accounted for 57.42% of all the health care insurers providing medical and hospital services. Regarding revenue from the sale of health care insurance, medical cooperatives stand out with the highest percentage for the health insurance market: 36% in 2008. This indicates that the Unimed System hold a significant market share in Brazil, and reflects the overall private health care market in Brazil.

An important contribution of our empirical analysis based solely on Unimed firm data is related to the fact that all insurance firms in our database share the same brand. The brand is a proxy for quality of the health care provider and offers a valuable competitive edge in the supplementary health care market, mainly due to asymmetries of information between physicians and consumers (Almeida, 2009). Thus, using only data from Unimed firms controls for quality in the empirical analysis performed.

4.2 Data

We use an annual panel data from 2003 to 2008.⁷ The data is segmented by health care provider, for all providers under the Unimed brand. The dependent variable is the total cost of each health care insurance provider, which was deflated using an inflation index provided by ANS. We control for size, using revenue,⁸ and we use year dummies to control for shocks and tendencies that affect the cost of all providers. We also use a dummy related to the existence of a hospital or an ER associated to the plan, which measures the effect of vertical integration on costs. Our main goal is to estimate this last parameter.

⁴4,623 municipalities.

⁵Information obtained from the Unimed website: <http://www.centralnacionalunimed.com.br/>. Access in march 09, 2010.

⁶Source: *Agência Nacional de Saúde Suplementar, ANS. Caderno de Informação em Saúde Suplementar – Setembro de 2009.*

⁷Data on health care providers cost and revenue are not available for earlier years.

⁸We also estimated the model not controlling for revenue, founding similar results.

The vertical integration variable was built using data from the Brazilian National Registry of Medical Facilities (CNES), which contains information on all health care facilities in Brazil. We searched for information on the websites of all Unimed health insurance companies that owned hospitals or emergency rooms to identify the date when each property was acquired or opened.

The information collected shows that of a total of 328 firms, 166 had at least one type of facility to provide its own services, ranging from clinics to general hospitals. There were a total of 279 Unimed health facilities, and their types are classified in Table 1.

Table 1: Number of Unimed Providers, by Type of Establishment

Type of Provider	Quantity
Clinics	63
Isolated clinics	27
Hospitals	94
Emergency rooms	37
Laboratories/diagnostic units	58

Source: *Cadastro Nacional de Estabelecimento de Saúde (CNES)*

Our empirical analysis only investigated the effects of vertical integration between health plans and hospitals or emergency rooms. We assume that vertical integration between insurers and other types of health facilities has a lower probability of having anticompetitive effects on health care market. These are easily contestable markets, since the entry of new competitors aiming to provide services through laboratories, clinics, and diagnostic units is less costly and less regulated. The possibility of entry of new competitors is a factor that inhibits the exercise of market power.

In this sense, our analysis focuses on the effects on health insurance’s costs of the types of vertical integration and is one of the major concerns of antitrust authorities: the integration between health insurers and hospitals or ERs (CADE, 2016; USDoJ, 1984).⁹

This pattern of integration is recent in the Brazilian health care market (Albuquerque, 2006). This was also observed in the data. Nearly 95% of Unimed hospitals and emergency rooms were built or acquired during the 1990s. By the year 1989, only 2 general hospitals were owned by Unimed. Between 2000 and 2009, this number grew to 81 general hospitals, with the acquisition of 49 units. There was a similar pattern with regard to emergency rooms.

The dependent variables of our empirical study are the costs that Unimed insurance firms incur to offer medical services to consumers. Information related to this variable is provided by ANS, which publishes a balance sheet of the health care insurance companies

⁹Despite the fact that the same operator could acquire more than one facility, the vertical integration variable reflects only the year in which the firm acquired the first unit and became fully integrated.

registered at the Agency. ANS data classifies health plan costs into three categories: i) medical costs: the expenditures related to medical services; ii) marketing costs: expenditures related to the commercialization of health plans; and iii) administrative costs: expenditures related to salaries of non-medical staff and taxes.

