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David Granlund: Economic Policy in Health Care

ECONOMIC POLICY IN HEALTH CARE

SICKNESS ABSENCE AND PHARMACEUTICAL COSTS

by

David Granlund

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Abstract

This thesis consists of a summary and four papers. The first two concerns health care and sickness absence, and the last two pharmaceutical costs and prices.

Paper [I] presents an economic federation model which resembles the situation in, for example, Sweden. In the model the state governments provide health care, the federal government provides a sickness benefit and both levels tax labor income. The results show that the states can have either an incentive to under- or over-provide health care. The federal government can, by introducing an intergovernmental transfer, induce the state governments to provide the socially optimal amount of health care.

In Paper [II] the effect of aggregated public health care expenditure on absence from work due to sickness or disability was estimated. The analysis was based on data from a panel of the Swedish municipalities for the period 1993-2004. Public health care expenditure was found to have no statistically significant effect on absence and the standard errors were small enough to rule out all but a minimal effect. The result held when separate estimations were conducted for women and men, and for absence due to sickness and disability.

The purpose of Paper [III] was to study the effects of the introduction of fixed pharmaceutical budgets for two health centers in Västerbotten, Sweden. Estimation results using propensity score matching methods show that there are no systematic differences for either price or quantity per prescription between health centers using fixed and open-ended budgets. The analysis was based on individual prescription data from the two health centers and a control group both before and after the introduction of fixed budgets.

In Paper [IV] the introduction of the Swedish substitution reform in October 2002 was used as a natural experiment to examine the effects of increased consumer information on pharmaceutical prices. Using monthly data on individual pharmaceutical prices, the average reduction of prices due to the reform was estimated to four percent for both brand name and generic pharmaceuticals during the first four years after the reform. The results also show that the price adjustment was not instant.

Key Words: vertical fiscal externalities, sickness absence, sickness benefits, health care expenditure, fixed budgets, pharmaceuticals, cost containment, dynamic panel data models, endogeneity, propensity score matching

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This thesis consists of a summary and the following four papers:

[I] Granlund, D. (2007). Sickness absence and health care in an economic federation, *Umeå Economic Studies* 665 (revised), forthcoming in *International Tax and Public Finance*. (Printed with kind permission of Springer Science and Business Media)

[II] Granlund, D. (2007). The effect of health care expenditure on sickness absence, *Umeå Economic Studies* 701 (revised).

[III] Granlund, D., Rudholm, N. and Wikström, M. (2006). Fixed budgets as a cost containment measure for pharmaceuticals, *The European Journal of Health Economics*, 7, 37-45. (Reprinted with kind permission of Springer Science and Business Media)

[IV] Granlund, D. and Rudholm, N. (2007). Consumer Information and Pharmaceutical Prices: Theory and Evidence, *Umeå Economic Studies* 709.

1 Introduction

This thesis consists of four papers which can be divided into two distinct parts. The first two papers concern the relationship between health care expenditure and absence from work. Paper [I] studies resource allocation problems in a situation where a lower level of government provides health care, the central government provides a sickness benefit and both levels tax labor income. In the second paper, data from a panel of the Swedish municipalities during 1993-2004 was used to study the effect of aggregated health care expenditure on absence.

The last two papers concern cost containment measures taken in the Swedish pharmaceutical markets. The purpose of the third paper was to study whether introducing fixed pharmaceutical budgets for health centers is an effective cost containment measure. The analysis was based on data on individual prescriptions from the county of Västerbotten, in which two health centers were given fixed budgets for pharmaceutical expenditures. Finally, in Paper [IV] a substitution reform in the Swedish pharmaceuticals market was used to study the effects of increased consumer information on pharmaceutical prices.

2 Health care and sickness absence

Health care in Sweden is nearly exclusively publicly provided and private expenditure accounts for only a few percent of total non-dental non-pharmaceutical health care expenditure (Socialstyrelsen, 2006). Today 21 directly elected regional authorities, county councils, are responsible for the public provision. The number of entities has shrunk from 26 a decade ago and a government commission, analyzing the organization of the Swedish public sector, have recently proposed a further reduction of the number of entities responsible for health care provision (SOU 2007:10). The regional authorities finance more than two thirds of their expenditure by proportional labor income taxes. Other important incomesources are grants from the central government, payments from other principals and patients' co-payments (Statistics Sweden; The Swedish Association of Local Authorities and Regions).

