Social Science & Medicine 265 (2020) 113454

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: http://www.elsevier.com/locate/socscimed

Health insurance as a state institution: The effect of single-payer insurance on expenditures in OECD countries

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ARTICLE INFO

Keywords:
Health expenditure
Single-payer
Insurance
Universal healthcare

ABSTRACT

A growing literature in comparative political economy and health economics has argued several cost-saving effects of a single-payer healthcare system. Despite this growing evidence, there has been no large-scale empirical examination of whether such an effect exists cross-nationally over time. This paper serves as the first attempt to find and calculate the extent to which healthcare spending is affected by the utilization of a single-payer scheme. I introduce an original dataset for OECD countries that measures when and where systems that qualify as single-payer exist, and employ it to test whether significant differences exist in health expenditures. Results demonstrate a significant difference between single- and multi-payer system expenditures. I estimate the utilization of a single-payer system is associated with decreased expenditure equal to 0.750 percentage-points of a nation's GDP. This would equate to the United States saving well over $1.5 trillion over ten years.

1. Introduction

Theoretical arguments concerning the features of single-payer healthcare systems have become more widespread in the political economy and health economics literatures. Proponents of the single-payer system argue several features inherent to the system work to increase efficiency and limit costs, while opponents argue government inefficiencies and bureaucracy serve to drive up costs, instead. However, despite this disagreement, no large-scale empirical evidence has been offered to confirm or deny any of these theoretical claims. A large impediment to such a large-scale test has been, until now, the lack of any comprehensive cross-national longitudinal measure of healthcare systems. This paper introduces a new dataset measuring the healthcare systems of all Organization for Economic Co-operation and Development (OECD) members from 1985 through 2015, assessing which qualify as single-payer. Further, I utilize this data to offer the first large-N empirical test of the theorized cost-savings mechanisms single-payer systems may offer.

Through a historical examination of OECD members covering a 30-year period (except for a few countries where data was unavailable until the 1990s), I find that, on average, utilization of a single-payer system is associated with decreased health expenditures vis-à-vis multi-payer counterparts ("multi-payer" taken here to refer to any non-single-payer system), even as the health status of the country, demographics, level of preventative medicine, government ideology, and other cross-national variances are controlled for. Further, I show that these differences in spending are largely focused in the areas of curative and rehabilitative care, medical goods, and governance and administration.

The contribution of this paper is two-fold. First, it serves to introduce a robust dataset coding healthcare systems for 34 OECD countries over 30 years. Such a measure was previously non-existent and should serve to greatly increase our ability to analyze the causes and effects of single-payer systems throughout the developed world. Second, I offer empirical evidence which demonstrates a significant difference exists in terms of expenditure between single- and multi-payer systems. These differences offer the first empirical evidence for theorized mechanisms of healthcare savings, including gains in efficiency, more effective risk distribution, and increases in bargaining power. I discuss each of these in the following section.

2. Single-payer versus multi-payer systems

Non-empirically, there is much evidence to suggest that, overall, countries with single-payer health insurance systems *should* pay significantly less per person than countries with multi-payer systems, all else

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[1] I thank John Constantelos, Christian Houle, Tim Callaghan, Crystal Williams, Stephen Anderson, Elizabeth Brannon, and Jonathan King for their extremely helpful comments and suggestions.

https://doi.org/10.1016/j.socscimed.2020.113454
Received in revised form 15 September 2020; Accepted 12 October 2020
Available online 5 November 2020
0277-9536/

being equal. Overall, there are several factors that contribute to this hypothesized effect, which can be broken down into three main categories: efficiency gains, risk-pooling, and costs and bargaining power.

2.1. Efficiency

A main cause of divergence in spending between systems may be linked to gains in efficiency. First, analysis has shown that taxation has much lower collection costs than standard insurance (World Health Organization 2000), and that therefore, tax-financed systems tend to be less expensive, all else being equal (Wagstaff 2009b). The costs of collecting revenues in these multi-payer systems is higher, in part, due to the potential for evasion of payments (Wagstaff 2009a). Second, many analyses have noted a large difference in time allocation across systems (e.g. Hussey and Anderson 2003). With an entire population of a country on a single plan, revenue collection and benefit payouts are streamlined to a single agency (as opposed to countless private insurance offices, with numerous individual plans).

Such a mechanism can be best exemplified by evaluating practitioner behavior across borders. Data suggests that doctors in Canada (an archetypical single-payer case) spend roughly one quarter of the billed time than that of their American counterparts (the US being a decidedly multi-payer nation) consulting with insurance companies, while Canadian nurses spend only one-tenth the time of their American counterparts (Morra et al., 2011). This considerable time saved on bureaucratic activity alone results in a billions of dollars per year expenditure gap between the two countries (Himmelstein and Woolhandler 1986; Pozen and Cutler 2010; Woolhandler and Himmelstein 1991; Woolhandler et al. 2003). Currently in the US, for example, estimates put the cost of physicians' administrative work between $68,000 and $85,000 per year per *physician* (Erickson et al., 2017).

A single-payer system, on average, frees roughly 4 h per week per doctor, and 5 h per week per support staffer (Blanchfield et al., 2010). These savings in billed time results in dramatically lower hospital overhead costs, and as many hospitals are non-profit, these savings are generally passed on to patients. Some estimates find approximately 20% of the differences in spending between the US and Canada are due to administration costs alone (Pozen and Cutler 2010). Beyond administration, the streamlined process of having a single insurance provider purchase medical technologies, medications, and medical procedures for a hospital has been found to result in lower costs for all three, as well as increasing their ability to control long term growth in costs and expenditures (Hussey and Anderson 2003).

Arguments could be made, admittedly, that these increases in efficiency may simply be counteracted by subsequent increases in utilization (i.e. readily available services may increase moral hazard). There are, of course, numerous methods for dealing with moral hazard while still enjoying the cost-savings of payment streamlining. The UK's National Health Service, for instance, maintains co-payments for certain services (Cylus et al., 2015). Even-still, Canada has yet to adopt any form of cost-sharing, and has not encountered any utilization problems (Oberlander 2016). Rather, many argue that utilization does not vary dramatically across insurance schemes, and that most of the variation in spending across systems is due to the costs of medical goods and services, not volume (Morgan et al. 2017).

2.2. Risk pooling

The second major mechanism linking expenditures and single-payer systems involves risk pools. For one, having every person in a country as a member of a universal insurance pool puts downward pressure on costs, as hospitals are no longer required to inflate their prices in order to subsidize patients who are not able to pay–as many times (e.g. in the United States) these patients cannot be turned away by law (Hirasuna 2007). Of course, this may be true in any system that insures all its citizens, and is not wholly unique to single-payer schemes.

More importantly, and unique to single-payer systems: while putting a whole populace into a single risk pool increases the number of sick people in the pool, it increases the number of healthy individuals in the pool to a much higher degree. This ability to distribute risk amongst the entire population results in a much lower cost per person, as the ratio of healthy members to sick members in the pool is increased. In the case of a more fragmented system, some insurers are likely to end up with a comparatively unhealthy, more expensive pool, as they are the most likely to need insurance (Petrou et al. 2018). Here it is not easy to establish an equitable, and thus cost-effective, spread of risk as insurers are incentivized to pick the healthier, and thus cheaper, members of the population (Wagstaff 2009a).

Of course, in the aggregate risk pooling cannot lower total expenditure, as in net more people are being provided insurance, though the mean cost per insured-person will decrease. Even-still, this adverse selection is an expensive problem in the multi-payer scheme, and its elimination will still serve to decrease aggregate spending. Whereby risk-distribution is automatically accounted for in single-payer systems, in the context of multiple payers large amounts of expensive data need to be collected to provide a more equitable risk distribution (Hussey and Anderson 2003). Even if a system does endure these costs, risk-adjustment has proven to be quite ineffective (e.g. Hussey and Anderson 2003; Light 2000), accounting for as little as 10% of variation in costs. Thus, the transition to a system which simply insures everyone wholly eliminates the need for large scale data-collection.

