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Take (health) care of yourself: what international experience predicts about drivers and structure of Polish health expenditure

Summary

The fulfillment of the society's needs for health care is a crucial issue – both at present and in the future. This paper aims to forecast the future development of healthcare expenditure (HCE) in Poland on the basis of international experience and taking into account the private – public composition. For this purpose, we apply econometric panel modelling methods. The unfavourable demographic changes occurring in the majority of highly developed countries, which are a consequence of a growing number of elderly people and an increasing life expectancy, are indicated as one of the main drivers affecting HCE. Hence, an increase in the percentage of pensioners should result in an over-proportional rise in HCE. In this context, the key problem is defining the source of funding. On the one hand, it is obvious that health care provision is one of the primary functions of a state but on the other hand, considering unlimited health care needs of a society and limited resources for meeting its needs, the additional sources of funding – including private – are required.

Keywords: healthcare expenditure, public and private healthcare, forecasting, panel estimation

1. Introduction

Ageing-related issues are becoming increasingly important in macroeconomic policy decisions in Poland. While the populations of Western European states have already been facing and managing this process, Poland – as indicated by

OECD and Polish CSO projections – is at the onset of the transition. One of its key aspects is the provision of healthcare services, as population ageing is likely to boost the demand in this market.

The development of healthcare markets plays a significant role, both from the business perspective (as this healthcare spending amounted to 10.2% GDP in the European Union in 2009) and for the policymakers (as 7.8 p.p. thereof was public spending). In Poland, the public spending is also dominant – in particular in the segment of health services. The Europe-wide fiscal stress, coupled with limited opportunities to increase public health contributions due to labour cost competitiveness considerations, raises the question about the sustainability of public healthcare provision.

The aim of this paper is twofold. Firstly, we attempt to forecast the size of healthcare market (i.e. health-related expenditure) in Poland. We look separately at the overall spending and at the private segment of the market, as privately financed services can be supposed to be determined in a different way than the demand for health goods and services in general. Secondly, we compare the forecasted overall spending with the forecasted private component and what we believe to be a feasible scenario for the public spending. As Poland is a catching-up economy in the group of the EU New Member States, we base the forecasts on international experience within the European “convergence club” of real living standards. This is why we apply here panel econometric methods.

The rest of the paper is structured as follows. Section 2 discusses the hypothetical factors that drive expenditure in healthcare, both via public and private financing. These factors are presented in the context of empirical literature that evaluates international experience as regards healthcare expenditure growth. Section 3 proceeds to the methodology, data and results of our empirical panel investigation. The forecast for Poland for the following years is presented in Section 4. This Section also discusses the public-private structure of future healthcare spending, with a particular emphasis on the constraints and tensions that might arise. Section 5 concludes.

2. Drivers of healthcare expenditure: literature review

Future healthcare expenditure depends on a number of demographic and economic factors. The relationship between health-related spending and the age structure of the population stems from the age-related expenditure profiles (see

e.g. European Commission and EPC, p. 60), implying a gradual increase from around 5% of *per capita* GDP when an individual is 50 to 15–30% at the age of 80, depending on the country and gender. In the EU's New Member States, these profiles are more heterogeneous and point to lower shares of health spending, but their shape remains roughly the same. Consequently, increasing old-age dependency ratio (expected to double in the EU by 2060 according to EURO-POP2010 exercise) should theoretically increase health-related spending.

This, however, is a static view, that can be challenged by policy responses and financing constraints, as well as dynamic social phenomena. As an example, one could quote two competitive hypotheses defining the relationship between increasing longevity and health: (i) expansion of morbidity¹ that presumes a reduction in fatality rates of diseases rather than their prevalence (and hence ageing in bad health); (ii) compression of morbidity² suggesting that diseases occur later as life becomes longer (i.e. ageing in good health). Manton³ comes up with a reconciling hypothesis of “dynamic equilibrium” between both effects. According to the European Commission and the EPC⁴, there is no clear-cut empirical evidence in favour of any of these hypotheses.

