



## **Asymmetric information in Cyprus health market**

December, 2016

## *Abstract*

The health care market is challenging to analyse using economic theory. It can't be approached by simple demand and supply functions. It contains a high degree of interaction between involved stakeholders pursuing their strategies and thus, different kind of human behavior enters.

Health systems in many advanced economies are under severe challenges due to population ageing, which deteriorates long-term health and long-term fiscal sustainability. These challenges are driven, inter alia, by improving quality of life and increasing life expectancy due to advances in the medical technology, but it is also associated with lower fertility rates due to different lifestyles and non-healthy diet.

The Cyprus health care market is facing similar challenges. As it appears more evidently, after the long-standing efforts undertaken to resolve these challenges by different governments that have been endeavoring to introduce a National Health Insurance Scheme (NHIS). The whole issue has stagnated for many years, despite the recent willingness of the Health Ministry to promote two relevant bills, aiming to promote public hospitals autonomy and NHIS.

This paper<sup>1</sup> attempts to approach the use of asymmetric information in economics and use it to understand the complexity of the domestic health care market to reveal some of the reasons leading to a persistent lack of the aforementioned health care reforms.

The intuition of the above analysis is that relative market power and the information advantage each health stakeholder retains could determine the relative payoffs, efficiency and equity gains, which can lead the health care market to higher or lower returns depending on their financial and political economy stance.

Keywords JEL: I11, D81, D82, I13, I18

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<sup>1</sup> The views expressed herein are those of the author and do not necessarily reflect the views of the Ministry of Finance or the Government of the Republic of Cyprus.

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## II. ASYMMETRIC INFORMATION IN THE HEALTH CARE MARKET

The theory of asymmetric information has appeared in economics by work from J. Stiglitz and G. Akerlof on insurance and the market<sup>2</sup> of second-hand cars. (J. Stiglitz 1976, G. Akerlof, 1970).

In the health care market, it is reasonable enough for a doctor to know more than the patient on specific health issues and of course, on issues of his/her specialty. This gives the doctor an information advantage that can direct his/her behavior towards the patient. This asymmetry gives rise to the so called “supplier induced demand<sup>3</sup>”, which necessarily distorts the health care market.

This can happen in the health care market mostly by physicians who maintain a priori an advantage over patients and this is transmitted to all other health providers who follow the same providers’ line. Furthermore, health care markets are related with adverse selection and moral hazard behavior, since they reflect information strategies in their decision making<sup>4</sup> domain.

As a result, some physicians may recommend unnecessary care that enhances their income, even though it may be of no benefit to the patient. Physicians might also recommend one medicine over another or one medical examination over another because of their collaboration with pharmacists and pharma industry or lab providers. Because of their limited knowledge, patients have no reliable way of evaluating the quality of the advice they are getting – especially, when they get different advice from different doctors or different health providers.

In such markets, state intervention is deemed necessary to correct market failures in health care provision towards patients. At the same time, health care needs consist of a significant share<sup>5</sup> of the household and state budget<sup>6</sup> once these expenses are both price inelastic and income elastic.

The above relationships reveal that any increase in prices in health care goods/services reduce households’ disposable income, which disproportionately impacts those social groups that are more exposed to health expenditure risks.

In most cases, patients follow their doctor’s advice and in case they doubt they may ask for a second opinion. This process is uncertain on whether it can produce positive results except for having the patient having to pay much more than he/she was expecting to pay initially.

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<sup>2</sup> G. Akerlof (1970), M. Rothschild and J. Stiglitz (1976).

<sup>3</sup> In health economics, supplier induced demand (SID) can be defined as the amount of demand that exists beyond what would have occurred in a market in which patients are fully informed, i.e. arises when information asymmetry is evident.

<sup>4</sup> Adverse selection occurs when there is a lack of symmetric information prior to a deal between a buyer and a seller, whereas moral hazard occurs when there is asymmetric information between two parties and change in behavior of one party after a deal is struck.

<sup>5</sup> Last Cyprus Household Budget Survey conducted by the Cyprus Statistical Service with 2009 as reference year identified that households on average spend around 5% of their disposable income on health care services.

<sup>6</sup> In 2016, the budget of the Health Ministry accounted for total public expenditure for €545 million reflecting 9% of total budget expenses.

