

Managing capital investments to bring innovation and quality in healthcare.
Level and variability of healthcare capital expenditure

Research project

Statement of the problem and of the related research question

The main concern in the policy debate over the future of healthcare systems is generally revolved around their financial sustainability, with a consequential focus on the time trend of current spending as driven by relevant cost drivers like aging and the rapid innovation of medical knowledge and technology, which contributes to increase social expectations and demand for quality healthcare. Despite the fact that healthcare systems are characterized by a highly labor-intensive production function, capital has been increasingly regarded as a relevant factor for the production of health services, especially for improving their quality and for realizing their innovation. As recently pointed out by OECD, in this regard, it is enough to consider the growing importance of diagnostic and therapeutic equipment or the expansion of information, computer and telecommunications technology in health care over the last few years. The lack or the insufficiency of capital investment in healthcare jeopardizes quality and safety of healthcare. As recently reported by The King's Fund, failure to invest in estates and infrastructure can have serious implications for patient safety and in 2018/19 resulted in nearly 5,000 clinical service incidents (where clinical services have been delayed, cancelled or interfered with because of estates and infrastructure failures). These incidents are not isolated to acute hospitals and occurred as often in mental health trusts in England on a per trust basis in 2018/19.

The recent OECD health statistics shows, however, that the level of capital expenditure tends to fluctuate more from year to year than current spending on health services, as investment decisions can be much more dependent on economic circumstances and political or business choices as well as reflecting future needs and past levels of investment. The erratic pattern of capital spending may inhibit the capability of healthcare systems of implementing cost-effective innovations as well as of maintaining adequate quality standards for its fundamental infrastructures. Moreover, in some countries like Italy, the problem is aggravated by the relatively low levels of capital expenditures, which, in some areas of the country, represent only about the 50% of the national average. The analysis of the time (and spatial) variability of capital spending in healthcare reveals to be crucial for the identification of actions that enhance the investment capability of healthcare systems. Even if this analysis seems to be quite neglected by the literature on the variability of healthcare expenditure, mainly focused on current spending, still it may provide several explanations, ranging from the ones related to demand of services to others connected with their supply. However, while current spending is strongly affected and pushed by actual and current demand, capital spending mainly relies on the willingness and the farseeing ability of decision-makers of taking into account future demand, not necessarily connected with currently expressed demand. This remark points out that the nature and the characteristics of the decision-making institutions of healthcare systems needs to be at the core of the analysis of the variability of healthcare capital spending. However, should the empirical analysis be focused on the determinants of this variability and, in particular, on its correlation with the salient features of the different institutional contexts, it would risk overlooking the relevant policy issue that lies behind this variability. The problem here is not the variability per se but whether it is the manifestation of a different adequacy of the institutions of healthcare systems to provide an appropriate level of capital spending for their communities. This research project aims at investigating this latter issue in the Italian regional context and, consequently, its main research question is whether the Italian

regions perform differently in supplying an adequate level of healthcare investments. As an obvious corollary to the empirical findings to this question, the project research activities will be extended to an investigation of the eventual observed heterogeneity and of its determinants, especially the ones connected with the salient features of the regional institutions.

Identification of the main stages in the development of the research project

1. A preliminary fundamental step for an empirical investigation of the main research question of this research project is the **empirical identification of what an adequate level of healthcare capital spending for the Italian regions is.**

- a. The empirical analysis will be based on a theoretical consideration along the lines of the literature on the need-standardized spending, which has mainly covered the field of current spending (for healthcare as well as for other public services), aiming at identifying the factors that should be taken into account for an appropriate sizing of healthcare investments. These factors have to be related to health needs and demand as well as to supply, in particular the availability of effective healthcare. A very important aspect to be considered at this stage regards how to reconcile a reconstruction of a need-standardized spending function, which, given the nature of investments, should be projected in the future, with the use of historical observed data.
- b. The empirical quantification of standardized capital needs starts with their physical identification. Different indicators for essential healthcare physical infrastructures and equipment will be considered. Since the objective is the estimation of a standardized capital spending for the Italian regions, the multidimensionality of the different indicators has to be compounded in a single dimension. Different methods for the development of a composite indicator of capital needs will be considered. First, the selected methodology will be applied to the historical data of the multiple indicators so as to estimate the historical level of healthcare capital in each region. These values will then be regressed on the local demand and supply factors (determined as a result of the work under 1.a) so as to estimate a function that allows a quantification of standardized regional healthcare capital needs in physical terms.
- c. To ensure that the money needed to enforce physical capital needs is estimated on the basis of an efficient realization of investments, the efficient regions, namely those that have realized higher levels of physical infrastructures with a minimum stock of capital expenditures, will be identified. In order to do so, cost-frontier methodologies will be considered for the estimation of a cost function for the “production” of healthcare capital (as measured by the composite indicator). In such a way, it will be possible to reconstruct the efficient capital financial needs for each region.

2. On the basis of the work done under 1, the **regional performance in terms of the adequacy of capital spending will be estimated** through the computation of the gap between theoretical standardized capital needs and actual capital spending.

- a. The gap will be computed both in physical terms (the difference between historical and need-standardized values of the composite indicator) and in money terms (the difference between capital financial needs estimated under 1.c and actual capital spending).

b. A spatial characterization of the heterogeneity of regional performance will be provided, with the identification of a set of spatially constrained homogeneous geographic areas maximally homogeneous in terms of capital spending gap. The spatial analysis will be based on the identification of spatial regimes characterized by homogenous spending gaps, with regions constrained by a spatial proximity graph. The clusterization results will be analyzed in the light of a relevant policy issue in the Italian context, that is the efficiency of the current regional partition of the Italian territory and the possibility to consider more aggregated geographic areas than current regions, for the government of healthcare capital spending. The identification of clusters of capital spending behavior helps also in picking out from the data on gaps a homogeneity, which can be connected with observed as well as unobserved factors, like immaterial aspects, shaped by the specific cultural and political histories of the different areas, that influence the social and institutional context of the regions. The spatial analysis, therefore, helps in providing insights in the exploration of the research question of this project, as far as the identification of the determinants of the gap is concerned.

3. The last part of the research activities of this project is focused on the **analysis of the role of some immaterial social aspects in the explanation of the regional differences of gaps in healthcare capital spending**. In particular, along the lines of similar studies in other fields, the effect of institutional quality on the estimated in healthcare capital spending will be estimated. Institutions will be considered with the largest meaning, including then informal institutions. Different indicators of institutional quality for the Italian regions will be considered (Institutional Quality Index, European Quality of Government Index, ecc.). To identify the causal effect of institutional quality on the gaps of healthcare capital spending, an instrumental variable approach based on historical data will be used, following a consolidated strand of literature, which argues that current backwardness is also a byproduct of history.

Data

The empirical analyses carried out within this research project will be based on panel data for Italian regions, related to the different aspects to be investigated (capital expenditure, physical capital indicators, healthcare demand factors, institutional quality). The time period to be considered will be long enough for guaranteeing an appropriate significance of the empirical estimates, compatibly with the availability of the necessary data. Data will be collected from public sources and, where necessary, will be asked for to the institutions in charge.