In Sweden, the rate of absence from work due to sickness and disability is much higher than in most industrialized countries (OECD, 2005). The rates peaked in 2003 when 5 percent of employee working hours were lost due to sickness absence and 8 percent of the population between the age of 16 and

64 years were on disability pension (Statistics Sweden; The Swedish Social Insurance Agency). One explanation for these high rates is the relatively generous sickness benefit that the central government provides.[1] During the last two decades the compensation levels in the public social insurance system have been above 75 percent of the income from the second day of absence, but with a cap at a certain level of income (Henrekson and Persson, 2004; the Swedish Social Insurance Agency). A second explanation for the high rates is the long waiting times in the health care sector.[2] For example, the waiting time for a primary hip joint operation has exceeded one and a half years in some parts of the country (The Swedish Association of Local Authorities and Regions).

Paper [I] studies the effects of division of power between lower-level governments that provide health care and a central government that provides a sickness benefit. This paper relates to the literature about vertical fiscal externalities. Paper [II] studies the effects of health care expenditure on absence. It primarily relates to the literature evaluating the effects of aggregated health care expenditure and access to health care, but since the effects of health care provided by the Swedish county councils affect the central government's budget constraint, the paper also relates to the empirical literature on vertical fiscal interactions. The existing literature in these fields is reviewed briefly below and thereafter the two papers are summarized.[3]

2.1 Vertical fiscal externalities

The literature about vertical fiscal externalities belongs to the broader group concerning fiscal federalism. Earlier papers in this field focused nearly exclusively on horizontal interactions between lower-level governments "states", and limited the role of the central "federal" government to one that only steps in to resolve the inefficiencies arising from inter-state interactions (Keen, 1998).

Vertical fiscal externalities arise when decisions of governments at one level affect the budget constraint of governments at another level. An early paper

[1] Using Swedish data, Johansson and Brännäs (1998), Johansson and Palme (2002, 2005) and Henrekson and Persson (2004) all found support for that economic incentives affect absence.

[2] Using data from five orthopedic clinics, Statskontoret (2000) found that waiting times affected absence from work.

[3] In addition, Paper [II] relates to the literature on absence. For a review of this literature I refer to Brown and Sessions (1996).

in this field is Cassing and Hillman (1982). They analyzed an Australian case, in which the federal government taxes coal exports and a state government implicitly taxes coal by using its railway monopoly to set excess rail freights on coal transports. Cassing and Hillman demonstrated that total revenues become lower if the federal and state separately try to maximize their revenues, compared to a cooperative solution. Hansson and Stuart (1987), Flowers (1988) and Johnson (1988) were the first to analyze vertical fiscal externalities when federal and state governments impose direct taxes on the same tax base. Flowers provided a result similar to that of Cassing and Hillman, namely that a federation of Leviathan revenue maximizing governments will set taxes above the revenue maximizing level. Johnson demonstrated that a state, by using own taxes to finance redistribution, will reduce income in the state and therefore the residents' federal tax bill. In a situation without migration, Johnson showed that this will make the state's residents prefer redistribution using state taxes as opposed to federal ones.

To avoid inefficiency caused by vertical fiscal externality Hansson and Stuart (1987), Boadway and Keen (1996) and Boadway et al. (1998) proposed the power of taxation to be assigned to only one level of government. Aronsson and Wikström (2001, 2003) demonstrated that this may be unnecessary, since intergovernmental transfer schemes can, in certain situations, induce the correct incentives for the governments.

Only a minority of the literature on vertical fiscal externalities includes expenditure externalities, defined as the effects of a government's expenditure decisions on other governments' budget constraints. Noteworthy exceptions are Dahlby (1996) and Dahlby and Wilson (2003). Dahlby exemplified tax and expenditure externalities and provided general formulas for revenue and expenditure matching grants which can make the governments internalize the externalities. Dahlby and Wilson presented a model where a state government provides a productivity-enhancing public input and both levels of government tax wages and corporate profits. They demonstrated that the vertical externality could be either positive or negative depending on the wage elasticity of the labor demand.

Two empirical papers on fiscal interactions are Besley and Rosen (1998) and Goodspeed (2000); both report evidence of tax interactions between governments. Aronsson et al. (2000) and Andersson et al. (2004) are two studies

in this area that use Swedish data. Aronsson et al. found that local expenditure is partly explained by regional expenditure and Andersson et al. report that an increase in the regional tax rate induces municipalities in the region to lower their tax rates. In a recent study using Swiss data Brulhart and Jametti (2006) found that vertical externalities, working for too high taxes, dominate horizontal externalities.