The single-payer system's large, population-sized pool also invokes the mathematical "law of large numbers" principle, where unpredictable risk in a small sample becomes much more predictable as the sample grows. This thus allows insurers to more accurately predict cost and risk.

2.3. Costs and bargaining power

There has been very little correlation found between quality of care and cost of care (e.g. Hussey et al. 2013). In 2000, the World Health Organization ranked countries based on the quality of their healthcare systems after a comprehensive comparative analysis. These rankings took into account (1) overall health of the country, (2) responsiveness (i.e. patient treatment, confidentiality, respect, choice), and (3) financing (i.e. regressive vs progressive payments, out-of-pocket spending). Their data seem to confirm this lack of a relationship.

For example, in 2011 Liberia spent the most on healthcare as a percent of GDP, yet the World Health Organization (2000) ranks their healthcare system as the 186th best out of 190 ranked countries. In fact, of the top 30 spenders in the world, only one made it in to the top ten. For comparison, the United States spent the second most, and was ranked 37th overall (World Health Organization). This lack of correlation points to the conclusion that cost-savings mechanisms likely exist to drive down costs without affecting quality.

Many agree that the greatest influence on the health expenditures of a country is the actual price of healthcare goods and services in said country (Anderson et al., 2003). In other words, the price pharmaceutical companies charge for drugs, and the price doctors and hospitals charge for procedures has a much larger effect than quality of care, health-level of a nation, or any other factor. The absolute (i.e. a monospony) bargaining power held by a single-insurer puts a large constraint on the prices of medical goods and services, as the government is permitted total control over spending. This constraint is thought to be a major mechanism affording single-payer systems a "discount" on prices vis-à-vis multi-payer alternatives.

For example, previous work has noted that the astronomical level of variation in health spending across countries is not driven by differences in volume (that is, some nations consuming more healthcare products/services than others), but rather by the specific drugs chosen, and the prices paid for them. On this front, single-payer systems have a significant advantage, as they are more able to promote lower cost alternatives without affecting quality of care (see Morgan et al. 2017).

This difference can again be exemplified by a comparison between the United States and Canada. Analyzing differences between healthcare in the US and Canada (as many have done), is particularly useful as they are, in many important ways, very similar countries (Evans et al. 1991). Canada finalized adoption of their single-payer system in 1971; at that time, both the US and Canada had roughly equal health expenditures at 7.5% of GDP (Ridic et al. 2012). After Canada's adoption of the single-payer system however, the countries quickly diverged as the US rate of expenditure quickly grew at a rate much faster than that of Canada. By 2017, expenditures in Canada had increased roughly 50% over that 36 year period, while spending in the US had risen nearly 140%. The rate of health expenditures over time is illustrated in Fig. 1.

Canada is, however, an interesting case. As their primary and acute care is wholly financed though a single-payer system, their prescription financing is decidedly multi-payer. Some have characterized this system as responsible for Canada's growing pharmaceutical costs (Angus and Karpetz 1998). Reports have specifically argued that transitioning to a singe-payer drug insurance scheme would save billions due largely to increased efficiency and absolute bargaining power (Morgan et al., 2015).

Further, evidence suggests that this cross-national evidence would apply to a multi-payer system transitioning to a single-payer system. In 2011 the state of Vermont passed legislation to transform its healthcare system into a statewide single-payer insurer. While this plan was ultimately abandoned, the economic scoring of the law concluded that it would cut employer and household healthcare spending by roughly $200 million (Hsiao et al., 2011). I return to the conclusions of this particular study later in the results section.

Because a single-payer system has been demonstrated by previous studies to control costs as well as growth, mainly by administratively setting prices, the notion that such a system would lead to lower healthcare expenditures seems probable and worthy of rigorous statistical analysis.

2.4. Theoretical considerations

Given the insights from the previous literature, it it very likely that countries with single-payer systems experience significant cost-savings over their multi-payer counterparts. Essentially, the literature argues for several cost-savings mechanisms that should present themselves to bring down the cost of healthcare in these single-payer systems. Namely, this is achieved via (1) the streamlining of billing and insurance procedures, saving doctors and nurses a significant amount of billed time, (2) the creation of a more equitable and predictable spread of risk throughout an entire populace, and (3) the leveraging of bargaining power to control costs. To put it formally, my hypothesis can thus be stated:

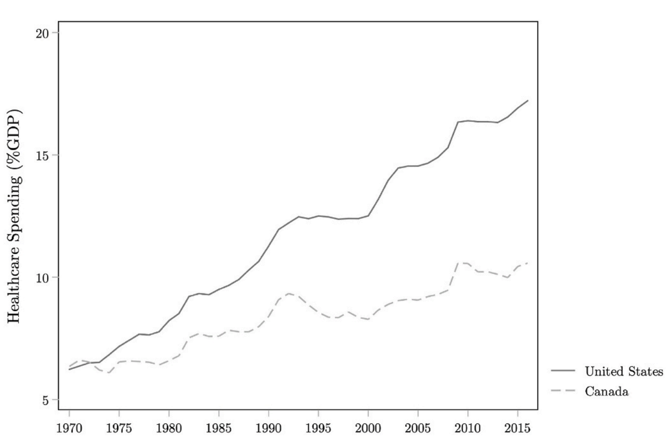

Fig. 1. USA vs Canada Health Expenditure Since 1970.

Hypothesis 1. Countries with single-payer healthcare systems experience significantly lower health expenditures, relative to countries with multi-payer systems.

Following this logic, my argument is simply that countries with single-payer systems pay less for healthcare compared to countries with multi-payer systems. I argue that a cross-national study comparing developed countries' health expenditures, while holding level and quality of care, national health status, and population demographics constant should bear these results, and I offer robust empirical evidence in support of this hypothesis.

3. Single-payer systems: a new coding

I define a single-payer system as one in which the government solely occupies the field of paying for primary health-related expenses for all citizens, regardless of employment, region of residence, age, or any other factor. The key element in this operationalization rests on the fact of their being no other entity to bargain against the government in terms of health insurance. This definition is consistent with others in the literature (e.g. Kutzin 2001) who argue the defining characteristic rests on "non-competition of buyers." This definition is also consistent with many other more maximalist definitions (e.g. Hsiao et al. 2019), yet remains fairly minimalist or "thin," focusing on the most basic aspects of the system that may serve to lead to potential differences in expenditure. For this reason, a country like Canada is considered single-payer, as there is exactly one provider per province, while Germany is not considered single-payer (Oberlander 2016), as a choice of sickness funds exists in a given region.

If a country employs a dual system, where citizens have the option of joining the government plan, or purchasing a privately funded plan, this is by definition not a single-payer system, as other entities exist to bargain against the government in terms of pricing. There exists an exception to this rule: if a dual-tiered system exists whereby the government solely occupies the realm of providing basic coverage to all citizens, while supplementary care can be purchased for additional services such as dentistry and optometry from private hospitals. In such a system no competition exists in the field of basic healthcare, which fits squarely within the definition of a single-payer entity.

I include all current members of the Organization for Economic Co-operation and Development for the time period of 1985–2015 (thus Latvia is the left out, as it joined the OECD in mid-2016). For each country, every year is coded independently, so as to ensure an accurate capturing of countries who transition between systems, as several countries in the sample do. The benefit of this coding system allows for a more in-depth analysis of the structure of the countries system, rather than relying on macro-level data as a type of proxy for what is actually occurring, for example by relying on fragmentation measures of funding sources (Glied 2009). Coding was done primarily by consulting the numerous issues of the World Health Organization's "Health Systems in Transition" series, though several country-specific sources were also consulted. See appendix 1 for a full list of sources used for coding each OECD member, and Table 1 for coding outcomes.

Finally, it is evident that "multi-payer" may indeed be a broad category, including systems like Germany which has well over 100 insurers, and France, which insures most of its population in just three insurance pools. The hypothesized causal mechanisms, however, should still hold at both levels. Cutting back to one insurer affords that single insurer monopsony power over pricing for medical goods and services, eliminates the expensive problems of adverse selection and payment evasion, utilizes a cheaper method of revenue collection, and makes risk and expenditure much more predictable.