The information advantage entailed in the health care market, if not treated properly may exaggerate health care costs and forces a large number of distortions.

One remedy that was attempted to resolve this problem was given through the health insurance industry, where other parameters come in, such as the individual overall health profile that relates to age, gender, clinical situation and his financial status. In this case, only very specific and tailor-made insurance products could mitigate this phenomenon but again, the insuree should pay a higher premium, the more health vulnerable he/she is.

For small countries like Cyprus, where the health insurance market is still at a developing stage and the health-related lobbies are strong enough to mitigate competitive practices, patients have no other option but to use public health services and in most times, receiving poor care reflected in long waiting lists, unless they have enough money to pay out of pocket systematically in the private sector or use their personal-family connections to receive earlier care in the public<sup>7</sup> sector. This is one of the reasons why the introduction of a universal health care scheme is critical to achieve effective coverage for quality health care and efficient health care access. The role of the insurance industry, however, remains significant by offering clever and more sophisticated insurance products to cover the health care needs of the population that is able to afford paying the relevant premium.

In the possibility of having a NHIS, it could lead the private insurance industry to anticipate an increase in its turnover by insuring the population by occupation rather than strictly individual schemes, thus offering occupational-group insurance patterns into large pooling structure at comprehensive prices. However, private insurance prices are uncertain to remain idle in the medium term, since private insurance enterprises will be endeavoring to transfer their risk on higher risk buyers who will have to pay higher premiums in their attempt to raise their profit margin.

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<sup>7</sup> It should be stressed, however, that public hospitals use all necessary hi tech medical equipment and infrastructure to face chronic illnesses/diseases that the private sector may not be interested to provide because they aren't cost efficient.

### III. THE CYPRUS HEALTH MARKET

In Cyprus as referred earlier, the health care market consists of a large number of providers, private and public physicians, pharmacists, nurses, labs and all other health providers demonstrating the supply side of the market. On the other hand, there are patients, reflecting the demand side. In most health care systems, the supply side is provided by both, the public and the private sector. In the domestic health care system, apart from the private sector providing nearly all health and medical services there exist the public sector, which apart from providing public health care services is obliged to offer minimum health services to all citizens residing in the country. In this direction, the Ministry<sup>8</sup> of Health needs to cooperate with the Ministry of Finance which is responsible in providing enough financing through the government's annual budget taking always into consideration the relevant fiscal space that is available. It is important to mention that the public-sector physicians cannot offer their services to the private sector since this is restricted by law except for cases when the government wants directly to contract with the private sector to purchase specific services through procurement.

In Figure 1 below, health care spending in Cyprus amounted to 7.4% of GDP<sup>9</sup> in 2013. The relatively low share to GDP is, inter alia, caused by the absence of a national health insurance scheme that could effectively cover the population and provide free access on an equal basis for all residents. Also, Cyprus has a low number of public funds attributed to health care services<sup>10</sup> but at the same time, it might be too inefficient<sup>11</sup> in providing health care services leading to significant losses in the health sector per se and in the broader economy. Moreover, it is worthy to note that Cyprus maintains the highest out of pocket spending (OOP) in the EU (28) replicating the highest private health expenditure in the union, which was representing 46.4% of total health expenditure in the year 2013.

