**Author's response to reviews**

**Title:** Is the core-periphery labour market structure related to perceived health? Findings of the Northern Swedish Cohort

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**Version:** 2 **Date:** 26 October 2011

**Author's response to reviews:** see over
REVIEWER 1

Title: Is the core-periphery labour market structure related to perceived health?
Analysis of the Northern Swedish Cohort
Version: 1 Date: 2 September 2011
Reviewer: Mikael Rostila

Reviewer's report:
This is a straightforward and distinct paper with clear research questions that are examined with appropriate data. Given the longitudinal character of the data material this paper could provide an important contribution to the field of peripheral employment and health after revision. Yet, I have some concerns related to the background and the empirical analyses that should be considered by the authors.

Major compulsory revisions
1.1 I believe that the causality problem is a major concern in this area as many people with health problems and who has been on sick-leave are left with temporary jobs. For instance, it is actually an active strategy in many countries, including Sweden, to provide employers with benefits (such as wage subsidies) if they employ a person that has been on sick-leave. The possibility to temporary employ an individual with a reduced cost makes it possible for employers to “test” employees. However, it also involves that people with potential physical or psychological health problems are employed on a temporary basis. This issue could be discussed in the paper.

Response: This is an important topic to discuss. In research on employment and its relation to health, reverse causation is always a vital aspect to consider when designing a study and when interpreting the result. We added a discussion regarding causality in the discussion section of this paper (page 15).

In studies on employment and health it is important to consider the issue of causality, e.g., if those who have been on sick-leave are more likely to end up with a temporary than a permanent employee. To reduce the risk of drawing faulty conclusions regarding the direction of the relationship between temporary employment and health we have included health status at baseline in the analysis. However, it is still possible that unmeasured health selection effects could influence the results.

1.2 Page 7: It is mentioned that you use a modified version of Aronsson’s core-periphery model. How was your measure modified? How does it differ from the original version? I think that this information is very important especially for readers not familiar with the Aronsson model. In general I also think that the measurement of the periphery model is somewhat unclear. Please revise the text once more in order to make it clearer for the general reader.
Response: We have extended Aronsson’s model by two principal developments of the original formulation. First, although the original model does not consider the time dimension, we have incorporated the duration of employments in the measure as we hypothesise that this is an important dimension to consider when dealing with potential health effects. Second, we included ‘self-employment’, ‘active in labour market programs’ and ‘other temporary employment’ (i.e., without further specification), in order to get a more comprehensive and naturalistic assessment of existing labour market positions. We have also rewritten the text describing the operationalisation of the peripheral employment score in the methods section (page 7). We hope that the description is more readily grasped in its revised form:

Peripheral Employment Score

The peripheral employment score was measured by the self-administered questionnaire as completed by participants in 2007, by applying an extended version of Aronsson’s original core-periphery model [1]. This extended version of Aronsson’s model also includes self-employed, active in labour market and other temporary employment contracts and also incorporates the dimension of time. Although being in a labour market programme is not considered employment per se, it might share some important aspects with peripheral employment more than with unemployment (e.g., regarding latent functions of employment), and was therefore included in the exposure. Participants’ labour market position from 1996 to 2007 was measured with a matrix consisting of columns representing half-year periods and lines representing different labour market positions. With the instruction ‘During which periods have you been employed permanently or have had some type of temporary job contract or have been out of job?’ the respondents were advised to choose between 11 employment options for each half-year period: ‘permanently employed’, ‘entrepreneur’, ‘employed in project’, ‘substitute’, ‘probationary employment’, ‘on-demand worker’, ‘seasonal worker’, ‘temporary employee for other reasons’, ‘in employment policy measure’, ‘unemployed’, ‘out of the labour market’. The order of the different employment contracts is based on the relative hierarchy in relation to degree of insecurity, reaching from the most core to the most peripheral employment contract.