4. Data and methodology

The sample for empirical analysis includes OECD countries from

Table 1
Healthcare system coding (1985–2015).

Country	Coding
Australia	Single-Payer
Austria	Multi-Payer
Belgium	Multi-Payer
Canada	Single-Payer
Chile	Multi-Payer
Czech Republic	Single-Payer until 1992
Denmark	Single-Payer
Estonia	Single-Payer until 1991, and after 2001
Finland	Single-Payer
France	Multi-Payer
Germany	Multi-Payer
Greece	Multi-Payer
Hungary	Single-Payer
Iceland	Single-Payer
Ireland	Single-Payer
Israel	Multi-Payer
Italy	Single-Payer
Japan	Multi-Payer
Luxembourg	Single-Payer after 2008
Mexico	Multi-Payer
Netherlands	Multi-Payer
New Zealand	Single-Payer before 1993, and after 2008
Norway	Single-Payer
Poland	Single-Payer before 1999, and after 2003
Portugal	Single-Payer
Slovakia	Multi-Payer
Slovenia	Single-Payer after 1992
South Korea	Single-Payer after 2000
Spain	Single-Payer after 1986
Sweden	Single-Payer
Switzerland	Multi-Payer
Turkey	Single-Payer after 2006
United Kingdom	Single-Payer
Unites States	Multi-Payer

1985 to 2015. The dependent variable in all models measures the total spent on healthcare within a given country in a given year. These data come directly from the OECD and includes spending on health services, medication, and administration from both public and private sources. I utilize health expenditures measured as a share of gross domestic product to control for differences in development between the countries in the sample.

I control for four major explanatory factors that may be correlated with both healthcare system and level of health expenditures, namely: health status of the country, population demographics, level of preventative medicine, and government structure and ideology.

First, three separate measures are used to control for the level of health in a country. First, life expectancy, measured as the number of years an average person can expect to live at birth. Second, infant mortality rate, measured as the number of deaths of children under one year of age, per 1000 births. And third, a control for a countries' obesity rate, measured as the percentage of men with a body mass index above 30. Taken together, these three measures provide a comprehensive measure of the overall level of health in a specific country.

Second, I control for differing demographics that may impact health spending. First, I include a control for population (logged). As health spending is measured as a percent of GDP, and not per capita, I expect a nation with a higher population to spend more than that of a nation with less people, all else being equal. Additionally, a measure of the age structure of the population is included, measured as the proportion of the population over the age of 65, as I expect older societies to face higher medical costs. I also add a control for percent of the population covered by health insurance. Single-payer systems tend to insure 100% of citizens, yet not all multi-payer systems achieve full insurance, potentially leading to bias in estimates of cost-savings. Including this variable also provides a check on the possibility that some of the aforementioned mechanisms may simply apply to countries with universal coverage, regardless of the insurance scheme.

Third, the level of preventative medicine in a country is controlled for. The ideal measure would be to simply separate out preventative medicine spending, and use it as a control for overall spending. This would allow an examination of total health spending while holding preventative medicine spending constant. However, due to the limited data availability of preventative health spending, this would have the effect of throwing out a large portion of the data. Instead I opt to proxy for preventative care by including measures of the prevalence of vaccinations in a country. Specifically, the percentage of the population receiving the diphtheria, tetanus and pertussis vaccine. I also include a measure of overall child vaccination rate. In appendix II I re-run all models with multiple imputation and use preventative care spending as a control, rather than measures of vaccinations. The results do not significantly change (in fact they show that, if anything, the presented results are a conservative estimate).

Fourth, I control for government-level variables that are likely a function of government healthcare spending and the type of health insurance scheme. First, the type of electoral system employed in the country. Electoral systems have been found to have strong effects on redistributive policy across countries (Alesina and Glaeser 2004), and may likely influence the type of insurance scheme in that same country. Additionally, partisan control of government has deep impacts on the level of social welfare spending (see for e.g. Allan and Scruggs 2004) and similarly serves as an important control for the probability that a nation adopts a single-payer system. Lastly, I control for the national deficit as a percent of GDP, as more indebted countries may be less likely to spend on such services. Data for these three measures all come from the Comparative Political Data Set (Armingeon et al., 2019).

Finally, I include yearly fixed-effects to control for global trends and shocks. Thus, I employ the following pooled ordinary least squares model:

$$y_{it} = \alpha + \beta_1 \mathrm{Single-payer}_{it} + \beta_2 \mathrm{Life-exp}_{it} + \beta_3 \mathrm{Pop-over65}_{it} + \beta_4 \mathrm{Log-population}_{it} + \beta_5 \mathrm{DTP3-immunization}_{it} + \beta_6 \mathrm{Child-vaccination}_{it} + \beta_7 \mathrm{Obesity}_{it} + \beta_8 \mathrm{Inf-mortality}_{it} + \beta_9 \%\mathrm{Insured}_{\mathrm{it}} + \beta_{10} \mathrm{PR-system}_{\mathrm{it}} + \beta_{11} \mathrm{Right-control}_{\mathrm{it}} + \beta_{12} \mathrm{Deficit}_{\mathrm{it}} + \mathrm{year}_{\mathrm{t}} + \varepsilon_{\mathrm{it}}$$

where $year_t$ are year fixed-effects and ε_{it} is the error term.

Importantly, I opt not to include country-level fixed-effects in the main model for several reasons. First, the interest is not in looking within a country longitudinally, but rather in comparing cases cross-nationally. The argument is specifically that, when controlling for differences in health, demographics, and level of care provided, a significant difference will persist between countries with and without single-payer systems. Further, within the time period under scrutiny, very few countries undergo a sustained institutional change of their healthcare system (i.e. that they transition from multi-payer to single-payer, or vice-vera, without reverting back). Therefore, there does not seem to be enough variation to undergo a fixed-effects model.

These methods, of course, present some limitations. For one, analyzing cross-national data may not always be the most comprehensive technique for examining the treatment effect of a policy. However, given data restrictions, this is the only real avenue for analysis. The sample to survey the change in expenditures for countries who take up the policy would be exceptionally small, as only Luxembourg, Slovenia, South Korea, Spain, and Turkey observe the adoption of a single-payer scheme (without having prior exposure to one). It is no doubt difficult to compare such different nations. Most importantly, it is possible the adoption of a single-payer scheme is not exogenous. That is, perhaps some external factor increases the likelihood a country adopts a single-payer system, and that same factor serves to drive down expenditure. There are two such likely confounders: rising healthcare costs, and politics (see for e.g. Oberlander 2016). In terms of costs, it may be that rising expenditures forces a nation to look for alternative schemes to finance their insurance system, and thus arrive at the single-payer system. I ensure robustness to this possibility by controlling for expenditure growth-rate, results do not change.

Second, certain political parties are likely more inclined to transition to government-provided social programs, as they are generally more supportive of such programs (Allan and Scruggs 2004). These same parties may also be correlated with overall expenditure level. This is controlled for by including a measure of the ideology of government. Outside of this, the mechanism for selecting such a policy is largely concerned with citizen demand and interest groups (Oberlander 2016), two factors which are wholly exogenous to the models of this paper.

Cross-national evidence has been used to analyze a multitude of different policy types (see for. e.g. Bradley et al., 2011, for their work on redistribution), including healthcare expenditure (e.g. Glied 2009; Moore et al. 1992). Given the importance of the question at hand, even limited, yet suggestive evidence provides an important contribution to the field and to our understanding of the inherent differences of health insurance schemes. Thus, given the controls on health, demography, preventative practices, and political environment, I argue robust and important results are found in the pooled-model. Even still, to address any remaining concerns I re-run the presented pooled-models including country-fixed effects. This transforms the question from one of comparing countries, to instead looking within countries overtime. In this case the results remain robust, and are displayed alongside the main results in the next section.

5. Results

I begin by reporting some descriptive statistics from the data. Overall, I code healthcare systems for 1004 country-years. Of these, 51.3% of the cases are coded as single-payer. Due to missing data in the control variables, the actual number of included cases is lower (I rerun the models on a multiple-imputation dataset, and the results do not change. I present the MI results in appendix II.).