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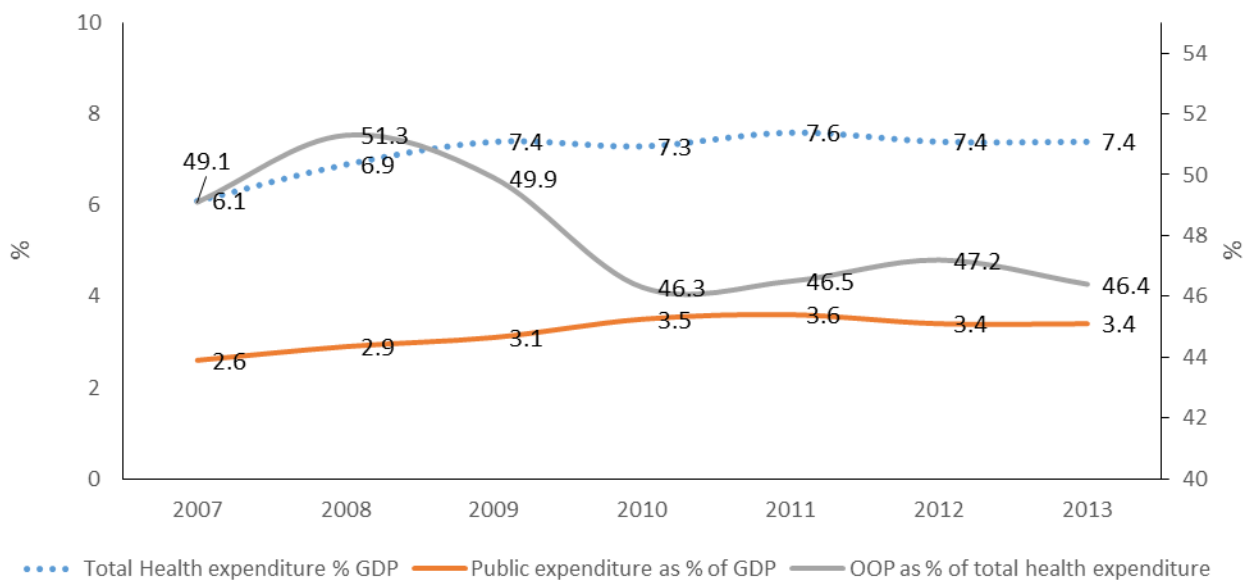
<sup>8</sup> World Bank, 2014.

<sup>9</sup> Joint Report on Health Care and Long term care systems & Fiscal sustainability, DG EC Fin, EPC (Ageing WG), Vol 1,2 October, 2016.

<sup>10</sup> Cyprus Statistical Service.

<sup>11</sup> Andreou et al (2010) "Cost and Value of Health Care in Cyprus", Cyprus Economic Policy Review, Vol. 4, No. 1, pp. 3-24.

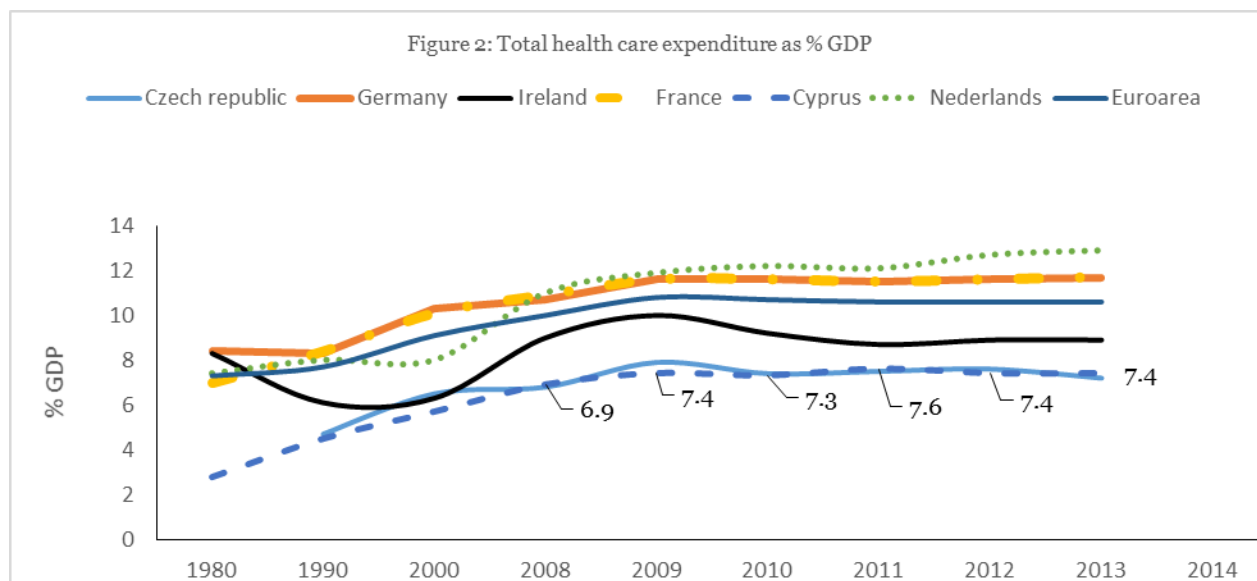
Figure 1: Total, Public and Out of pocket expenditures (OOP)



Source: European Commission, 2016

When health care expenditure is expressed in per capita terms, total spending on health care is also at €1,749 PPS in 2013 that was below the EU average of €2,997 using as a reference year 2013. Similarly, public spending on health care reached 3.4% of GDP in Cyprus in 2013 versus an average of 7.8% of GDP in the EU; and €743 PPS in Cyprus vs. an EU average of €2,215 PPS in 2013.