Each response option was given a score for each half-year period according to the core-periphery structure: permanent (coded as 0), self-employed (=1), project/object employed (=2), probationary (trial period of maximum 6 months after which employer decides whether the employee is hired permanently or let go) (=3), substitute (temporary replacement of ordinary employee, e.g. filling in while an ordinary employee is on parental leave) (=4), seasonal (=5), on-call (to meet emergency requirements) (=6), active in labour market programme (=7) and other temporary employment (=4; the mean score among temporary employment contracts). If more than one option per column was marked, the alternative closest to 0 (i.e., closest to the core) was used.

In order to yield a cumulative measure of cumulative peripheral employment reflecting the entire 12-year period, the scores for all 24 half-year periods were averaged, generating a variable with range 1-7. The peripheral employment score can thus be viewed as the average degree of peripheral employment across the entire 12-year period, thus considering both duration (accumulated time in different contracts) and degree (type of temporary contract) of exposure.
**to peripheral employment.** This variable was very skewed and in order to yield a variable more suitable for our analyses, the score was therefore divided into four groups: 0= no experience of temporary employment; with experience of temporary employment or self-employment divided into tertiles of exposure, separately by gender: tertile 1=‘low exposure’, tertile 2= ‘medium exposure’, tertile 3=‘high exposure’. This four-level variable of cumulative peripheral employment was used in all analyses.

Note that, in the response to another reviewer’s comment, we have also expanded the conceptual description of the core-periphery model in the introduction (page 3-4):

> In today’s flexible post-industrial labour market a simple dichotomy of employed and unemployed is long gone, as it is common to move between different occupations and careers with different types of employment contracts. Notions of temporary employment as an exposed employment condition somewhere in between permanent employment and unemployment partly address these issues, but fail to take the substantial heterogeneity among temporary contracts into consideration. To address the complexities of the current labour market, Aronsson [1] has developed a conceptual model in which employment contracts are differentiated based on degree of job insecurity along an axis between the core and the periphery of the labour market. The core-periphery model[8, 13, 14] aims to capture this heterogeneity by regarding the permanent employees as the ‘core work force’ with favourable working conditions and temporary employees as the ‘periphery work force’ with reduced benefits. The structure of the model is based on aspects along the core-periphery axis, ranging from the core of permanent workers, to employment on projects/probationary employment, substitutes, and last the seasonal and on-call workers being closest to the periphery. The model suggests that the core represents the group with most secure conditions, with insecurity increasing the further from the core and the closer to the periphery one comes. In addition, the core-periphery axis also describes increasingly unfavourable working condition the further from the core one comes, e.g. in terms of duration of contract, skill development, influence on decision-making, education, and support from supervisors [15]. Project and object employment resembles the working conditions in the core, substitute’s contracts represents somewhere in the middle and on-call and seasonal workers are the groups with working conditions that least resembles the working conditions of the core [1]. The model also suggests that there is a health gradient running along the core periphery axis, with worse health among those closer to the periphery. In the present study we consider the relative hierarchy between different employment contracts along the core-periphery axis, accumulated across a 12-year period, as an determinant for health.

1.3•Page 7: You mention that the peripheral employment score considered both duration and degree. How was the relative contribution of duration and degree calculated?
Response: This statement was indeed somewhat unclear. What we attempted to convey was that our conceptualisation and operationalisation of the model considers the degree of peripheral employment (operationally by assigning a score to each employment form at each 6-month period, in order of proximity to the periphery) as well as the accumulation duration of these employment (operationally by summing up the score for each 6-month period). The measure is essentially a representation of the product of the duration and the degree of peripheral employment. As the final measure is divided by the number of 6-month periods considered, it can be expressed as the average degree of peripheral employment across the entire period. We have rewritten the description of the operationalisation in the revised manuscript (see comment above), including the particular sentence about duration and degree (page 8):

In order to yield a cumulative measure of cumulative peripheral employment reflecting the entire 12-year period, the scores for all 24 half-year periods were averaged, generating a variable with range 1–7. The peripheral employment score can thus be viewed as the average degree of peripheral employment across the entire 12-year period, thus considering both duration (accumulated time in different contracts) and degree (type of temporary contract) of exposure to peripheral employment.