The average expenditure for cases coded as single-payer is 7.65% of GDP, compared to the multi-payer average of 8.00%. Table 2 displays the means of all health and demographic control variables for each system, with standard deviations in parentheses.

I report the results of the main OLS-regression model in column one of Table 3. The coefficient on single-payer systems is negative and significant ($P < 0.001$), indicating support for the hypothesis that single-payer systems are associated with lower expenditures than multi-payer systems. These results specifically indicate that on average, a single-payer system is associated with health expenditures that are approximately 0.750 percent of GDP lower than multi-payer systems, all else being equal.

While not directly supporting the causal mechanisms put forward, these results strongly support the general theory that countries with single-payer systems experience less healthcare expenditures than countries with multi-payer systems. Further, these savings tend to be fairly sizable, an average of 0.75% of the country's GDP.

I briefly return to the Vermont H.202 bill which, while ultimately abandoned, designed a single-payer system for the state. As mentioned, an economic scoring of the bill found that the single insurer, if implemented, would result in decreased health expenditures of about $200 Million (Hsiao et al., 2011). I calculate this figure as a percent of Vermont's gross state product for 2011 (the year of the analysis) and arrive at 0.740%, putting it staggeringly close to the estimated savings suggested by the OLS model, and well within the 95% confidence interval.

These predictions are in-line with many other economic scorings performed on the same subject. For example, a national scoring estimated savings of around 0.72% of GDP (Thorpe and Woodruff 2005) for the United States. More recent studies indicate these results may even be conservative estimates of savings. A recent budget scoring of a potential medicare-for-all bill in the United States estimated savings upward of $450 Billion, or roughly 2% of GDP (Galvani et al., 2020).

Fig. 2 shows the marginal effect of a single-payer system. Taking a hypothetical country with mean values for all control variables from a multi-payer to a single-payer system corresponds to expenditures falling from just under 8.8% to about 8.0% of GDP. Vertical bars in Fig. 2 refer to 95% confidence intervals.

5.1. Robustness checks

For robustness, I first re-specify my model using real spending in US dollars as an alternative measure of healthcare spending. These results are presented in column two of Table 3. Using the alternative measure for health expenditures does not appear to significantly alter the results; single-payer systems are still associated with significantly lower spending. All else being equal, a single-payer system spends an average of roughly $661 less per person.

Second, I re-run the main model with potential post-treatment variables omitted. That is, variables that are potentially *outcomes* of a single-payer system, not indicators of one. In other words, it is evident that countries with single-payer systems devote more resources to preventative care (Petrou et al. 2018). Therefore, the included measures on health outcomes may bias results. Thus, column 3 of Table 3 presents the results of the pooled-model while omitting both measures of immunizations, BMI, and infant mortality. The results remain robust to this specification.

Third, rather than a pooled-OLS, I re-specify the model as a fixed-effects regression. Utilizing fixed-effects allows all time-invariant confounders to be controlled for, analyzing instead within-country variation. First, in column 4 I present the respecified results from the main model with fixed-effects, while column 5 presents results of a fixed-effects model with the post-treatment variables again omitted. In all cases, the negative effect of single-payer systems remains significant. Thus, where single-payer systems is clearly associated with cost savings cross-nationally, it is also evident that within-country cost differences also exist. That is, a country would likely see their health expenditures decrease following the adoption of a single-payer system.

I provide several additional robustness tests in appendix 2. First, there may be concerns that the data-generating process is in fact non-linear, as variables may have diminishing marginal effects on healthcare spending. I test this by re-running the main model on a logged-DV (that is, healthcare spending as a % GDP logged). I further provide models accounting for potential biases due to missing data, non-stationarity, and autocorrelation. The results again remain robust to these specifications.

6. Testing the mechanisms: disaggregation of spending data

Though directly testing the hypothesized causal mechanisms would be difficult with currently available data, in this section I disaggregate spending by category in an attempt to gain some leverage regarding the

Table 2
Health and demography descriptive statistics.

	(1) Single-Payer	(2) Multi-Payer
Life Expectancy	78.208	77.636
	(2.891)	(3.089)
% Population Over 65	14.453	13.375
	(2.760)	(4.335)
Ln (Population)	16.055	16.836
	(1.467)	(1.493)
Immunization	94.028	92.827
	(5.268)	(7.053)
% BMI > 30	17.162	16.137
	(4.750)	(5.971)
Infant Mortality	5.285	7.883
	(2.914)	(8.172)

Means of each variable presented. Standard deviations appear in parenthesis.

Table 3
Results of main regression models.

	(1)	(2)	(3)	(4)	(5)
	%GDP	USD Per Capita	%GDP	%GDP	%GDP
Single Payer	−0.750***	−661.0***	−0.719***	−0.346*	−0.540***
	(0.0459)	(37.41)	(0.0531)	(0.139)	(0.118)
Life Expectancy	0.293***	253.7***	0.192***	−0.253***	−0.0746***
	(0.0234)	(9.990)	(0.0144)	(0.0331)	(0.0198)
Population Over 65	0.0524***	−21.76***	−0.0525***	0.111***	0.0460***
	(0.0155)	(6.460)	(0.0156)	(0.0134)	(0.00888)
DTP3 Immunization	0.0155	41.18*		−0.0331***	
	(0.0213)	(19.31)		(0.00914)	
Child Vaccination	−0.0167	−37.65		0.0447***	
	(0.0221)	(19.49)		(0.00838)	
Population (logged)	0.189***	28.66***	0.185***	−0.107	0.936***
	(0.0279)	(8.481)	(0.0308)	(0.436)	(0.281)
BMI (men)	0.153***	84.71***		0.152***	
	(0.0103)	(4.478)		(0.0138)	
Infant Mortality	0.00175	12.88		−0.0196	
	(0.0354)	(12.57)		(0.0250)	
% Insured	−0.0696***	−40.55***	−0.0403***(0.00983)	0.00152	0.00306
	(0.0156)	(11.72)		(0.00499)	(0.00357)
PR System	−0.379***	−536.4***	−0.893***	0.0848	0.463*
	(0.0783)	(113.1)	(0.0811)	(0.295)	(0.222)
Right-Government Control	0.000569	−0.186	−0.00246	0.000112	0.000182
	(0.00120)	(1.126)	(0.00125)	(0.000290)	(0.000306)
Deficit	−0.0525***	39.33***	−0.0312***	−0.0845***	−0.0693***
	(0.00462)	(5.588)	(0.00423)	(0.00547)	(0.00505)
Fixed-Effects?	Year	Year	Year	Country & Year	Country & Year
Constant	−13.49***	−14705.1***	−4.908***	23.14**	−4.828
	(1.343)	(1748.7)	(1.385)	(7.888)	(4.533)
N	620	618	706	620	706
R^2	0.552	0.735	0.496	0.937	0.926

Panel-corrected standard errors appear in parentheses. Year and country fixed-effects omitted from table. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$, two-tailed test.

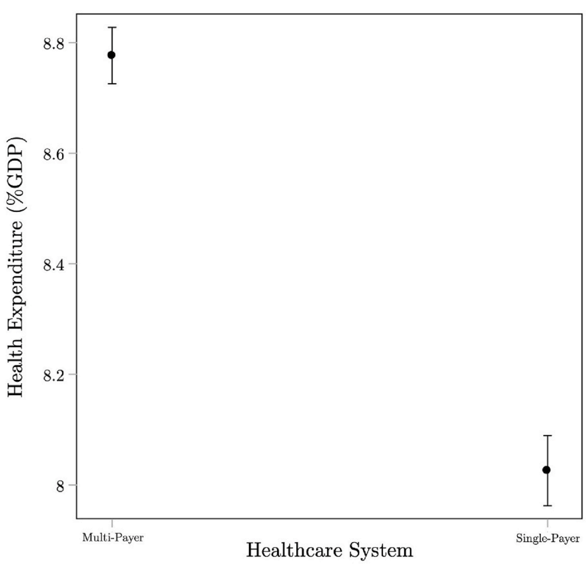

Fig. 2. Marginal effect of single-payer system.

areas of expenditures that are reduced in a single-payer context. The OECD data on health expenditures can be broken into six categories: curative and rehabilitative care, longterm care, ancillary services, medical goods, preventive care, and governance and administration. In each case, the variable is measured as a percent of total GDP.