As illustrated in graphs 2 and 3 Cyprus retains the lowest share of health care expenditure as % of GDP compared with the EU average and with other countries. Moreover, the public health expenditure to GDP is the lowest in the EU-28.

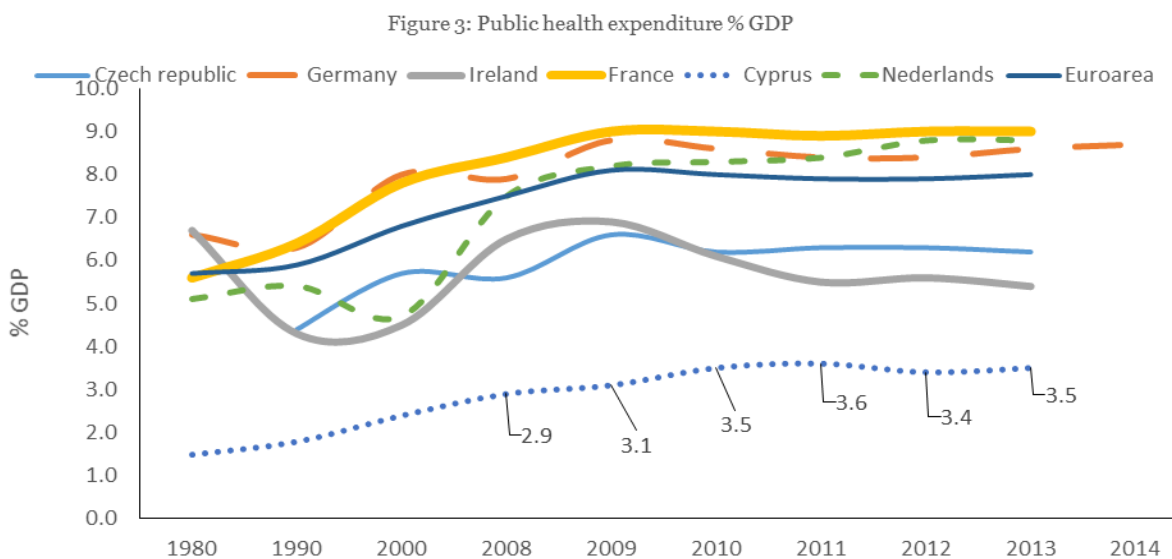


Source: European Commission, 2016

The illustration in figure 2 depicts that Cyprus total health expenditure to GDP in 1980, 1990 and 2000 was rising moderately on average per decade by around 0.17% in 1980-1990 and by 0.12% in 1990-2000. At the same time in figure 3 public health expenditure to GDP was rising even with lower pace since in 1980 it was representing 1.5% of GDP, in 1990 1.8% of GDP and in 2000 was 2.4% of GDP.

As a consequence of the population ageing, health care expenditure is projected to increase by 0.3 p.p. of GDP, below the average growth level expected for the EU of 0.9 p.p. of GDP, according to the AWG reference scenario<sup>12</sup>. When taking into account the impact of non-demographic drivers on future spending growth (AWG risk scenario), health care expenditure is expected to increase by 0.6 p.p. of GDP from the current percentage until 2060 (EU: 1.6).

Overall, the projected health care expenditure increase is expected to add to the budgetary pressure, contributing to the risk for long-term sustainability of public finances.



Source: European Commission, 2016

Cyprus maintains its own health care financing system based on a combination of tax financed by around 45% and the rest financing coming out from mostly out of pocket spending and private insurance spending (Figure 4). It is clear enough from the two preceding graphs that the low public health care spending is counterbalanced by a higher private health care spending.