Another critical factor explaining health expenditure is income. However, estimated income elasticity of health-related spending depends on the type of data covered by the sample. Micro data point to near-zero individual elasticity⁵, which can be explained by the presence of insurance schemes. Panel data on the national level point to elasticities slightly below one⁶. Finally, time series

¹ See e.g. S.J. Olshansky, M.A. Rudberg, B.A. Carnes, C.K. Cassel, J.A. Brody, *Trading off longer life for worsening health*, “Journal of Ageing and Health” 1991, vol. 3(2), pp. 194–216.

² J.F. Fries, *The compression of morbidity: near or far?*, “Milbank Memorial Fund Quarterly” 1989, vol. 67(2), pp. 208–232.

³ K.G. Manton, *Changing concepts of morbidity and mortality in the elderly population*, “Milbank Memorial Fund Quarterly” 1982, vol. 60, pp. 183–244.

⁴ European Commission – DG ECFIN, Economic Policy Committee, *The 2012 Ageing Report: Economic and budgetary projections for the EU27 Member States (2010–2060)*, “European Economy” 2012, vol. 2.

⁵ T.E. Getzen, *Health care is an individual necessity and a national luxury: Applying multilevel decision models to the analysis of health care expenditures*, “Journal of Health Economics” 2000, vol. 19(2), pp. 259–270.

⁶ K. Azizi, C. Pereira, *Comparaison internationale des dépenses de santé: une analyse des évolutions dans sept pays, 1970–2002*, DREES, “Dossier Solidarité et Santé” 2005, vol. 1, pp. 43–60; U.G. Gerdtham, B. Jönsson, *Price and Quantity in International Comparisons of Health Care Expenditure*, “Applied Economics” 1991, vol. 23, pp. 1519–1528; R. Mahieu, *Les déterminants des dépenses de santé: une approche macroéconomique*, “Série des documents de travail de la Direction des études et synthèses économiques” 2000, G2000/01, INSEE.

and cross-section studies on country level tend to estimate a high elasticity of 1.2–1.3⁷.

Such regressions suffer from well-known problems of regressor endogeneity (health status of the population determines income level as it affects availability of labour or, in more general terms, human capital) and nonstationarity (often tackled by series differencing, which leads to looking away from long-term level corrections).

Smith et al.⁸ describe the above-unity elasticity – supported by purely descriptive evidence of healthcare expenditure growing faster than *per capita* income – as “excess cost growth” in healthcare, and the literature attempts to provide various explanations for this phenomenon. Baumol⁹ perceives this growth as predominantly nominal, i.e. driven by price increases. This mechanism, referred to as “Baumol cost disease”, should stem from the fact that healthcare services are a labour-intensive sector and hence benefit from productivity increases to a smaller extent than other sectors. A whole strand of literature provides an explanation that might possibly be treated as opposite¹⁰, i.e. that dynamic growth in healthcare cost is driven by significant, but cost-intensive technological improvements.

Finally, the European Commission and the AWG (2012) formulate the hypothesis of converging expectations as regards the public healthcare provision (as part of the convergence in the standard of living, in general). Accordingly, the dynamic growth of demand for healthcare services might be driven by the fact that the needs in this field are better satisfied in other countries in the convergence club.

3. Data, methodology and model results

As it was stated before, for the purpose of our study we analyse overall health expenditure and private health expenditure separately. The study of health

⁷ See Newhouse (J.P. Newhouse, *Medical Care Expenditure: a cross national survey*, “Journal of Human Resources” 1977, vol. 12 (1), pp. 115–125) or Leu (R.E. Leu, *The Public-Private Mix and International Health Care Costs*, in: *Public and Private Health Services*, eds A.J. Cuyler, B. Jönsson, Basil Blackwell, Oxford 1986, pp. 41–63) for empirical investigations with OECD data.