Based on the hypothesized "efficiency" causal mechanism, I expect to see significantly decreased expenditure levels in the Governance and Administration category. This category includes spending on the exact areas that are considered most suitable for cost savings in a single-payer scheme: administration, financing, and paperwork. In terms of the "costs and bargaining power" mechanism, I hypothesize large differences in the medical goods category, as the absolute bargaining power afforded to single-payer systems allows for generous cost savings by way of cheaper prices. I also expect to see cost savings in the curative/rehabilitate care category, as the cost for actual medical services, not simply goods, should be cheaper.

There is, unfortunately, no straightforward test for the risk-pooling causal mechanism. Rather, given the main driver of aggregate savings pursuant to this mechanism involves savings in terms of data collection, as well as more predictable risk, the category of spending most likely to experience savings is again Governance and Administration.

Data on disaggregated categorical health expenditure are more sparse than the simple overall spending measure. Thus, I utilize multiple imputation via AMELIA II to impute missing values. I compute 5 separate imputed datasets, and further include a squared time polynomial, and interact these with cross-sectional units to allow time trends to behave differently across countries. I re-run the original OLS model five times, each time on a separate category of health spending. The results are presented in Table 4.

Indeed, the results seem to be consistent with what these causal mechanisms would predict. Roughly half of the observed cost savings come from medical goods and administration spending (roughly 0.37% of GDP). Much of the remaining difference in spending is attributed to curative and rehabilitative care expenditure (just over 0.20% of GDP). Interestingly, longterm care also seems to be an area of significant cost-savings, as well. Meanwhile, there does not appear to be any difference in the categories of ancillary services or preventative care.

7. Conclusion

While the theoretical argument for cost savings in the single-payer system has existed for some time in the political economy and health economics literatures, until now there has been no large-N empirical evidence on the issue, due in no small part to the fact that a

Table 4
Disaggregated, multiple imputation results.

	(1) Curative/Rehabilitative	(2) Longterm Care	(3) Ancillary Services	(4) Medical Goods	(5) Preventive Care	(6) Governance/Admin.
Single Payer	−0.204***	−0.194**	0.000449	−0.171***	−0.00365	−0.200***
	(0.0462)	(0.0555)	(0.0199)	(0.0273)	(0.00624)	(0.0142)
Life Expectancy	0.211***	0.0722***	−0.00692	−0.0403***	−0.00222	0.00791**
	(0.0184)	(0.0174)	(0.00359)	(0.00793)	(0.00253)	(0.00233)
Population Over 65	0.0190	0.0377*	0.0212**	0.0132	−0.00386	−0.0145***
	(0.0156)	(0.0166)	(0.00476)	(0.0104)	(0.00216)	(0.00297)
DTP3 Immunization	0.0920*	−0.0112	−0.00520	−0.0233	−0.00994**	0.00156
	(0.0395)	(0.0159)	(0.00645)	(0.0123)	(0.00365)	(0.00268)
Child Vaccination	−0.101*	−0.00200	0.00609	0.0381**	0.00952**	−0.00138
	(0.0393)	(0.0146)	(0.00651)	(0.0118)	(0.00358)	(0.00290)
Population (logged)	0.191***	−0.121***	0.00979	0.0855***	0.0160***	0.0439***
	(0.0263)	(0.0155)	(0.00651)	(0.0123)	(0.00201)	(0.00343)
BMI (men)	0.124***	0.0172*	0.0185***	0.00252	0.000959	0.0209***
	(0.00981)	(0.00724)	(0.00190)	(0.00356)	(0.00128)	(0.000838)
Infant Mortality	−0.126***	−0.0735*	0.0121**	0.0424**	−0.00514	−0.0217***
	(0.0302)	(0.0287)	(0.00422)	(0.0141)	(0.00315)	(0.00508)
% Insured	−0.0437***	−0.0103	0.00401***	0.0124**	−0.00127	−0.00675***
	(0.00900)	(0.00795)	(0.00113)	(0.00403)	(0.000862)	(0.00141)
PR System	−0.568***	−0.420**	0.181*	0.266*	−0.182***	−0.0353
	(0.0662)	(0.0786)	(0.0461)	(0.0903)	(0.0214)	(0.0240)
Right-Government Control	0.00287*	0.000463	−0.0000433	−0.000554	−0.0000268	−0.0000440
	(0.00143)	(0.000550)	(0.000206)	(0.000323)	(0.000113)	(0.000136)
Deficit	−0.0665***	0.0478***	0.00481*	−0.0421***	0.00489***	−0.00388***
	(0.00568)	(0.00704)	(0.00170)	(0.00494)	(0.000670)	(0.000941)
Constant	−9.522***	−0.127	−0.601	−0.682	0.479*	−0.220
	(1.735)	(2.241)	(0.445)	(0.939)	(0.232)	(0.264)
N	845	845	845	845	845	845

Panel-corrected standard errors appear in parentheses. Year fixed-effects omitted from table. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, two-tailed test.

comprehensive, longitudinal dataset of health systems' financing schemes did not exist. I introduce a new coding for OECD countries that measures when and where healthcare systems that qualify as single-payer exist. This dataset includes all OECD members for the time period of 1985–2015.

Using this new dataset, I empirically show that single-payer systems are correlated with lower healthcare expenditures, while controlling for health status, demographics, level of preventative medicine, and political factors of the country. I further demonstrate that these expenditure differences are largely concentrated in the areas of curative and rehabilitative care, medical goods, and governance and administration, and thus consistent with much of the extant literatures' theorized causal mechanisms.

Namely, literature on health systems argus that cost savings are likely borne out in three main ways: (1) higher efficiency in terms of billing and insurance management, (2) the ability to pool risks and save on expensive data collection efforts, and (3) the ability to bargain for cheaper costs. Through these three mechanisms, the utilization of single-payer insurance scheme is associated with an average expenditure difference equal to 0.750 percentage-points of GDP. Using the United States as an example, this is equal to roughly $161 Billion of savings in 2019, representing a 4.4% reduction in healthcare spending.

Importantly, these cost differences persist even as the percent of population insured increases to 100%. More recent research has suggested a slow rollout (that is, gradually expanding the citizen base eligible for government provided insurance) as an effective and efficient way to transition to a new system while sidestepping many challenges relating to said transition (Wallack 2020). The most important challenge, likely, is determining the most effective mechanism for containing long-term cost increases. Additionally, during such a transition the cost of health insurance becomes more visible. Where the amount the average person pays will decrease, historically the health insurance cost for an employed person happened behind the scenes (Wallack 2020). Instead, under a single-payer scheme, payment comes in the form of a very visible tax, likely generating ire among many citizens. Beyond this, research has found the visibility of social programs has many important impacts on society (e.g. Gingrich 2014).

Further research may benefit through a more thorough examination of the hypothesized causal mechanisms to further understand exactly how the single-payer system is able to achieve such cost-savings, and the specific ability of single-payer schemes to more effectively limit long-term growth in expenditures. Exploring potential differences relating to the number of insurers in multi-payer systems may also prove beneficial, and serve as an important dataset. Additionally, expanded datasets allowing analysis outside the developed world may also go a long way in understanding the differences between single- and multi-payer systems.