1.4 The study follows individuals of a specific age-group. It further seems reasonable to expect that age is an important predictor of peripheral employment as well as health consequences by such employment conditions. Younger people are to a greater extent temporary employed but it could also have less detrimental health effects. Younger people may not have a family to provide for, and they may also live a more flexible life. Hence, to many young adults it may rather be an advantage to have a temporary employment. To what extent could the study of a specific age-group have influenced your findings?

Response: It is indeed possible that the impact of temporary employment on self-rated health might differ by age, or by life course period. This important question has not, to the authors’ knowledge, been specifically studied in previous research. However, we are not able to address this empirical question with the current data set. The homogenous nature of our sample with respect to age is in our view a considerable methodological strength when considering the internal validity of our results, as age, as a potential confounding factor, is controlled by design. Nevertheless, as the reviewer points out, this homogeneity might affect the generalisability of our results if the association is indeed dependent on age. In the revised manuscript, we have discussed this issue as a limitation (in a new paragraph concerning the generalisability of our results, page 16-17):

Moreover, all participants were of the same age. This is an important methodological strength as it controls the potentially confounding influence of age by design. However, it is possible that the health impact of temporary employment is moderated by age, e.g. younger people may not have the responsibility of a family to provide for. In summary, caution should be exercised when generalising the results to other ages and ethnic groups, as well as to other labour market contexts.
Your study is also performed in Luleå which is a city in the Northern part of Sweden with fairly low population density and perhaps a lower supply of available jobs. It could be that being in the periphery of the labour market has different effects on health and wellbeing in Luleå than in a larger city such as Stockholm or Gothenburg. This might relate to the availability of jobs. Having a temporary employment contract could involve higher insecurity (and higher stress etc.) in Luleå because an individual might have greater troubles of receiving another job. The labour market in Stockholm, on the other hand, is more flexible with good possibilities to find a new and maybe better job which could imply that being in the periphery of the labour market is not that detrimental for health. The implications of the specific context of study for the findings should be further discussed in the paper.

Response: As we have reported in a separate report[2], the cohort has been shown to be representative of Sweden as a whole with respect to sociodemographics, socioeconomic status and health status and health behaviour[2]. Moreover, the excellent response rate means that groups of people commonly lost due to attrition in most other prospective cohorts are included, which is a substantial methodological strength of the cohort. This issue, in addition to other factors limiting the generalisability of the results (age and ethnic composition), has now been addressed in a new paragraph in the Methodological Considerations subsection (page 16-17):

Regarding the generalisability of the results, previous examinations suggest that the original cohort was fairly representative of Sweden as a whole on a number of demographic measures[3]. Moreover, the few participants lost due to attrition, means that participation bias would not be expected to be a major problem. However, the closed nature of the cohort means that the cohort is not as ethnically heterogeneous as the contemporaneous Swedish population. Trade cycles and the regional labour market situation could possibly also influence the impact of temporary employment, e.g. insecure employments might be more stressful in contexts with low availability of jobs.

Page 9: In the abstract and conclusions the authors mention that they measured sociodemographics at baseline. However, in the methods section it is described that SEP is measured at age 42-years of age. This is not the baseline?

Response: We have shortened the aim in order to make it more focused and clarified in the conclusions that SEP is measured at age 42. Previous health is the only covariate measured at age 30 (page 5-6 and 17).

This study aims at examining whether 1) the accumulation of time in peripheral labour market positions is associated with psychological distress and poor or average self-rated health; 2) the proposed association is different among women than among men.

This study supports the hypothesis of a gradient particularly in psychological distress along with the core-periphery structure, as accumulated over a 12-year period, and that sociodemographics at age 42, previous health and time in
unemployment and out of the labour market to a large degree explain these results.

1.7•Page 15: To what extent is your findings representative for the total Swedish population given the very small sample size?