⁸ S. Smith, J. Newhouse, M. Freeland, *Income, Insurance, and Technology: Why Does Health Spending Outpace Economic Growth?*, “Health Affairs” 2009, vol. 28 (5), pp. 1276–1284.

⁹ Baumol W.J., *Children of Performing Arts, the Economic Dilemma: The Climbing Costs of Health Care and Education*, “Journal of Cultural Economics” 1996, vol. 20, pp. 183–206.

¹⁰ E.g. J. Oliveira Martins, C. de la Maisonneuve, *The Drivers of Public Expenditure on Health and Long-Term Care: An Integrated Approach*, “OECD Economic Studies” 2006, vol. 43, 2006/2, pp. 115–154; S. Smith, J. Newhouse, M. Freeland, op.cit.

expenditure is based on the data from the OECD database, as well as Health Consumer Power House and Thompson and Mossialos¹¹. A large number of missing data makes it impossible to conduct the investigation for the whole group of the European countries. Hence, the analysis covers 23 of them¹² in case of the overall health expenditure and 21 European countries for the private healthcare expenditure (Slovakia and Switzerland are excluded due to lack of data) over the period from 1990 to 2010. Due to the fact that systems of reporting health-related data are far from perfect, all estimations are based on unbalanced panels. It is worth noticing that all of the countries are well-developed European ones, so the obtained results can be perceived as representative for this relatively homogeneous group. However, the public healthcare system delivers better quality in most of the analyzed countries in comparison to Poland. According to European Health Consumer Index 2012, Hungarian healthcare system is the only one in this group, which is less satisfying than Polish.

The dependent variable is a natural logarithm of health expenditure *per capita* or logarithm of private health expenditure *per capita*, respectively. This data is expressed in Mio USD PPP (for international comparability) and is based on System of Health Accounts reporting (consistent across Eurostat, OECD and national CSO sources). The list of explanatory variables is presented in Table 1.

Table 1. Independent variables in the overall and private expenditure models

Variable Name	Description	Source
log_gdppc	natural logarithm of GDP <i>per capita</i> (PPP-corrected)	OECD
pop65	share of population aged 65 or above (%)	OECD
beds	number of beds (per 1000 population)	OECD
participation	share of population possessing private health insurance or health subscription (%)	Thompson and Mossialos (2009)
rank_range	public healthcare's ranking points in the category "range and reach of services" (from 0 to 175 points, 175 points is a maximum)	Health Consumer Power House

Source: own calculations.

¹¹ S. Thompson, E. Mossialos, *Private health insurance in the European Union. Final report prepared for the European Commission, Directorate General for Employment, Social Affairs and Equal Opportunities*, LSE Health and Social Care 2009.

¹² Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Island, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the UK.

Rank_range is one of the components of the Euro Health Consumer Index (EHCI), which has been published since 2005 by Health Consumer Power House. The EHCI measures the quality of healthcare services and allows for international comparisons. The maximum value of the EHCI is 1000 and it consists of 5 various sub-categories: patient rights and information, waiting time for treatment, outcome, range and reach of services and pharmaceuticals, whose weights in the index are unequal. Generally, the higher the value of the index and the greater the number of points achieved by a country in every category, the better the quality of healthcare services is.

Firstly, total health expenditure is considered and the cointegration relationship is estimated using the dynamic ordinary least squares (DOLS) method proposed by Stock and Watson¹³. Then, an error correction model is estimated to combine the obtained long-run relationship with the short-run dynamics. The results are presented in Table 2 and Table 3, respectively. We considered initially a wider set of explanatory variables (including macroeconomic variables e.g. government debt as a share of GDP, government expenditure, technological development variables e.g. infant mortality, life expectancy or healthcare system variables e.g. density of physicians in the population) and arrived at the final specification using the from-general-to-specific strategy.