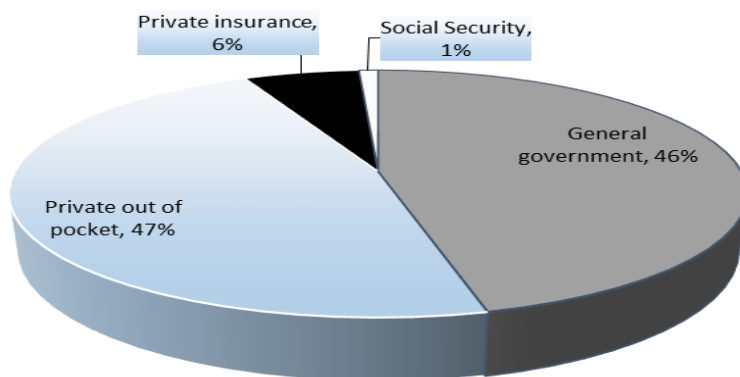
This situation underlines to a great extent why the Cyprus health care system is highly unregulated and the private sector plays a substantial role entailing a relatively higher market power in determining total health care expenditure.

<sup>12</sup> The 2015 Ageing Report: [http://europa.eu/epc/pdf/ageing\\_report\\_2015\\_en.pdf](http://europa.eu/epc/pdf/ageing_report_2015_en.pdf)



It is obvious from the aforementioned that the Cyprus health care market maintains, inter alia, all the characteristics that health care markets ensue in theory and thus, a similar type of behaviour is expected to be pursued by domestic health care providers.

**Figure 4: Cyprus health care expenditure by financing source, 2013**



Source: European Commission, 2016

Although Cyprus<sup>13</sup> maintains a relatively low share of public health expenditure and total health expenditure as a ratio to GDP belongs in the cluster with other EU countries like Belgium, Spain, France, Luxembourg, Sweden and the Netherlands that consistently score among the top seven performers in most of the models and are clustered in the group of countries with highest efficiency scores as measured by life expectancy. This outcome is based on models' results suggesting that

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<sup>13</sup> J. Medeiros and Chr.Schwierz, "Efficiency estimates of health care systems" European Commission, Economic Papers 549 | June 2015.

Cyprus has one of the highest life expectancy in the EU (28) associated with relatively low per capita health expenditure.

The role of state intervention comes into resolving health care market failures without adding, however, unnecessary bureaucratic and administrative costs to the society and at the end on public finances and tax payers. The ideal health care policy mix for Cyprus would have been to devour low administrative and bureaucratic costs associated with more efficient public sector hospitals trusted by citizens.

Cyprus finds itself faced with major challenges in the health sector focusing in the possible introduction of a NHIS. The political decision taken for the autonomization of public sector health care providers to be a prior action to NHIS is the appropriate one. Public hospitals consist a crucial asset for the public sector and they can be considered the backbone of the public health system of Cyprus. Any failure of a valid and successful reorganization and autonomization may lead them to a significant downswing of their health care services, especially in an NHIS environment.

#### IV. GAME THEORY TO CONTEMPLATE DOMESTIC HEALTH MARKET

Before making a small reference to game theory, it is important to clarify the meaning of Nash equilibrium (NE), which is at the center of game<sup>14</sup> theory and has been widely used to contemplate behaviour<sup>15</sup> under information asymmetry. Underneath, a cooperative series of games is presented to exhibit the relationship between Private health care providers (P) in the Cyprus health care market with the Government (G), which is the other significant player in taking the decisions influencing the domestic health system.

Health care providers are defined as the Private sector health care providers and the Government is mainly defined as the Ministry of Health and includes public sector health care providers, which is also the supervisory authority for monitoring efficiently and effectively the overall health care sector. It is considered that private health providers have high probability to cooperate with each other to ensure higher payoffs depending on the relative power each provider entails in the health care market at a given time and under specific circumstances. The Government is supposed to play the role of attempting to find the best possible outcome for citizens under a public finance scrutinized envelope constraint.

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<sup>14</sup> A Nash equilibrium is a concept of game theory where the optimal outcome of a game is one where no player has an incentive to deviate from its chosen strategy after considering an opponent's choice.

<sup>15</sup> H. Varian, 1992.

In this framework, cooperative games are often analyzed through cooperative game theory, which focuses on predicting which coalitions will be formed, the joint actions that groups take and the resulting collective payoffs<sup>16</sup>.