2.2 Health care outcomes

Papers accessing the effects of health care on an aggregated level differ both in terms of dependent and explanatory variables used. Naturally, as dependent variable most studies have used some measure of health status (Nixon and Ulmann, 2006). Infant mortality and life expectancy are often chosen, presumably because that these variables are objective and reasonable easily to measure. The drawback of these measures is that health care has other outcomes than extended life spans that are not captured by these variables, e.g. improvements in health related quality of life. Variables including quality of life are more subjective, less often available, and are therefore not commonly used in the literature. One exception is Miller and Frech (2002). In a cross-section analysis of 18 OECD countries they found significant effects of pharmaceutical expenditure on disability adjusted life expectancy (DALE) but insignificant effects of other health care expenditure.

The measures of health care inputs also differ among studies in this field. Many researchers have used expenditure on health care, often disaggregated to pharmaceutical expenditure and other health care expenditure, as their primary explanatory variables (e.g. Hitiris and Posnet, 1992; Crémieux et al., 1999; Lichtenberg, 2004). Hitiris and Posnet used data from 20 OECD countries over 28 years and found limited effects of health care expenditure on mortality rates. Crémieux et al. found that higher health care expenditure among Canadian provinces reduced infant mortality and increased life expectancy. They explained the limited effect reported by Hitiris and Posnet and others by the inherent heterogeneity associated with cross-country studies. Lichtenberg analyzed time-series of life expectancy in the United States and found that both public health care expenditure and research and development expenditure on pharmaceuticals had positive effects.

Aakvik and Holmås (2006) studied the effect of the number of general prac-

titioners (GPs) on mortality rates in Norwegian municipalities using an instrumental variable estimator. They found no effect of the total number GPs per capita but found a statistically significant negative effect of the number of contracted GPs.

All the studies discussed above are troubled by the context in which decisions regarding health care are taken. For example, the amount of health care provided is partly determined by the perceived need for health care. This results in endogeneity problems, which are not addressed properly in all studies. One study not affected by such problems is Brook et al. (1983). They reported results from a controlled trial in the United States (the Rand Health Insurance Experiment) where families were randomly assigned insurance plans. One group received all their medical care free of charge and, as a consequence, used more than the other groups. The only statistically significant effects on health status were improvements for those with poor vision and for low-income persons with high blood pressure.

2.3 Summary of Papers [I] and [II]

Paper [I]: Sickness absence and health care in an economic federation

In Paper [I] an economic federation model is presented, where the state governments provide health care, the federal government provides a sickness benefit and both levels of government tax labor income. The objective of this paper was twofold. First, to analyze the fiscal externalities facing the state governments and to characterize the differences in health care expenditure and sickness benefit between the centralized and decentralized solutions. Second, to analyze the different ways in which the second best solution can be obtained by changing the governments' responsibilities or policy instruments.

The results show that the states can either have an incentive to under- or over-provide health care depending on, among other things, the wage elasticity of labor supply and the marginal product of expenditure on health care. The federal government can induce the states to increase their health care expenditure by reducing the sickness benefit and the federal tax rate, and vice versa. Whether health care will be under- or over-provided in the decentralized solution depends on the sign of the fiscal externality facing the states, the social costs of financing the sickness benefit and on the slope of the states' reaction functions. By introducing an intergovernmental transfer, the federal government can make

the state governments internalize the effects that their decisions will have on the federal government's budget constraint. Moreover, it was proved that the vertical fiscal externality will not vanish by assigning all powers of taxation to the states. This result differs from previous ones presented in the literature and is caused by the fact that the states' decisions in this model directly affect the federal government's expenditure.

The results can be generalized to state financed programs which reduce the number of recipients of federal transfers, for example labor market programs, economic development ventures aimed at reducing poverty and programs aimed at reducing the abuse of federal transfers.

Paper [II]: The effect of health care expenditure on sickness absence

The purpose of Paper [II] was to estimate how aggregated public expenditure on health care affects absence from work due to sickness or disability. To my knowledge, this has not been studied previously.

First, two equations were derived; one that illustrates how absence is affected by health and other variables, and another that shows how health can be affected by public health care expenditure. Then these equations were used in order to specify an empirical model. The analysis was performed using data from a panel of the Swedish municipalities during 1993-2004 and an instrumental variable estimator was used to avoid the potential endogeneity problem caused by absence affecting expenditure on health care.

Public health care expenditure was found to have no statistically significant effect on absence and the standard errors were small enough to rule out all but a minimal effect. This result is robust against changes in model specification and also held when separate estimations were conducted for women and men, and for absence due to sickness and disability.

The main result (that public health care expenditure had a negligible effect on absence) increases the likelihood that general health care is over-provided in Sweden, according to the model in Paper [I]. However, the low effect of health care expenditure may be explained by the Swedish counties' weak incentive to reduce absence which may lead to that a relatively small share of total health care expenditure being focused on reducing absence. Therefore, although aggregated health care expenditure may be over-provided, health care aimed at reducing absence might still be under-provided.