Our final specification suggests that income is the only long-term driver of health-related expenditure in the group in consideration, while income elasticity for health expenditure above 1 percent indicates that – within the analyzed group of countries – health is still perceived as a luxury good. Even though an increasing share of elderly people seems to be statistically insignificant in DOLS estimates, we decide to preserve this variable in the specification of our model as we strongly believe that in a long run the unfavourable demographic changes will impact on the overall health expenditure. The insignificance of this variable in a proposed model might be due to the short time span of the analysis – demographic changes are usually a long-lasting process. The additional argument in favour of significant effect of an increasing contribution of elderly people on health expenditure is the fact that this variable is statistically significant in alternative models estimated with panel-corrected standard errors estimator (PCSE) proposed by Parks¹⁴. Moreover, a comparison of forecasted percentage

¹³ J.H. Stock, M.W. Watson, *A simple estimation of cointegrating vectors in higher order cointegrated vectors*, "Econometrica" 1993, vol. 61 (4), pp. 783–820.

¹⁴ R. Parks, *Efficient estimation of a system of regression equations when disturbances are both serially and contemporaneously correlated*, "Journal of the American Statistical Association" 1967, vol. 62, pp. 500–509.

of elderly people in Poland up to 2020 with a histogram of this variable in 2010 for all analysed countries suggests that a volatility of forecasted values is reasonably covered with the in-sample volatility within the panel.

Table 2. DOLS estimation results – total health expenditure

Variable	Dynamic OLS	PCSE AR (1)	PCSE PSAR (1)
log_gdppc	1.315 (0.000)	1.151 (0.000)	1.146 (0.000)
pop65	0.015 (0.190)	0.034 (0.000)	0.041 (0.000)
constant	-5.887	-4.522 (0.000)	-4.600 (0.000)
		R ² = 0.991	R ² = 0.996

PCSE AR (1) – panel-corrected standard errors for autoregression of order 1

PCSE PSAR (1) – panel-corrected standard errors for panel-specific autoregression of order 1

p-values reported in parentheses

Source: own calculations.

Table 3. ECM estimation results – total health expenditure

Variable	ECM
ε_{t-1}	-0.193 (0.000)
$\Delta \log_gdppc_t$	0.391 (0.000)
$\Delta pop65_t$	-0.008 (0.709)
$\Delta \log_gdppc_{t-1}$	0.191 (0.001)
$\Delta pop65_{t-1}$	0.005 (0.837)
constant	0.033 (0.000)
	R ² within = 0.299 R ² between = 0.707 R ² overall = 0.329

P-values reported in parentheses.

Source: own calculations.

The error correction parameter is negative in a statistically significant way, what confirms the functioning of error correction mechanism. 19% of the deviation from equilibrium is corrected within one year, and this implies a half-life of deviation from equilibrium at three years and a quarter.

The forecast of private health expenditure is prepared on the basis of separate models, whose parameters are estimated using panel-corrected standard errors (PCSE) method. This helps to tackle the problem of contemporaneous correlation and heterogeneity across panels. The estimation results are presented in Table 4. For robustness check purposes, we present two alternative versions with panel-specific autocorrelation coefficient and with a common autocorrelation coefficient (the outcomes do not differ significantly). This might be seen as an inferior way of dealing with dynamic error-correction issues; however, the estimation of a cointegrating relationship using DOLS was not feasible here due to binding data limitations, implying strong unbalancedness of the panel. The from-general-to-specific approach was applied here as well, with the same initial set of variables.

Unsurprisingly, private health-related expenditure is determined by different factors than the overall expenditure. Naturally, income is still anticipated to affect this expenditure. The income elasticity of health spending clearly exceeds unity, and – as regards PCSE estimates – remains higher than the income elasticity of overall health spending. This conclusion, however, is not robust as DOLS estimate in the model of overall spending even exceeds 1.3.