As shown in Game 1, each of P and G attempts to earn the highest possible payoff under the limitations set by the abovementioned assumptions.

**Game 1: A cooperative game**

|          | <b>P</b>                              | <b>G</b>     |
|----------|---------------------------------------|--------------|
| <b>P</b> | <b>(k<sub>1</sub>, k<sub>2</sub>)</b> | (0,0)        |
| <b>G</b> | (0,0)                                 | <b>(1,1)</b> |

The solution of the above game can be provided by the  $(k_1, k_2)$ <sup>17</sup> and the  $(1,1)$  vectors depending on the values of the former. If  $(k_1, k_2)$  is  $>0$ , then both vectors are at Nash equilibrium. But if  $k_1 < 0$  and  $k_2 < 0$ , then the vector  $(1, 1)$  is the only perfect cooperative NE.

The value of other vectors illustrate that the relative payoffs for  $(P,G)$  and  $(G,P)$  are  $(0,0)$  exhibiting that these options are worse than either  $(k_1, k_2)$  or  $(1,1)$ .

A perfect cooperative NE may help explain player's behavior in games where cooperation is observed

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<sup>16</sup> D. M. Kreps, 1990.

<sup>17</sup> The value of the vector  $k_1, k_2$  can be anything. Thus, its value could be any value in the domain of natural numbers and the solution to the game depends merely on this value.

in practice. A player’s payoff in perfect cooperative equilibrium is at least as high as in any NE. However, a perfect cooperative equilibrium does not always exist depending mainly on the degree of cooperation.

There are cases, however, where Nash equilibrium<sup>18</sup> may have more than one equilibrium or no Nash equilibrium.

Recalling Game 1, it could have been added an extension by incorporating further assumptions such as excessive or minimal regulation<sup>19</sup> put by the government differentiating relative payoffs of both players<sup>20</sup>.

Normally, excessive regulation will a priori lead to less payoffs to private health care providers and could lead  $k_1$  and  $k_2$  becoming negative and therefore (1,1) to be the only Nash perfect cooperative equilibrium, whereas a minimal regulation could lead to higher payoff for P. The more the regulation is, the more the financial burden accrued to the government and thus, on tax payers leading to a higher implicit tax rate on labour and employment distorting the labour market through higher labour cost deteriorating competitiveness of the economy. It is essential to mention that the whole framework becomes more complicated once health care service is considered a “public good” and the society may react and exercise pressing demands on the Government and thus, put public finances under potential risks.

Game 2 below is interpreted as a cooperate game with excessive regulation set by the government while with minimal regulation is depicted in Game 3, which presents the opposite example to Game 2 leading to the opposite results from the former Game. In Game 2, excessive regulation might lead to negative values for the vector  $(k_1, k_2)$  due to lower private health care providers’ incentives and thus, the only Nash cooperative equilibrium is vector (1, 1).

**Game 2: A cooperative game with perfect cooperative Nash equilibrium-  
Excessive regulation**

|          |          |               |
|----------|----------|---------------|
|          | <b>P</b> | <b>G</b>      |
| <b>P</b> | (-1, -1) | (0,0)         |
| <b>G</b> | (0,0)    | <b>(1, 1)</b> |

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<sup>18</sup> A game might have more than one equilibrium that is multiple equilibria, or no Nash equilibrium, which means that each player obtains a zero payoff.

<sup>19</sup> Excessive or minimal regulation is regarded as the government intervening in a way to modify the legislation of public sector intervention in health care becomes more pronounced or through deregulation by allowing private sector to determine the rules of the game.

<sup>20</sup> Another version of this game could include private insurance industry as a distinct financing source of the health care sector with opposing interests to G and relatively similar interests to P.

**Game 3: A cooperative game with perfect cooperative Nash equilibrium-  
Minimal regulation**

|          |              |          |
|----------|--------------|----------|
|          | <b>P</b>     | <b>G</b> |
| <b>P</b> | <b>(2,2)</b> | (0,0)    |
| <b>G</b> | (0,0)        | (-1,-1)  |

In Game 3, the perfect cooperative Nash equilibrium is the vector (2,2) due to the fact that the private health care providers entail the opportunity to expand their activities in a freer market environment and thus, they can realize higher payoffs in profits.