Thus, we have the following cost variables, which were built by dividing the respective cost by the number of consumers of each Unimed:

- i) *Average Medical Expenditure (AME)*: average expenditures related to hospital and medical services.
- ii) *Average Commercial Expenditure (ACE)*: average expenditures related to the sale of health insurance plans.
- iii) *Average Administrative Expenditure (AAE)*: average expenditures related to administrative costs, wages and taxes.
- iv) *Average Total Expenditure (ATE)*: the sum of *AME*, *ACE* and *AAE*. This is the average total cost that the company incurs when operating.

Medical expenditures comprise 77.85% of total cost, administrative expenditures, 20.89%, and commercial expenditures, 1.25%.

We used total revenue (*TR*) from the commercialization of health care insurance plans, data available in the ANS Annual Reports, as a control variable for the size of the Unimed company. Thus, we control for potential gains of scale in the health insurance market, which may affect the firm's costs. It was necessary to control for size so as not to misspecify gains of scale as efficiency gains resulting from vertical integration.

Since our primary interest concerned the estimation of the marginal effects on a percentage basis, we used the logarithm of the variables *AME*, *ACE*, *AAE*, *ATE* and *TR* in our empirical procedure.

4.3 The Estimation

We employed data disaggregated by Unimed health plan company between 2003 to 2008 to build a panel, in which the number of periods is equal to six and the observations in the cross-section are 326 health insurance companies.

We perform two main estimations. The first uses average total cost as the dependent variable and tests whether vertical integration reduces the total cost of health insurance companies. The second measures the effect on each type of cost, i.e., medical, administrative and commercial, in order to investigate what type of cost vertical integration impacts more.

We estimate three models: random effects, fixed effects and first differences. The results of Hausman test¹⁰ and the analysis whether there is autocorrelation in the error term

¹⁰The Hausman test compares the random and fixed effect estimators. Under the null hypothesis, both

¹¹ indicate that fixed effects is the most appropriate method for estimating the effects of vertical integration.

4.4 Results

4.4.1 Total Costs

The main interest of the first empirical analysis is to assess the impact of vertical integration on the total cost of Unimed health care insurers, in order to measure potential efficiency gains arising from vertical integration. The estimated equation was:

$$\ln(ATE_{it}) = \alpha_1 + \alpha_2 VI_{it} + \alpha_3 \ln(TR_{it}) + \alpha_4 D_{2004} + \alpha_5 D_{2005} + \alpha_6 D_{2006} + \alpha_7 D_{2007} + \alpha_8 D_{2008} + u_{it},$$

where:

- ATE_{it} is the average total expenditure for company i in the year t , which is the sum of medical, commercial and administrative expenditures;
- VI_{it} is a dummy variable that is 1 if Unimed insurance i had a hospital or an ER, 0 otherwise, in year t ;
- D_{2004} , D_{2005} , D_{2006} , D_{2007} , D_{2008} are year dummies;
- TR_{it} is company i total revenue in year t .

If the vertical integration dummy is significantly higher than 0, we have evidence that vertical integration increases costs. If it is significantly lower than 0, then vertical integration decreases costs. We also estimated the model not controlling for revenue.

Table 2 below reports the results for the fixed effect estimation. The Total Revenue (TR) variable is positive and statistically significant at 5%. Since the econometric model estimated a logarithmic function, this parameter measures the revenue-elasticity of the total cost. Since the value is positive and below 1, the total cost is inelastic with respect to total revenue. Therefore, an increase in revenues results in a less-than-proportional increase in costs. This means that providers with high revenues tend to have a lower cost/revenue ratio and, consequently, proportionally higher profits. This result is evidence that there are gains of scale in the health insurance market.¹²

these estimators are consistent, but the random effects is efficient. Under the alternative hypothesis, fixed effects is consistent, whereas the random is not.