We treat the number of hospital beds and summary index for “range and reach of national service” as a satisfactory, though still imperfect approximation of public healthcare system effectiveness¹⁵. The imperfections of public healthcare system force wealthier people to search for alternative solutions and take advantages of goods and services provided by the private healthcare sector (public and private healthcare are perceived as substitutes, but differentiated in terms of price and availability). Hence, the contribution of private health expenditure is higher in countries characterized by less satisfying national healthcare system.

Lastly, an increasing participation in private health insurance and subscriptions seems to raise private health expenditure as such, and not only to change its structure by crowding out the out-of-pocket expenditure.

What is interesting, demographic variables are not significant in case of private health expenditure – the major burden associated with a provision of healthcare services for elderly people seems to be borne by the public sector.

¹⁵ The results remain almost unchanged when using the density of physicians in the model (instead of density of hospital beds). However, the use of hospital beds is much better in terms of data availability.

Table 4. PCSE estimation – private health expenditure

Variable	PCSE AR (1)	PCSE PSAR (1)
log_gdppc	1.205 (0.000)	1.147*** (0.000)
beds	-0.049 (0.000)	-0.057 (0.000)
participation	0.008 (0.000)	0.007 (0.000)
rank_range	-4.808 (0.000)	-4.288 (0.000)
constant	0.940 (0.000)	0.598 (0.000)
	R ² = 0.946	R ² = 0.983

PCSE AR (1) – panel-corrected standard errors for autoregression of order 1
 PCSE PSAR (1) – panel-corrected standard errors for panel-specific autoregression of order 1
 p-values reported in parentheses
 Source: own calculations.

The obtained results are consistent with the ones by Xu et al.¹⁶, who investigated the health expenditure determinants in a group of 143 countries between 1995 and 2008. The authors analyse the health expenditure drivers in four various income groups of countries. According to Xu et al.¹⁷, income affects both total and out-of-pocket expenditure. However, their estimated income elasticity differs from ours – it is below one for the total health expenditure and it reaches 1.5 for the out-of-pocket expenditure in a group of high-income countries. Moreover, according to results obtained by Xu et al., the increasing share of people aged above 60 years has no influence on both types of expenditures.

4. Forecasting exercise

We apply both models described in Section 3 to forecast the overall and private health-related expenditure in Poland until 2020. We apply, respectively, the ECM model (based on DOLS estimates of the cointegrating relation) for the overall health expenditure and PCSE-AR (1) model for the private expenditure.

¹⁶ P. Xu, P. Saksena, A. Holly, *The determinants of health expenditure: A country-level panel data analysis*, World Health Organization, Results for Development Institute 2011.

¹⁷ Ibidem.

The results are, however, quite robust with respect to alternative estimates in consideration in this paper.

As regards the paths of exogenous variables, we make the following assumptions:

- the GDP *per capita* comes from the OECD Economic Outlook database;
- the share of population aged above 65 evolves in line with CSO's demographic projections;
- the participation ratio in private health insurance schemes and private medical subscriptions should gradually converge to European levels, whereby we assume 12% as a reasonable benchmark; this level is chosen based on a reference country – Great Britain – due to similarity of the public frameworks, and a 10-year long, front-loaded convergence (arithmetically decreasing increments) is assumed;
- we assume that, due to fiscal pressure, the proxies for the public system availability (i.e. number of hospital beds per 1000 population and evaluated range and reach of national service) should remain unchanged.

We do not model the public (i.e. general government's) health expenditure econometrically because, in our opinion, this would not be part of an optimum forecasting strategy. Instead, we prefer to treat this value as systemically pre-determined by National Health Fund revenues (social insurance subsector) and central and local budget's discretionary spending (central and local subsector). With central and local budget under pressure in the years to come (i.a. due to the Excessive Deficit Procedure implying fiscal constraints for Poland), we believe the latter to remain at best flat as percentage of GDP. The former, in turn, should evolve in line with the wage and pension fund in the economy (i.e. the basis for health contribution), as long as no legal changes to public health insurance framework are applied. For the purposes of this paper, we approximate its path using the data from the regulatory impact assessment prepared by the Polish government upon increasing the retirement age in 2011.