In the aforementioned examples, what plays a significant role is the market power and the information advantage/disadvantage each player entails based on their relative domain of action. Certainly, what is of equal importance is whether each player will ensue valid strategies to maximize their payoff. In some cases, in game theory the overall payoff can be equally divided among the players. On the other hand, the government entails limitations in fast and efficient decision making, which might cost and reduce its negotiating power and payoff.

To make the circumstances more comprehensible and relate it to the domestic health care market, the relative power of private sector health care providers and the government's stance could focus on two possible outcomes; the No Reform Scenario (NRS), which is a situation similar to what is happening today. The NRS can be achieved by any outcome (Nash equilibrium, no Nash equilibrium and multiple Nash equilibria). The alternative scenario is concerned with the implementation of a NHIS as currently being amended by the Government and the Parliament.

Game 4, further down, attempts to illustrate a game reflecting the above-mentioned for the domestic health care market that is based upon the following assumptions:

- the game is cooperative.
- there are two players, P and G and the former is risk neutral whereas the latter is risk averse implying information asymmetry exists between the two players.
- both players are assumed to behave rationally and each player seeks to maximize its payoff under the given circumstances.
- the players are free to negotiate with each other and form any kind of alliance/coalition.

- there are two options to select, the No Reform Scenario (NRS) and the implementation of a NHIS.
- there is imperfect information and the relevant market is assumed to behave as oligopoly under oligopolistic competition.
- each player makes an estimation about the other’s player strategy, which is taken into consideration to decide its strategy.

As shown, both players having opted their strategies, Game 4 solution is a Nash perfect cooperative equilibrium leading to an outcome where the situation remains as it is today. In this case, the opposing preferences can lead to a No Reform Scenario (NRS), which under the current situation serves as the prime option for both players, in terms of maintaining the current status quo without taking any additional financial and political economy risks. The rationale behind the values of the relevant vectors related to NHIS is justified through the existing information asymmetry and validated on that NRS is considered as a safer strategy for both players in contrast to a NHIS implementation that is anticipated as having higher risk in terms of perceived future payoffs to both players and having higher uncertainty in terms of implementation cost. Moreover, the conflicting interests of involved stakeholders<sup>21</sup> are leading to an offset of alternative actions in terms of stimulating a significant health reform, such as NHIS.

**Game 4: The Cyprus health care market :“NHIS vs NRS”**

|          |             |          |              |
|----------|-------------|----------|--------------|
|          |             | <b>P</b> |              |
|          |             |          | <b>NHIS</b>  |
| <b>G</b> | <b>NHIS</b> | (0,0)    | (0,1)        |
|          | <b>NRS</b>  | (1,0)    | <b>(1,1)</b> |

One way to facilitate a consensus on NHIS implementation is the government to incentivize private physicians through inducements to raise productivity and provide certain spurs to increase medical quality and health care efficiency. This option could lead the government to regulate more efficiently

the private sector in the domestic health care market and at the same time, it could raise coordination with the public sector via the NHIS under a more autonomous and reorganized public health care network setup.

Figure<sup>22</sup> 5 underneath displays the tradeoff between equity and efficiency in economics and it is shown to exhibit that this concept can be extended to the domestic health care market. This concept is associated with the option of health care market reform in the domestic economy and could facilitate which system is the most appropriate.

The Figure shows that the efficiency is a convex curve whereas the equity is a linear line. NRS represents the “No Reform Scenario” reflecting the current situation in terms of equity and efficiency, while NHIS 1, 2, 3 represent 3 different states of affair where a national health insurance scheme is introduced. NHIS 1 depicts how equity and efficiency would be affected in case the NHIS is promoted under the current 2001 legislation with its 2005 amendment but without addressing many current open issues in the legislation (National Health Insurance Laws, 2001-2005).

NHIS 2 depicts how the system could become much more efficient by introducing e-health in autonomous public hospitals context without at the same time deteriorating equity by ensuring effective universal coverage of all citizens and by having the right to opt their health care provider.

This option implies that more equity and efficiency could be achieved through higher quality in IT health services, leading to a computerized monitoring of health care provision and health expenditure containment via global budgeting<sup>23</sup>. This option should first be implemented to public health providers so as efficiency and equity to emerge in the public sector under a public hospitals autonomous set up supported by more updated and upgraded IT health technology.

