Dear anonymous Reviewer,
Thank you very much for your constructive Review!

Executive Summary of Reply to Referee Report: Overall, the review has brought up some interesting and valuable points with respect to my manuscript which are of substantial importance and of profound nature but, nonetheless, appear manageable. Looking at the comments and responses made in the following, I believe that the changes necessary to generalize the formal approach and to clarify the actual results of the analysis are within the scope of a Major Revision and I would be more than happy to revise the paper according to the critical points in question if I were given the chance to major-revise and resubmit by the Editor-in-chief.

Summary of Suggested Resulting Revisions: Clarify and abbreviate p.2 to 9; Generalize and clarify the formal approach of p.9 to 14 and extend it with respect to p. 18 to 19 according to detailed instructions given below; Transfer the numerical setup to the Appendix; Clarify results of p. 15 to 20 written on p. 21 to 23 with respect to the hypotheses and central question raised on pages 8 and 14.

Detailed Response to Referee Report:
In the following, I will respond to the comments made:

Comment: "The starting point of the paper is the observation that life expectancy goes up as GDP goes up, and, moreover, that beyond certain levels of GDP the positive relationship between GDP and life expectancy weakens."

Reply: This is correct.

Comment: "The novel point of the paper, this is what the abstract says, is that it takes a holistic approach towards modelling the market for health services in order to explain the fading relationship between GDP and life expectancy."

Reply: This is also correct.

Comment:" I have read the paper three times and I still find it quite a struggle. With respect to the introduction, it is not until page 4 it is stated explicitly what this paper is achieving. In addition, even here it is not transparent what this paper add. In fact, it is not until page 9 that the author sets out four hypothesis/characteristics that a model should ideally explain. I find this quite confusing. In addition, I think that there is a string need for making precise in what way the proposed model/set-up gives an answer to the four questions. As it stands it is not clear, at least to me, what the model actually delivers on these four questions."

Reply: I am sorry to hear that. Upon going through the points and comments made within the report, I have to admit that there are several revisions to the manuscript necessary in order to increase both scope and clarity of the analysis conducted.

Comment: "With respect to the formal analysis there are also some lack of clarity. There are two products, a consumption good called Z and a health good called M. It is not explained if these two goods are sold in markets characterised by perfect or imperfect competition (my guess is perfect competition)."

Reply: Your guess is certainly correct and I apologize for not having provided the information in the present form in the manuscript. This certainly has to be altered.

Suggested Resulting Revision: Clarify product market structures.

Comment: *"The representative consumer's maximisation problem is set out in equation (6). This problem produces demand functions (I think). But how does the demand function for, say, good Z interact with the supply side that is given in equation (10)? Also, in the maximisation problem in (6) good M enters into the utility function since we have H(M,E). In the budget restriction, the price of good M is only a function of H. This is maybe all right (in fact, I think it is all right under certain conditions) but it is not explained."*

Reply: Actually, we are faced with a microeconomic Walrasian-type equilibrium in a two-goods perfect competition market economy where the optimal consumption plan is defined as an equilibrium if the marginal utility ratio is equal to the respective price ratio (eq. (7)), given that the budget constraint (eq. (5)) holds. This is explained, most likely in too little detail, between eq. (6) and (7) on p. 12.

Suggested Resulting Revision: Clarify equilibrium market conditions and some of the functional relationships.

Comment: *"Incidentally, when we speak about consumers, in the motivation it is mentioned that inequality of distribution can explain why the positive relationship between GDP and life expectancy weakens beyond certain GDP thresholds. But the model has a representative consumer. So there is no room for distributional matters. I am sorry to say that I find these examples characteristic of the paper and it really confuses the work."*

Reply: Fortunately, this is not the case. We do start out with a representative utility function in eq. (2) on p.10., but, within the relevant section 2.c [which is titled by the headline "*Adding Complexity: The Impact of Introducing Dynamics and Heterogeneity*"] of the paper there are three different representative consumers which differ in their social status which is included in the analysis according to standard empirical findings on social structure (Mielck 2005). However, I have come to realize that, as the approach is a multidisciplinary one, it requires more attention to detail so that experts from one field can directly relate to the notions and standard assumptions taken from other fields. I apologize for the confusion and would be happy to clarify the manuscript accordingly.