¹¹If the analysis of the error term of the fixed effects estimator is such that $u_{it} = \rho u_{i,t-1} + e_{it}$, $\rho = 1$ (Test 1) and the analysis of the error term of the first-difference estimator is such that $v_i = \rho v_{i,t-1} + e_{it}$, $\rho = 0$ and $v_i = \Delta u_{it}$, (Test 2), then the best approach is the first-differences because u_{it} is a random walk. However, if the error analysis of the term of the fixed effect estimator is such that: $u_{it} = \rho u_{i,t-1} + e_{it}$, $\rho = 1$ (test 1) and the analysis of the error term in first-difference is such that $v_i = \rho v_{i,t-1} + e_{it}$, $\rho = 0$ and $v_i = \Delta u_{it}$, (Test 2), then the best approach is fixed effects (Cameron and Trivedi, 2005).

¹²An inelastic cost with respect to total revenue may seem a counterintuitive result, since it would indicate that the health plans providers would not be maximizing their profit. However, as discussed in section 3, ANS requires economic and financial guarantees, such as minimum capital and solvency margins (similar with medical loss ratio), which diminishes the ability of firms to reach the optimal point of their profit maximization.

Second, when controlling for Total Revenue, the year dummies are all significant, with negative signs, which indicates that there are factors which are not associated with total revenue or vertical integration that affected total costs. According to the results, the year dummies point to an increasing trend in health insurance costs from 2003 to 2009.

Table 2: Results – Vertical Integration and Total Cost

Variable	Values Estimated	
	(1)	(2)
Constant	7.1181 (0.0357)	-2.7796 (0.6135)
Total Revenue	n/a n/a	0.6121 (0.0379)
VI Dummy	-0.1492 (0.0633)	-0.1268 (0.0585)
Year Dummy 2004	0.0210 (0.0441)	-0.0835 (0.0413)
Year Dummy 2005	0.0266 (0.0434)	-0.1924 (0.0424)
Year Dummy 2006	0.0735 (0.0435)	-0.2211 (0.0441)
Year Dummy 2007	0.0495 (0.0439)	-0.2840 (0.0455)
Year Dummy 2008	0.1375 (0.0440)	-0.2776 (0.0481)
N _o . Obs.	1852	1852

Standard errors in parentheses

Both estimations showed that the vertical integration dummy is negative and significant. The model not controlling for revenue points to a reduction of 15% on total costs, while the model with total revenue indicates that vertically integrated Unimed's have around 12% lower costs. Therefore, vertical integration provides gains of efficiency in this market.

4.4.2 Segmented Costs

We now present the results of the impact of vertical integration on each type of cost: i) Average Medical Expenditure (*AME*), ii) Average Commercial Expenditure (*ACE*), and iii) Average Administrative Expenditure (*AAE*). We check if vertical integration has a uniform effect on all three types of expenditure or whether if there is a type of cost that is more sensitive to the phenomenon.

Three estimations were performed, similar to the one presented in the previous sub-

section. Each estimation has a different dependent variable: average medical, commercial and administrative expenditures. The equation estimated is:

$$\ln(AE_{it}) = \alpha_1 + \alpha_2 VI_{it} + \alpha_3 \ln(TR_{it}) + \alpha_4 D_{2004} + \alpha_5 D_{2005} + \alpha_6 D_{2006} + \alpha_7 D_{2007} + \alpha_8 D_{2008} + u_{it},$$

where:

- AE_{it} is the average expenditure for company i in the year t , which can be one of the three types above;
- VI_{it} is a dummy variable that is 1 if company i has a hospital or an ER, 0 otherwise, in year t ;
- D_{2004} , D_{2005} , D_{2006} , D_{2007} , D_{2008} are year dummies;
- TR_{it} is total revenue for company i in year t .