The insight emerging from the comparison from this "systemic" forecast (based on public financing possibilities) and both econometric forecasts (based on international experience and projected macroeconomic and demographic environment) seems to be alarming. There is a gap between the sum of forecasted public and private outlays, and the econometric forecast of overall health expenditure. The latter exceeds the former by around 5% in 2012–2013 and this difference widens to above 14% in 2016. This means that the overall predicted needs for health financing would grow over-proportionally to GDP (as implied by the usual income elasticity of more than unity), and negative demographic

trend would add to this phenomenon. Moreover, given international experience summarised in the econometric model, the growth of the private expenditure is unlikely to be high enough to compensate for this over-proportionality. The prediction of how this imbalance would be resolved is extremely difficult, but one could take into consideration such scenarios as e.g. (i) significant deterioration in access to healthcare (both public in terms of queues and private in terms of prices and rather inelastic supply of services), (ii) market pressure on a dynamic development of the private segment (more intensive than international experience implies) or (iii) changes in the public framework, including an increase in the public health contribution.

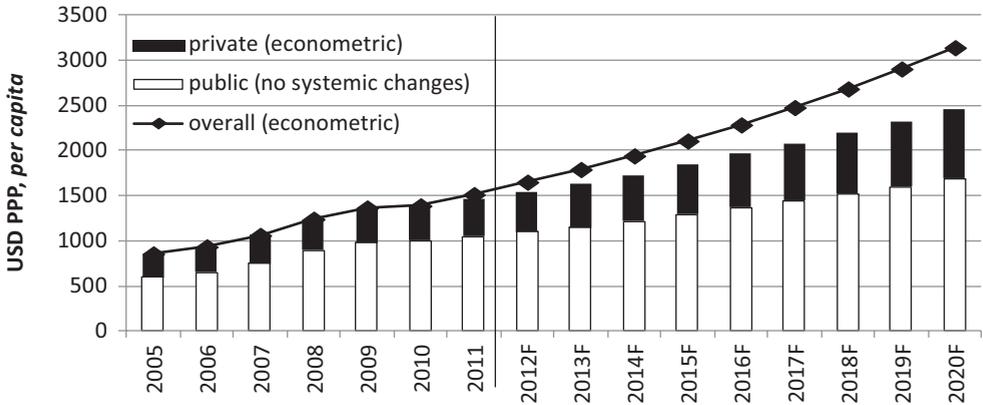


Figure 1. Private, public and overall expenditure in Poland, 2005–2016 (including 2012–2016 forecast)

Source: own calculations.

This *status quo* scenario on the public side can obviously be challenged because of a number of endogeneities (such as raising the contribution or limiting the access to publicly funded services that could arise from a specific macro-economic, demographic and fiscal context). Their explicit modelling, however, would be unreliable given the data available and the specific political context of every change of this kind. This is why we prefer to forecast the public expenditure on a non-econometric basis and treat such a *status quo* forecast as a measure of potential tensions in the public system, or – alternatively – as a measure of skewed, upside risks for the private expenditure forecast.

5. Conclusions

This paper investigates the forecasted healthcare needs of the Polish society measured by health expenditure and analyses to what extent the public health-care system would be able to provide services for Polish citizens.

The obtained results indicate that the determinants of total and private health expenditure are different. Income and demographic changes seem to have an impact on total health expenditure, while private health expenditure are also driven by imperfections occurring on public healthcare market and prevalence of additional health insurances and subscriptions (but not necessarily demographics). Given the current financing framework of the public system, it seems that the tensions will continue to arise and the gap between the overall needs and the public delivery is unlikely to be filled by the private healthcare supply in the coming years.

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