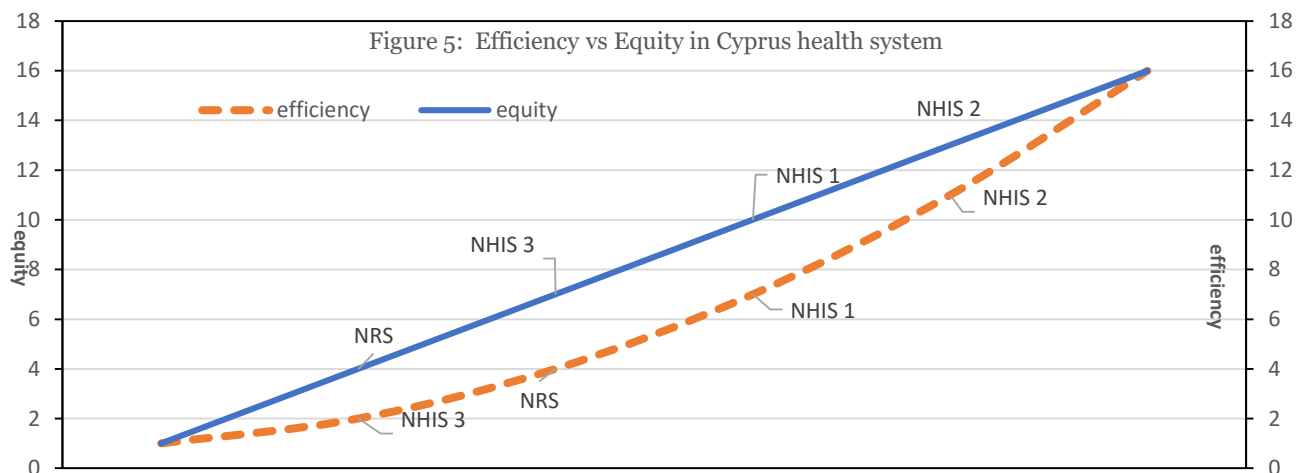
On the contrary, NHIS 3 exhibits a failure of the NHIS to resolve the pending health care issues and hence, more bureaucracy and higher administrative burden could be loaded to the current health care system without introducing a hi-tech and sophisticated information technology system reducing

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<sup>22</sup> The numbers used in Figure 5 are for illustrative reasons and have no real value.

<sup>23</sup> Global budgeting is the process by which society chooses, directs, and enforces how much to spend on health care, what to spend it on, and where that spending will take place.

at the end of the day the possibilities to increase the quality of patients' life.



#### IV. CONCLUDING REMARKS

The forgone analysis provides three explicit inferences, which could be used in both economic and political economy terms to provide some remedies for the domestic health care market:

- a) First of all, it exhibits that the health care market per se is a very distinct market compared with many other markets and its reestablishment could be achieved through many alternative policy measures such as cost containment and upgrading quality care.
- b) Secondly, it reveals that the implementation of NHIS is a very challenging task in terms of the stance the involved stakeholders could hold.
- c) Lastly, it identified that one possible way to implement NHIS is through raising private physicians' payoff in association with an autonomization of public health care providers. This option, however, needs a broad consensus and should be safeguarding public finances sustainability providing the valid health policy mix to make the NHIS option feasible and viable in the long run.

Cyprus should promote health care reforms including reforming primary health care services and public health care providers in a way to raise health quality, distribute resources more equally, increase efficiency by achieving higher utilization of available resources through more efficient capacity planning and restore the confidence of patients to public hospitals. **These measures can lead in the longer run to higher life expectancy, higher productivity gains, less morbidity and mortality rates and have a positive impact on medium and long run economic growth addressing efficiently the population ageing challenge.**

The government has announced a new deadline on health care reforms. A National Health Insurance



Scheme (NHIS) is envisaged by mid-2020. Before this stage, the reform of primary health care and public health care providers' autonomization in financial and administrative terms is envisaged by July 1 2017. The NHIS launching shall be integrated to provide the necessary time for all providers to be up to date and compatible with the NHIS IT system and provide the necessary time so as the public hospitals IT system can be completed.

**Elias Mallis**

WP/06/16

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