3 Pharmaceutical costs and prices

The Swedish real pharmaceutical costs have doubled in the last 15 years. In 2005 the costs reached 30 billions Swedish crowns and accounted for 13 percent of total health care expenditure (Socialstyrelsen, 2003, 2006). The Swedish development parallels that of many other industrialized countries and has spurred an interest in different methods to contain pharmaceutical costs (Buzzelli et al., 2006).

Since 1993, the price-setting of pharmaceuticals has been unregulated, but for pharmaceuticals to be subsidized, the price charged by the pharmaceutical firms has to be authorized by the Pharmaceutical Benefits Board (PBB). During the past six decades, subsidies have covered a large part of the pharmaceutical costs for Swedish consumers and in 2005 nearly two thirds of the costs were covered by subsidies (Socialstyrelsen, 2006).

In the Swedish pharmaceutical insurance system consumers have to pay all costs below 900 Swedish crowns per year. Then, the subsidy rate gradually increases and all costs exceeding 4,300 Swedish crowns are covered by the insurance (Socialstyrelsen, 2000). There are, however, some exceptions. From 1993 to October 2002 a reference price system was in effect, under which all costs exceeding 110 percent of the price of the least expensive generic substitute also had to be borne by the consumer.[4] On October 1, 2002 a substitution reform came into effect, requiring consumers who refused to switch to the cheapest available substitute to also pay the difference in price between this pharmaceutical and the prescribed one. A key motive behind this reform was to contain pharmaceutical costs (SOU 2000:86). This was also an important motivation for the decentralization of the costs for the pharmaceutical insurance from the central government to the regional governments, that took place in 1998 (Socialstyrelsen, 2000).

In the county of Västerbotten two health centers were, in 2004, given fixed pharmaceutical budgets. Paper [III] studies the effects on pharmaceutical costs of this hardening of previously soft budget constraints. In Paper [IV] the substitution reform is used to study the effects of increased consumer information on pharmaceutical prices. The existing literature in each of these two fields is reviewed briefly below and thereafter the two papers are summarized.

[4] The effects of the reference price system have been analyzed by e.g. Aronsson et al. (2001) and Bergman and Rudholm (2003).

3.1 Soft budget constraints

The term "soft budget constraint" was originally used by Kornai (1979) to denote the budget constraints of enterprises in socialist economies in which deficits were nearly automatically covered by authorities. Primary explanations for the existence of soft budget constraints are asymmetry in information and lack of credible commitments by principals. For example, an investor may when setting up an enterprise, in order to provide management with strong incentives, declare that no additional founds will be provided even if the enterprise would encounter financial difficulties. Thus, the concept is closely related to that of time inconsistency (Kyland and Prescott, 1977). The term is also related to the "ratchet-effect" (Weitzman, 1980), e.g. that a principal may adjust budgets according to history, creating an incentive for agents to overspend to preclude future budget cuts. If the agent realizes that its budget constraint is not hard, this will affect its decisions.

The early literature in the field focused nearly exclusively on state owned enterprises in socialist economies. At present, the concept is also used in analyzes of markets in primarily capitalistic ones. Soft budget constraints clearly apply to the bank sector in most economies, since large banks with severe financial trouble are rarely left without financial assistance and forced to go out of business. The concept can also be used to understand the behavior of local and regional governments, which frequently can rely on being rescued by the central government, and that of poor countries which might obtain international assistance if they become insolvent (Kornai et al., 2003). Further, the budget constraints of nonprofit organizations, such as hospitals and schools, are often soft. For example, Duggan (2000) found clear support for the existence of soft budget constraints for government-owned hospitals in California. Studying the effects of a state-program which made it more profitable to treat the poor, he reported that local government reduced their subsidies to public hospitals by on average one dollar for each additional dollar the hospital earned due to the state-program.

The effects of hardening budget constraint on pharmaceutical costs have been analyzed previously by Whynes et al. (1997). They used cross-sectional data from one English health authority and regressed pharmaceutical costs per patient for each general practitioner (GP). After controlling for five confounding factors, they found that GPs that held their own budgets (and thus had

harder budget constraints) had approximately 8 percent lower pharmaceutical costs. However, based on their study it is not possible to separate selection and treatment effects; it was voluntary for GPs to hold their own budgets and it is therefore possible that those who opted for this were those with low initial pharmaceutical costs.