For all estimation methods used, the results are statistically insignificant for both regressions. Thus, we cannot conclude that vertical integration between providers and insurers results in lower administrative or commercial costs for Unimed firms. Table 6 and 7 present the results of the fixed effects estimation where average administrative expenditure and the average commercial expenditure is the dependent variable, respectively.

Finally, Table 8 presents the results of the fixed effects estimation where average medical expenses is the dependent variable.¹³ Our findings show that the vertical integration dummy is negative and significant. Therefore, vertical integration reduces medical cost for both estimations. When controlling for Total Revenue, the results indicates that vertically integrated Unimeds have around 20% lower medical costs.

The results presented in Tables 6 to 8 show that the effects of the vertical integration dummy are not uniform when the dependent variable is segmented by the type of cost. Vertical integration is statistically significant only in relation to medical expenditure, and not significant for the estimations that use administrative and commercial costs as the dependent variable.

4.5 Discussion

The first estimation performed used the average total costs of Unimed health care insurance firms and found that the vertical integration variable is statistically significant and negative for the fixed effects method, which proved to be the most appropriate model according to the test results presented above. Thus, our analysis indicates that once vertical integration between insurers and health care providers took place, costs were reduced for the integrated company.

Therefore, our findings support the hypothesis that vertical integration between Unimed cooperatives and hospitals or emergency rooms leads to efficiency gains, in the

¹³As the previous section, Hausman test and the analysis of autocorrelation in the error term indicate that fixed effects is the most appropriate method for estimating the effects of vertical integration.

Table 3: Results – Vertical Integration and Administrative Cost

Variable	Values Estimated	
	(1)	(2)
Constant	5.3087 (0.0601)	-1.1201 (0.311)
Total Revenue	n/a n/a	0.3974 (0.0682)
VI Dummy	-0.0526 (0.1060)	-0.0394 (0.1049)
Dummy 2004	-0.2078 (0.0739)	-0.2743 (0.0741)
Dummy 2005	0.0957 (0.0727)	-0.0449 (0.0759)
Dummy 2006	0.1780 (0.0728)	-0.0116 (0.0790)
Dummy 2007	0.2368 (0.0735)	0.0219 (0.0815)
Dummy 2008	0.2822 (0.0737)	0.0143 (0.0862)
N° Obs.	1848	1848

Standard errors in parentheses

form of lower health plan costs. This is an indication that the strategy adopted by some Unimed firms to vertically integrate with hospitals and ERs, in order to provide services directly to their consumers, had a significant effect in reducing total costs per person: around 12% of total costs. This number is even larger when we analyze the medical costs separately: 20%.

This means that even if there is an increase in the market power of the integrated firm and the possibility of exercising this market power, there are efficiency gains from vertical integration which may outweigh the potential anticompetitive effects associated with adopting this strategy, which could result in greater overall well-being.

This conclusion is consistent with the results of Ciliberto and Dranove (2006), who found efficiency gains arising from vertical integration between physicians and hospitals that could offset the increase in market power, and, therefore, have no effect on consumer prices.

The second round of estimations investigated whether vertical integration had an homogenous impact on each of the three types of costs (administrative, commercial and medical). The estimations performed indicate that vertical integration of Unimed insurers with hospitals and emergency rooms implies lower costs due to the payment of medical and

Table 4: Results – Vertical Integration and Commercial Cost

Variable	Values Estimated	
	(1)	(2)
Constant	1.9896 (0.1269)	-9.0001 (2.2950)
Total Revenue	n/a n/a	0.6795 (0.1416)
VI Dummy	-0.0545 (0.2181)	0.0850 (0.2166)
Dummy 2004	-0.3802 (0.1532)	-0.4994 (0.1541)
Dummy 2005	-0.5192 (0.1508)	-0.7654 (0.1583)
Dummy 2006	-0.6477 (0.1508)	-0.9774 (0.1647)
Dummy 2007	-0.6676 (0.1522)	-1.0407 (0.1699)
Dummy 2008	-0.6418 (0.1527)	-1.1055 (0.1798)
N° Obs.	1825	1825

Standard errors in parentheses

hospital services, but does not significantly impact the other two types of cost incurred, namely administrative and commercial, although the sign also indicates a reduction in these other two types of costs.