Appendix I. Country-Specific Sources

Australia	Biggs (2004)
Austria	Hofmarcher and Rack (2006)
Belgium	Corens (2007)
Canada	Marchildon (2013)
Chile	Bossert and Leisewitz (2016)
Czech Republic	Hussey and Anderson (2003); Alexa et al. (2015)
Denmark	Olejaz et al. (2012)
Estonia	Lai et al. (2013)

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(*continued*)

Finland	Vuorenkoski (2008)
France	Chevreul et al. (2015)
Germany	Busse and Blümel (2014)
Greece	Economou (2010)
Hungary	Gaál et al. (2011)
Iceland	Sigurgeirsdóttir et al. (2014)
Ireland	McDaid et al. (2009)
Israel	Rosen and Samuel (2009)
Italy	Ferré et al. (2014)
Japan	Tatara and Okamoto (2009)
Latvia	Not included, joined OECD in 2016
Luxembourg	Berthet et al. (2015)
Mexico	Barraza-Lloréns et al. (2002)
Netherlands	Kroneman, Boerma, van den Berg, Groenewegen, de Jong, and van Ginneken (2016)
New Zealand	French et al. (2001)
Norway	Ringard et al. (2013)
Poland	Sagan et al. (2011)
Portugal	Barros et al. (2011)
Slovakia	Szalay et al. (2011)
Slovenia	Albreht et al. (2016)
South Korea	Chun et al. (2009)
Spain	García-Armesto et al. (2010)
Sweden	Anell et al. (2012)
Switzerland	DePietro et al. (2015)
Turkey	Tatar et al. (2011); Yidirim (2011)
United Kingdom	Cylus et al. (2015)
Unites States	Rice et al. (2013)

Appendix II. Additional Models

Table 5 displays the results of the multiple imputation models. Multiple imputation is done through AMELIA II. I compute 5 separate imputed datasets. Further, I include a squared time polynomial, and interact these with cross-sectional units, to allow time trends to behave differently across countries.

Table 5
Multiple Imputation Results

	(1)	(2)	(3)	(4)	(5)
	%GDP	USD Per Capita	%GDP	%GDP	%GDP
Single Payer	−0.764***	−594.5***	−0.708***	−0.419***	−0.522***
	(0.0609)	(50.84)	(0.0541)	(0.100)	(0.105)
Life Expectancy	0.237***	235.0***	0.267***	−0.184**	−0.108
	(0.0303)	(25.19)	(0.0206)	(0.0624)	(0.0710)
Population Over 65	0.0703***	−2.176	−0.0139	0.157***	0.0472**
	(0.0160)	(10.21)	(0.0146)	(0.0244)	(0.0166)
DTP3 Vaccination	0.0330	49.24		−0.00638	
	(0.0302)	(25.86)		(0.0171)	
Child Immunization	−0.0386	−54.83*		0.00493	
	(0.0291)	(25.51)		(0.0180)	
Population (logged)	0.233***	27.94	0.197***	0.172	1.752***
	(0.0316)	(15.33)	(0.0245)	(0.708)	(0.513)
BMI (men)	0.179***	102.4***		0.234***	
	(0.0122)	(7.914)		(0.0307)	
Infant Mortality	−0.168***	−48.58		−0.00781	
	(0.0480)	(39.91)		(0.0294)	
% Insured	−0.0441***	−25.42*	−0.0354**	0.00112	0.000758
	(0.0117)	(10.89)	(0.0115)	(0.00706)	(0.00799)
PR System	−0.637***	−563.0***	−1.340***	0.390**	0.412**
	(0.0932)	(82.84)	(0.0908)	(0.119)	(0.140)
Right-Government Control	0.00224	0.356	−0.00113	−0.000479	−0.000733
	(0.00162)	(1.382)	(0.00150)	(0.000492)	(0.000567)
Deficit	−0.0475***	39.97***	−0.0178*	−0.0710***	−0.0675***
	(0.00699)	(9.156)	(0.00879)	(0.00737)	(0.00817)
Fixed-Effects?	Year	Year	Year	Country & Year	Country & Year
Constant	−10.72***	−13899.0***	−11.77***	12.18	−15.87
	(2.878)	(2720.4)	(1.582)	(11.95)	(11.01)
N	845	845	845	845	845

Panel-corrected standard errors appear in parentheses. Year and country fixed-effects omitted. *$p < 0.05$, **$p < 0.01$. ***$p < 0.001$

In table 6 I utilize the multiple imputation dataset and respecify the models with alternative measures of preventative care. Specifically, I separate out spending on preventative care and include it as an indicator of overall spending. This allows an examination of total healthcare spending while keeping preventative care constant. In every model, the results show an even greater difference in spending between single- and multi-payer countries.

Table 6
Alternative Measure of Preventative Care, Multiple Imputation

	(1)	(2)	(3)
	%GDP	USD Per Capita	%GDP
Single Payer	−0.761***	−604.8***	−0.408***
	(0.0689)	(59.63)	(0.0983)
Life Expectancy	0.248***	240.4***	−0.160*
	(0.0275)	(23.31)	(0.0611)
Population Over 65	0.0893***	1.997	0.136***
	(0.0158)	(11.17)	(0.0236)
Preventative Care	5.381***	1383.0***	1.888***
	(0.430)	(303.2)	(0.367)
Population (logged)	0.147***		0.346
	(0.0289)		(0.660)
BMI (men)	0.174***	100.2***	0.197***
	(0.0128)	(9.097)	(0.0297)
Infant Mortality	−0.140**	−36.89	−0.00752
	(0.0431)	(35.42)	(0.0283)
Percent Insured	−0.0361***	−22.21*	−0.00234
	(0.00988)	(9.710)	(0.00669)
PR System	0.358*	−314.9**	0.331**
	(0.159)	(103.8)	(0.126)
Right-Government Control	0.00213	0.236	−0.000271
	(0.00190)	(1.453)	(0.000477)
Deficit	−0.0736***	33.27***	−0.0737***
	(0.00616)	(8.222)	(0.00747)
Fixed-Effects?	Year	Year	Country & Year
Constant	−13.61***	−15204.1***	8.298
	(2.273)	(2303.2)	(11.29)
N	845	845	845

Panel-corrected standard errors appear in parentheses. Year and country fixed-effects omitted. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$, two-tailed test.

Next, in Tables 7 and I test the possibility of a non-linear data generating process. Column 1 presents the results of the main model on a logged DV, to test for robustness in the case of diminishing marginal returns. In this case, the coefficient remains significant, and in fact shows a larger effect (as $-e^{0.0699} = -1.07\%$ GDP).

Table 7
Results of Non-Linear Model

	(1)
	%GDP (logged)
Single Payer	−0.0699***
	(0.00558)
Life Expectancy	0.0398***
	(0.00355)
Population Over 65	0.00777***
	(0.00178)
DTP3 Vaccination	0.00145
	(0.00256)
Child Immunization	−0.00168
	(0.00258)
Population (logged)	0.0196***
	(0.00336)
BMI (men)	0.0168***
	(0.00133)
Infant Mortality	0.00148
	(0.00496)
Percent Insured	−0.00609***
	(0.00151)
PR System	−0.0149
	(0.00805)
Right-Government Control	−0.0000404
	(0.000129)
Deficit	−0.00612***
	(0.000522)
Constant	−1.082***
	(0.219)
N	620
R^2	0.528

Panel-corrected standard errors appear in parentheses. Year fixed-effects omitted. $*\ p < 0.05$, $**\ p < 0.01$. $***p < 0.001$

Table 8 re-runs the disaggregated models from section 6 with the alternative measure for preventative care (that is, level of preventative care spending as a %GDP). For robustness, I also include longterm care spending as an additional control. Again, the results remain robust.