3.2 Consumer Information and Prices

The role of information in economics was largely ignored until Stigler (1961) published his paper on the economics of information. He illustrated that if it is costly to ascertain the most favorable price of a product firms will get market power and set prices above competitive levels. Similarly, Diamond (1971) showed that if information is costly, this could lead to an equilibrium where firms charge monopoly prices. Salop and Stiglitz (1977) presented a model where low-cost stores had higher sales because low search cost individuals actively seek them out, while only high search cost individuals patronized the high cost stores. They also showed that there may exist equilibrium with a single price, which is above the competitive equilibrium price, and that no equilibrium exists under certain circumstances.

Empirical tests of the effects of increased consumer information on prices and market structure are becoming increasingly common. Devine and Marion (1979) collected price information for supermarkets in Ottawa and then published these during a five week period. Compared to the control market, Winnipeg, price levels decreased and consumer satisfaction increased in Ottawa. However, Devine and Marion's paper was later commented on by Lesser and Bryant (1980), who criticized the statistical analysis performed. Recently, empirical papers analyzing the impact of lower search costs through the introduction of internet price comparison sites on price or price dispersion have been published (Baylis and Perloff, 2002; Baye et al., 2004). The findings from these papers show that price dispersion remains even on internet price comparison sites, which according to Bayliss and Perloff could be explained by the division of consumers into two groups, informed and uninformed.

Frank and Salkever (1992) presented a theoretical model for brand name pharmaceutical prices and showed that these will decrease if the share of informed consumers increases. Sorensen (2000) studied how imperfect consumer information affected prices and price dispersion among prescription pharma-

ceuticals. The data was collected from pharmacies in upstate New York, and the price dispersion among equivalent prescriptions was found to be large. The results also give support to a consumer search cost model, since both markups and price dispersion were significantly lower for frequently purchased pharmaceuticals compared to one-time prescription pharmaceuticals.

3.3 Summary of Papers [III] and [IV]

Paper [III]: Fixed budgets as a cost containment measure for pharmaceuticals

In 2001, two health centers in Västerbotten, Sweden, were given fixed budgets for pharmaceutical expenditure, giving them an incentive to decrease expenditure as they were allowed to keep any surplus (and would be forced to repay any deficit) generated during the year. The purpose of Paper [III] was to analyze if this reform affected the prices and quantities of pharmaceuticals prescribed by physicians working at these health centers.

The analysis was based on data on individual prescriptions from the two health centers and a control group, both before and after the introduction of fixed budgets. Changes in pharmaceutical expenditure were decomposed into three parts; the number of prescriptions, the size of prescriptions (the number of defined daily doses per prescription), and the price of the pharmaceutical. A difference-in-difference extension of propensity score matching was used to study if physicians responded to the budgetary rules by prescribing cheaper medicine or fewer doses of medicine per prescription. This method allowed us to control for observable heterogeneity between patients and for time-invariant unobservable heterogeneity between different health centers.

The results show no systematic effect of the introduction of fixed budgets on either price or quantity per prescription, possibly due to physicians not viewing the fixed budgets to be credible. However, the number of prescriptions in the two health centers with fixed budgets declined relative to the control group after the introduction of the fixed budgets.

Paper [IV]: Consumer Information and Pharmaceutical Prices: Theory and Evidence

In Paper [IV] the impact of increased consumer information on brand name and generic pharmaceutical prices was analyzed both theoretically and empir-

ically. The theoretical results show that an increase in information is likely to reduce the price of brand name pharmaceuticals, while the results regarding generics are less clear.

In the empirical part of the paper, the introduction of the substitution reform in the Swedish pharmaceutical market in October 2002 was used as a natural experiment to examine the effects of increased consumer information on pharmaceutical prices. The main hypothesis to be tested was if the substitution reform, by increasing consumer information about pharmaceutical prices and available generic substitutes, decreased the price of brand name and/or generic pharmaceuticals. In addition, we tested whether the possible price response differed between brand name and generic drugs and studied additional heterogeneity in the reform effect, suggested by the theoretical model. The empirical analysis was based on monthly data on pharmaceuticals sold January 2001 to October 2006 and performed using a Prais-Winsten estimator.

The results from the empirical part of the paper show an average reduction in prices due to the reform of about 4 percent during the period under study, both for brand name- and generic pharmaceuticals. In addition, the results give some support for the reform effect being amplified for pharmaceuticals in markets which had previously been characterized by low levels of consumer information, as well as for pharmaceuticals which prior to the reform had high markups over marginal cost. The results also indicate that the introduction of the reform increased the impact of the number of products on pharmaceutical prices. Finally, the price adjustment was found to be gradual.

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