The empirical finding that vertical integration leads to cost reduction, mostly in medical expenditures, is a novel result in the literature. There is a vast empirical literature presenting evidence that insurance coverage may increase healthcare utilization and spending, since it lowers the marginal cost of care to the individuals. However, most quantitative approaches is focused on consumers incentives. It received less empirical attention the providers incentives to induce patients' demand for medical services (Einav and Finkelstein, 2017). Providers have inside information on the patients' health and the proper procedures for each type of situation, as well as the ability to induce greater demand for health services by consumers. Since hospitals and medical care providers are remunerated by the number of services performed, there is an incentive to induce their overuse, which would unnecessarily increase the costs of medical health insurance firms (Jacobs and Rapoport, 2003; Culyer and Newhouse, 2000; Gaynor and Vogt, 2000; Andrade et al., 2000).

Since we found that the type of cost mainly reduced is medical expenditures, our results indicate that vertical integration alleviates the problem of asymmetric information between health insurance firms and health care providers. By offering health services through

Table 5: Results – Vertical Integration and Medical Cost

Variable	Values Estimated	
	(1)	(2)
Constant	6.8838 (0.0618)	-12.9326 (1.0382)
Total Revenue	n/a n/a	1.2252 (0.0641)
VI Dummy	-0.2458 (0.1092)	-0.2017 (0.0981)
Dummy 2004	0.0321 (0.0763)	-0.1736 (0.0694)
Dummy 2005	-0.0976 (0.0751)	-0.5324 (0.0712)
Dummy 2006	0.0078 (0.0751)	-0.5783 (0.0741)
Dummy 2007	-0.0591 (0.0759)	-0.7232 (0.0765)
Dummy 2008	0.0422 (0.0761)	-0.7850 (0.0809)
N° Obs.	1850	1850

Standard errors in parentheses

its own establishments, health insurance firms have a greater control over the number of procedures performed and the amount and type of material used in each medical procedure. Moreover, integrated units jointly maximize profit. Thus, vertical integration aligns the interests of hospitals and or emergency rooms to those of health insurance firms, reducing the incentive for health care providers to adopt a strategic behavior that would hamper the profits of insurance firms.

5 Conclusion

The increase in the number of health care insurance providers that have vertically integrated with health care providers in recent years indicates that vertical integration is a trend in the overall health care market in Brazil. Since the health care insurance market presents characteristics that increase the possibility of negative effects of vertical integration, such as high market concentration and barriers to entry, it is important to investigate the impact of this strategy in this important sector. Studies that have attempted to empirically assess the effects of vertical integration in the health insurance market have helped to identify the effects of adopting this strategy by health care insurance firms in Brazil.

The empirical analysis undertaken in this paper concludes that vertical integration leads to lower total cost for Unimed insurance firms that have vertically integrated with hospitals or ERs. We find that costs are not homogeneously affected: the cost component mostly affected is related to medical expenditures, which are expenses incurred by insurers to pay for medical services and hospital treatment.

One could think that the effect of integration should be more prominent reducing administrative costs, due to synergies and the possibility of trimming cost by joining and reducing departments such as sales, research, marketing, etc. Our results suggest that vertical integration is an effective strategy to reduce costs for insurance companies by alleviating the moral hazard problem between health care insurers and providers, either because it increases the capacity of insurance firms to monitor the services provided by their own facilities, or because it aligns incentives between these two agents. Thus, the large number of Unimeds that have medical and hospital establishments may possibly be related to the fact that vertical integration is an effective strategy to contain medical costs, making the Unimeds more competitive in the market. Thus, this strategy has pro-competitive effects that could be passed on to consumers.

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