Table 8
Results of Disaggregated Models, Alternative Preventative Measures

	(1)	(2)	(3)
	Curative/Rehabilitative	Medical Goods	Governance/Admin.
Single Payer	−0.212***	−0.217***	−0.198***
	(0.0524)	(0.0265)	(0.0170)
Life Expectancy	0.213***	−0.0255***	0.00813**
	(0.0181)	(0.00645)	(0.00231)
Population Over 65	0.0205	0.0322**	−0.0123***
	(0.0143)	(0.00762)	(0.00259)
Preventative Care	1.696***	0.722*	0.543***
	(0.234)	(0.228)	(0.0592)
Longterm Care	0.0386	−0.278***	0.00680
	(0.0465)	(0.0154)	(0.0128)
Population (logged)	0.168***	0.0391***	0.0359***
	(0.0250)	(0.00920)	(0.00405)
BMI (men)	0.121***	0.00938*	0.0205***
	(0.0106)	(0.00426)	(0.00118)
Infant Mortality	−0.109***	0.0149	−0.0191***
	(0.0313)	(0.0138)	(0.00420)
Percent Insured	−0.0386***	0.00709*	−0.00612***
	(0.00857)	(0.00298)	(0.00131)
PR System	−0.232**	0.301*	0.0693
	(0.0883)	(0.104)	(0.0358)
Right-Government Control	0.00259	−0.000410	−0.0000567
	(0.00150)	(0.000351)	(0.000151)
Deficit	−0.0760***	−0.0333***	−0.00693***
	(0.00739)	(0.00380)	(0.00117)
Constant	−11.27***	0.728	−0.386*
	(1.515)	(0.567)	(0.183)
N	845	845	845

Panel-corrected standard errors appear in parentheses. Year fixed-effects omitted. *$p < 0.05$, **$p < 0.01$. ***$p < 0.001$

Finally, table 9 ensures results are robust to possibility of non-stationarity and auto-correlation. First, I log all continuous variables and difference them (that is, their change from the previous year). I run this model on a logged-differenced dependent variable. I drop variables measuring right-government control and deficit as they contain negative values. The results are displayed in column 1 of table 9. Next, column 2 displays the results from an autocorrelation model, accounting for a common AR (1) autoregressive structure (the results remain nearly identical if instead an panel-specific structure is specified). In both cases the results remain robust.

Table 9
Non-stationarity Results

	(1)	(1)
	%GDP	%GDP
Single Payer	−0.00500*	−0.455**
	(0.00241)	(0.163)
Life Expectancy	−0.137	.0665*
	(0.519)	(0.0266)
Population Over 65	0.204	0.0728*
	(0.115)	(0.0304)
DTP3 Vaccination	−0.0740	−0.00129
	(0.158)	(0.0181)
Child Immunization	0.0135	−0.00345
	(0.158)	(0.0183)
Population	0.273	0.309***
	(0.229)	(0.0514)
BMI (men)	0.470**	0.134***
	(0.153)	(0.0177)
Infant Mortality	−0.166*	−0.168***
	(0.0714)	(0.0452)
Percent Insured	0.00153	−0.00798**
	(0.0367)	(.00275)
PR System	−0.00592	−0.600
	(0.00469)	(0.335)
Right-Government Control		0.00002
		(0.0004)
Deficit		−0.0368***
		(0.00329)
Constant	0.0260*	−2.635
	(0.0109)	(2.441)
N	585	620
R^2	0.317	0.756

Panel-Corrected standard errors appear in parentheses. Year fixed-effects omitted.
$^{*}p < 0.05$, $^{**}p < 0.01$. $^{***}p < 0.001$

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2020.113454. Raw data is available upon request to the author.

Credit statement

I am the sole-author of this manuscript.

References

Albreht, Tit, Brinovec, Radivoje Pribaković, Jošar, Dušan, Poldrugovac, Mircha, Kostnapfel, Tatja, Zaletel, Metka, Panteli, Dimitra, Anna, Maresso, 2016. Slovenia health system review. Health Systems in Transition 18 (3).

Alesina, Alberto, Glaeser, Edward, 2004. Fighting Poverty in the US and Europe: A World of Difference.

Alexa, Jan, Rečka, Lukáš, Jana, Votápková, van Ginneken, Ewout, Spranger, Anne, Friedrich, Wittenbecher, 2015. Czech republic health systems revie. Health Systems in Transition 17 (1).

Allan, James, P., Scruggs, Lyle, 2004. Political partisanship and welfare state reform in advanced industrial societies. Am. J. Polit. Sci. 48 (3), 496–512.

Anderson, Gerard F., Uwe, E Reinhardt, Peter, S Hussey, Petrosyan, Varduhi, 2003. "It's the prices, stupid: why the United States is so different from other countries. Health Aff. 22 (3), 89–105.

Anell, Anders, Anna, H Glenngård, Merkur, Sherry, 2012. Sweden health system review. Health Systems in Transition 14 (5).

Angus, Douglas E., Karpetz, Heather M., 1998. Pharmaceutical policies in Canada: issues and challenges. Pharmacoeconomics 14 (1), 81–96.

Armingeon, Klaus, Wenger, Virginia, Wiedemeier, Fiona, Isler, Christian, Knöpfel, Laura, Weisstanner, David, Engler, Sarah, 2019. Comparative Political Data Set. Bern. Institute of Political Science, University of Berne.

Barraza-Lloréns, Mariana, Bertozzi, Stefano, González-Pier, Eduardo, Gutiérrez, Juan Pablo, 2002. Mexico: addressing inequity in health and health care in Mexico. Health Aff. 21 (3), 47–56.

Barros, Pedro Pita, Machado, Sara Ribeirinho, Almeida Simões, Jorge de, 2011. Portugal health system review. Health Systems in Transition 13 (4).

Berthet, Françoise, Calteux, Anne, Wolter, Michèle, Weber, Laurence, van Ginneken, Ewout, Spranger, Anne, 2015. "Luxembourg: HiT in Brief." Health Systems in Transition.

Biggs, Amanda, 2004. Medicare - Background Brief. Parliament of Australia.

Blanchfield, Bonnie B., James, L Heffernan, Osgood, Bradford, Sheehan, Rosemary R., Meyer, Gregg S., 2010. "Saving billions of dollars–and physicians' time–by streamlining billing practices. Health Aff. 29 (6), 1248–1254.

Bossert, Thomas J., Leisewitz, Thomas, 2016. Innovation and change in the Chilean health system. N. Engl. J. Med. 374 (1), 1–5.

Bradley, David, Huber, Evelyne, Moller, Stephanie, Nielsen, François, Stephens, John D., 2011. Distribution and redistribution in postindustrial democracies. World Polit. 55 (2), 193–228.

Busse, Reinhard, Blümel, Miriam, 2014. Germany health system REview. Health Systems in Transition 16 (2).

Chevreul, Karine, Berg Brigham, Karen, Durand-Zaleski, Isabelle, Hernández-Quevedo, Cristina, 2015. France health system review. Health Systems in Transition 17 (3).

Chun, Chang Bae, Kim, Soon Yang, Lee, Jun Young, Lee, Sang Yi, 2009. Republic of Korea health system review. Health Systems in Transition 11 (7).

Corens, Dick, 2007. Belgium health system review. Health Systems in Transition 9 (2).

Cylus, Jonathan, Richardson, Erica, Findley, Lisa, Longley, Marcus, O'Neill, Ciaran, Steel, David, 2015. United kingdon health systems review. Health Systems in Transition 17 (5).

DePietro, Carlo, Paul, Camenzind, Sturny, Isabell, Crivelli, Luca, Edwards-Garavoglia, Suzanne, Spranger, Anne, Friedrich, Wittenbecher, Quentin, Wilm, 2015. Switzerland health system review. Health Systems in Transition 17 (4).

Economou, Charalambos, 2010. Greece health system review. Health Systems in Transition 12 (7).

Erickson, Shari M., Rockwern, Brooke, Koltov, Michelle, McLean, Robert M., 2017. Putting patients first by reducing administrative tasks in health care: a position paper of the American College of Physicians. Ann. Intern. Med. 166 (9), 659–661.

Evans, R.G., Barer, M.L., Hertzman, C., 1991. The 20-year experiment: accounting for, explaining, and evaluating health care cost containment in Canada and the United States. Annu. Rev. Publ. Health 12, 481–518.

Ferré, Francesca, Giulio de Belvis, Antonio, Valerio, Luca, Longhi, Silvia, Lazzari, Agnese, Fattore, Giovanni, Ricciardi, Walter, Anna, Maresso, 2014. Italy health system review. Health Systems in Transition 16 (4).

French, Slan, Old, Andrew, Healy, Judith, 2001. New Zealand. Health Systems in Transition 3 (19).

Gaál, Péter, Szigeti, Szabolcs, Csere, Márton, Gaskins, Matthew, Panteli, Dimitra, 2011. Hungary health system review. Health Systems in Transition 13 (5).

Galvani, Alison P., Parpia, Alyssa S., Foster, Eric M., Singer, Burton H., Fitzpatrick, Meagan C., 2020. Improving the prognosis of health care in the USA. Lancet 395 (10223), 524–533.