Suggested Resulting Revision: Clarify and pay more attention to detail so that experts from one field can directly relate to the notions and assumptions taken from other fields.

Comment: *"One of the topics that stand out in the introduction is a discussion about the level of health. There can be a socially optimal level of health. On the other hand, when medical goods (good M in the paper) are provided by private firms it is quite likely that the level of health that maximises private firms' profit differs from the socially optimal level of health."*

Reply: I absolutely agree, this is exactly the point made by the paper, e.g. on p.3 (third paragraph), p.9. (third paragraph), p. 14 (second paragraph below eq. (12)) or p.23 (last sentence of first paragraph of section 4).

Comment: *"This makes me speculate about the determination of health (called H in the paper). The variable H is determined by consumers' use of medical goods (called M) and some initial health (called E in the paper). As I understand the paper E is exogenous and does not really have any role."*

Reply: E is indeed an exogenously given health status component as mentioned on p.10 which is in line with seminal research papers in the field of health economics such as Eisenring (2000), for more details

see also p.6 second paragraph. However, it does have a role as in the course of the comparative static analysis of section 2c effects of changes in E are discussed on p.15 to 17 as well as in section 3 on p.20 to 22.

Suggested Resulting Revision: Establish a clearer connection between the results of the comparative static analysis and the hypotheses introduced on p. 9 (third paragraph) and p. 14 (last paragraph).

Comment: "*It is unclear how M is determined (but I guess it is determined in a competitive market, see page 14) and it is thus not clear if and how the level of actual health differs from the socially optimal level of health. This is a serious shortcoming given the attention devoted to discussing the possibly socially inefficient supply of health.***"**

Reply: I have to admit that my discussion on the matter, e.g. on the price and cost function of medical products and health care services M on p.12 as well as on p.13 to 14, could be altered to foster clarity on the subject in question. Moreover, the second aspect is, admittedly, somewhat hidden or too mixed-in e.g. on p. 19 (first sentence and following), p. 20 (third sentence of section 3 and following), p. 21 (first paragraph, second sentence and following), p.23 (last senctence, continued on p.24) and could need some clarification.

Suggested Resulting Revision: E.g. provide a general functional form of both P_M, and C_M and, hence, also alter eq. (11) and use the present form eq. (11) only in the appendix to retain the illustrative and graphical benefits of the numerical example. Moreover and most importantly, carve out a clearer connection between the model setup and the results of the comparative static analysis and the resulting outcome within the market for health, especially with respect to the supply side of the market.

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Comment: "*Also, but maybe not that important, why does health not enter the profit functions of the Z-good producing firms as Z(H, d(H)) but as Z(d(H)).***"**

Reply: Of course, the suggested alternative model setup is a valid approach as well. However, the difference between the two is, in my opinion, just a matter of scale while the nature of the actual effect of an increase in H on Z is exactly the same either way, as the production function is assumed to hold positive but decreasing marginal productivity with respect to labor time d employed (p.12) and, by definition (p.11), labor time d exhibits the same characteristics with respect to health H. Hence, either way, we arrive at positive but decreasing marginal productivity of Z with respect to health H, i.e.

$$\frac{\partial Z}{\partial H} = \frac{\partial Z}{\partial d}\frac{\partial d}{\partial H} > 0, \frac{\partial^2 Z}{\partial H^2} = \frac{\partial Z}{\partial d}\frac{\partial^2 d}{\partial^2 H} < 0.$$

Comment: "*I would have thought that more healthy persons are more productive.***"**

Reply: This is certainly true and, moreover, the model setup in its current form also brings up and incorporates this idea both verbally, i.e. e.g. on p.11 it says *"Intuitively speaking, the healthier people are, the longer they can work per period"* and also formally as there is, as mentioned above, a positive but decreasing marginal productivity of Z with respect to H, expressed by eq. (3), (8), (9) and following.

Comment: "*Along this line of reasoning, how precisely does health affects the wage rate?*"

Reply: E.g. On p.11. it says that *"Intuitively speaking, the healthier people are, […] the better their performance during that time, which would be reflected by a higher wage rate."* Consequently, eq. (4), (8) [and (10)] take up this idea within the formal model setup, however, I have to admit that just before eq. (4) I should add some clarification, such as:

Suggested Resulting Revision: Extend the clause before eq. (4) adding that there is a positive but decreasing connection between the wage rate w and health H, i.e. $\frac{\partial w}{\partial H} > 0, \frac{\partial^2 w}{\partial H^2} < 0$.

Comment: "*I have one more final worry about the analysis. It is entirely based on the use of specific functional forms. I am not by principle against the use of specific functional forms. However, it makes it difficult to find out to which extent the findings can claim broad validity.*"

Reply: Fortunately, this is only partially the case. With some minor alterations, the model setup on p. 9 to 12 can be transferred into a completely generalized form. The comparative static analysis on p. 15 to 18 remains almost entirely unaffected by this change. Regarding p. 18 to 20 I can still refer to the numerical example which would then be located entirely within the appendix.

Suggested Resulting Revision: Generalize and clarify the formal approach of p.9 to 14 and extend it with respect to p. 18 to 19; Transfer the numerical setup to the appendix.

Comment: "*I am particularly worried about the price and cost functions in equation (11). Take the price of good M. If this price can be determined this way, it must be because there are some restrictions on demand (i.e., the utility function) and supply (i.e., cost functions). Or have I missed something?*"

Reply: Actually, I discussed this probably too vaguely on p. 13 (second paragraph below eq. (10)) and p. 14, where the functional form is explained. On p.14 it says that the supply of M is basically a bang-bang type solution, i.e. "*Given the assumptions that companies cannot influence people's health or lower production costs, for example through decrease in output quality or technological progress, there are two different market outcomes possible. Given people's optimal health level characterized by (6), unit production costs of M are either above or below unit prices. Consequently, medical companies choose to produce either M* = 0 or to supply the quantity demanded, i.e. M* > 0, given the absence of capacity restrictions.*" Later on, once the time dimension is introduced, companies can influence the demand for M in the second period through the type of M provided in period on, and results are that net discounted profits increase if the type of M provided in the first period provides a less effective health outlook for the second period.

Suggested Resulting Revision: Revise p. 13 to 14 and also provide a general functional form of both P_M, and C_M and, hence, also alter eq. (11) and use the present form eq. (11) only in the appendix to retain the illustrative and graphical benefits of the numerical example.

Comment: "*One can clearly argue that the theme of this paper is important.*"

Reply: Thank you, the paper has been presented to several experts in the field of health policy or economics and they all agreed with your assessment.

Comment: *"But overall my assessment is negative. This is in part because the paper is unfinished as I see it. But as detailed above, I also have some reservations about the scope of the modelling. Thus it is not clear to me that the paper accomplishes what it sets out to do: to explain a fading positive relationship between GDP and life expectancy."*

Reply: Looking at the points made above, I can see how this conclusion comes about, however, I believe that the changes necessary to generalize the formal approach and to clarify the actual results of the analysis are within the scope of a Major Revision and I would be more than happy to revise the paper according to the points in question if I were given the chance to major-revise and resubmit by the Editor-in-chief.

Suggested Resulting Revision:

Clarify and abbreviate p.2 to 9

Generalize and clarify the formal approach of p.9 to 14 and extend it with respect to p. 18 to 19

Transfer the numerical setup to the appendix

Clarify results of p. 15 to 20 written on p. 21 to 23 with respect to the hypotheses and central question raised on pages 8 and 14.

Overall, the review has brought up some interesting and valuable points with respect to my manuscript which are of substantial importance and of profound nature but, nonetheless, appear manageable.

Thank you again for your effort and work!

Sincerely,

The author