García-Armesto, Sandra, María Begoña, Abadía-Taira, Durán, Antonio, Hernández-Quevedo, Cristina, Bernal-Delgado, Enrique, 2010. Spain health system review. Health Systems in Transition 12 (4).

Gingrich, Jane, 2014. Visibility, values, and voters: the informational role of the welfare state. J. Polit. 76 (2), 565–580.

Glied, Sherry, 2009. Single payer as a financing mechanism. J. Health Polit. Pol. Law 34 (4), 593–615.

Himmelstein, David U., Woolhandler, Steffie, 1986. Cost without benefit. N. Engl. J. Med. 314 (7), 441–445.

Hirasuna, Donald, 2007. Universal Health Coverage: an Economist's Perspective. Technical report Minnesota House of Representatives, St. Paul, MN.

Hofmarcher, Maria, Rack, Herta, 2006. Austria health system review. Health Systems in Transition 8 (3).

Hsiao, William C., Knight, Anna Gosline, Kappel, Steven, Done, Nicolae, 2011. "What Other States Can Learn from Vermont's Bold Experiment: Embracing A Single-Payer Health Care Financing System. " Health Affairs.

Hsiao, William C., Cheng, Shou Hsia, Yip, Winnie, 2019. What can be achieved with a single-payer NHI system: the case of Taiwan. Soc. Sci. Med. 233, 265–271.

Hussey, Peter S., Anderson, Gerard F., 2003. A comparison of single- and multi-payer health insurance systems and options for reform. Health Pol. 66 (3), 215–228.

Hussey, Peter S., Wertheimer, Samuel, Mehrotra, Ateev, 2013. The association between health care quality and cost. Ann. Intern. Med. 158 (1), 27.

Kroneman, Madelon, Boerma, Wienke, van den Berg, Michael, Groenewegen, Peter, de Jong, Judith, van Ginneken, Ewout, 2016. Netherlands health system review. Health Systems in Transition 18 (2).

Kutzin, Joseph, 2001. A descriptive framework for country-level analysis of health care financing arrangements. Health Pol. 56 (3), 171–204.

Lai, Taavi, Habicht, Triin, Kahur, Kristiina, Reinap, Marge, Kiivet, Raul, van Ginneken, Ewout, 2013. Estonia health system review. Health Systems in Transition 15 (6).

Light, D.W., 2000. Sociological perspectives on competition in health care. J. Health Polit. Policy Law 25 (5), 969–974.

Marchildon, Gregory, 2013. Canada health system review. Health Systems in Transition 15 (1).

McDaid, David, Wiley, Miriam, Anna, Maresso, Mossialos, Elias, 2009. Ireland health systems review. Health Systems in Transition 11 (4).

Moore, W.J., Newman, R.J., Fheili, M., 1992. Measuring the relationship between income and NHEs. Health Care Financ. Rev. 41 (1), 133–139.

Morgan, Steven G., Leopold, Christine, Wagner, Anita K., 2017. Drivers of expenditure on primary care prescription drugs in 10 high-income countries with universal health coverage. Can. Med. Assoc. J. 189 (23), E794—–E799.

Morgan, Steven G., Martin, Danielle, Mintzes, Barbara, Jamie, R Daw, Lexchin, Joel, 2015. Pharmacare 2020: the Future of Drug Coverage in Canada. Pharmaceutical Policy Research Collaboration, University of British Columbia, Vancouver.

Morra, Dante, Nicholson, Sean, Levinson, Wendy, Gans, David N., Terry, Hammons, Casalino, Lawrence P., 2011. US physician practices versus Canadians: spending nearly four times as much money interacting with payers. Health Aff. 30 (8), 1443–1450.

Oberlander, Jonathan, 2016. The virtues and vices of single-payer health care. N. Engl. J. Med. 374 (15), 1401–1403.

Olejaz, Maria, Annegrete Juul, Nielsen, Andreas, Rudkjøbing, Birk, Hans Okkels, Allan, Krasnik, Hernández-Quevedo, Cristina, 2012. Denmark health system review. Health Systems in Transition 14 (2).

Petrou, P., Samoutis, G., Lionis, C., 2018. Single-payer or a multipayer health system: a systematic literature review. Publ. Health 163, 141–152.

Pozen, Alexis, Cutler, David M., 2010. Medical spending differences in the United States and Canada: the role of prices, procedures, and administrative expenses. Inquiry: The Journal of Health Care Organization, Provision, and Financing 47 (2), 124–134.

Rice, Thomas, Rosenau, Pauline, Unruh, Lynn Y., Andrew, J., Barnes, 2013. United States of America health system review. Health Systems in Transition 15 (3).

Ridic, Goran, Gleason, Suzanne, Ridic, Ognjen, 2012. Comparisons of health care systems in the United States, Germany and Canada. Mater. Soc. Med. 24 (2), 112–119.

Ringard, Ånen, Anna, Sagan, Ingrid Sperre, Saunes, Lindahl, Anne Karin, 2013. Norway health system review. Health Systems in Transition 15 (8).

Rosen, Bruce, Samuel, Hadar, 2009. Israel health system review. Health Systems in Transition 11 (2).

Sagan, A D Panteli, Borkowski, W., Dmowski, M., Domański, F., Czyżewski, M., Goryński, P., Karpacka, D., Kiersztyn, E., Kowalska, I., Księżak, M., Kuszewski, K., Leśniewska, A., Lipska, I., Maciag, R., Madowicz, J., Madra, A., Marek, M., Mokrzycka, A., Poznański, D., Sobczak, A., Sowada, C., Świderek, M., Terka, A., Trzeciak, P., Wiktorzak, K., Włodarczyk, C., Wojtyniak, B., Wrześniewska-Wal, I., Zelwiańska, D., Busse, R., 2011. Poland health system review. Health Systems in Transition 13 (8).
Sigurgeirsdóttir, Sigurbjórg, Waagfjórð, Jónína, Anna, Maresso, 2014. Iceland health system review. Health Systems in Transition 16 (6).
Szalay, Tomáš, Peter, Pažitný, Szalayová, Angelika, Frisová, Simona, Morvay, Karol, Petrovič, Marek, van Ginneken, Ewout, 2011. Slovakia health system review. Health Systems in Transition 13 (2).
Tatar, Mehtap, Mollahaliloglu, Salih, Sahin, Bayram, Aydin, Sabahattin, Anna, Maresso, Hernández-Quevedo, Cristina, 2011. Turkey health system review. Health Systems in Transition 13 (6).
Tatara, Kozo, Okamoto, Etsuji, 2009. Japan health system review. Health Systems in Transition 11 (5).
Thorpe, Kenneth, Woodruff, Robert W., 2005. Impacts of Health Care Reform: Projections of Costs and Savings. National Coalition on Health Care, Washington, DC.
Vuorenkoski, Lauri, 2008. Finland health system review. Health Systems in Transition 10 (4).
Wagstaff, Adam, 2009a. Social health insurance reexamined. Health Econ. 19 (December 2007), 503–517.
Wagstaff, Adam, 2009b. Social Health Insurance vs. Tax-Financed Health Systems–Evidence from the OECD. World Bank Policy Research Working Paper, p. 4821.
Wallack, Rader, Anya, 2020. Medicare for all, with eyes wide open. NEJM Catalyst 1 (5), 1–11.
Woolhandler, Steffie, Himmelstein, David U., 1991. The deteriorating administrative efficiency of the U.S. Health care system. N. Engl. J. Med. 324 (18), 1253–1258.
Woolhandler, Steffie, Campbell, Terry, Himmelstein, David U., 2003. Costs of health care administration in the United States and Canada. N. Engl. J. Med. 349 (8), 768–775.
World Health Organization, 2000. The World Health Report 2000–Health Systems: Improving Performance. WHO, Geneva.
Yidirim, Hasan Húseyin Yildirim Túrkan, 2011. Healthcare financing reform in Turkey: context and salient features. J. Eur. Soc. Pol. 21 (2), 178–193.