Response: The issue of generalisability of the results has been addressed in comment 1.5 (see above). For convenience, we repeat our response here:
As we have reported in a separate report,[2] the cohort has been shown to be representative of Sweden as a whole with respect to sociodemographics, socioeconomic status and health status and health behaviour.[2] Moreover, the excellent response rate means that groups of people commonly lost due to attrition in most other prospective cohorts are included, which is a substantial methodological strength of the cohort. The high response rate would have been difficult to achieve with a larger sample size. However, as the cohort is closed it is much more ethnically homogenous than the Sweden population of similar age is today. This issue, in addition to other factors limiting the generalisibility of the results (age and regional and national context), has now been addressed in a new paragraph in the Methodological Considerations subsection (page 16-17):

Regarding the generalisability of the results, previous examinations suggest that the original cohort was fairly representative of Sweden as a whole on a number of demographic measures[3]. Moreover, the few participants lost due to attrition, means that participation bias would not be expected to be a major problem. However, the closed nature of the cohort means that the cohort is not as ethnically heterogeneous as the contemporaneous Swedish population. Trade cycles and the regional labour market situation could possibly also influence the impact of temporary employment, e.g. insecure employments might be more stressful in contexts with low availability of jobs. Moreover, all participants were of the same age. This is an important methodological strength as it controls the potentially confounding influence of age by design. However, it is possible that the health impact of temporary employment is moderated by age, e.g. younger people may not have the responsibility of a family to provide for. In summary, caution should be exercised when generalising the results to other ages and ethnic groups, as well as to other labour market contexts.

1.8•The manuscript would benefit from a language check. There are grammar errors in various parts of the paper.

Response: The entire manuscript has been corrected by professional editing service after revision.

Minor essential revisions
1.9•Page 8: Non-optimal self-rated health sounds arbitrary. Please change to less than good self-rated health or something similar.
Response: We have changed ‘Non-optimal self-rated health’ to ‘Poor or average self-rated health’ throughout the revised manuscript.

1.10 Page 6: Please provide any decision number to the ethical approval.
Response: The decision number on the ethical approval has been added in the manuscript.

The study was approved by The Regional Ethical Review Board in Umeå [no 07-057].

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interests

REVIEWER 2

Title: Is the core-periphery labour market structure related to perceived health?
Analysis of the Northern Swedish Cohort
Version: 1 Date: 30 September 2011
Reviewer: Alfred Wagenaar

Reviewer's report:
This is an interesting study that addresses some important shortcomings in previous employment contract research. Its most important strengths are that it covers a large time-span, has included the ‘degree’ to which workers are exposed to temporary employment, and stratified results by gender. The analyses suit the research questions well and are also well performed. However, I have some concerns regarding the descriptive nature of this study: it has not developed hypotheses and does not very well explain some of the (most) important aspects of the study very well.

Major Compulsory Revisions
Introduction
2.1. Please explain the core-periphery continuum more extensively as this is the basis for your study. You only mention a division between core and periphery, but what does this so-called ‘continuum’ look like and who are the most ‘peripheral’ employees in this continuum? (p. 4). Because of this, also your aim and hypotheses are difficult to understand. For example, what do you mean by ‘based on measurement of the stay in different positions of the core-
Response: We have extended the description of the core-periphery. We have introduced the topic more carefully and now describe how the core periphery model is based on how secure employees are in different labour market position; the most secure (core group) are the permanent employees and the project/object employed are nearly as secure as the core. Substitutes are considered to be in the middle and the seasonal and on-call are those with most insecurity. Further, the model describes how working conditions in terms of duration of contract, skill development, influence on decision-making, education, and support from supervisors also have the same core-periphery structure. The original model, however, is only cross-sectional and has not considered what it means to be long-term temporarily employed. In this study we have therefore tried to consider accumulation of type of employment contracts, by considering what type of contract employees have over a 12-year period.

In today’s flexible post-industrial labour market a simple dichotomy of employed and unemployed is long gone, as it is common to move between different occupations and careers with different types of employment contracts. Notions of temporary employment as an exposed employment condition somewhere in between permanent employment and unemployment partly address these issues, but fail to take the substantial heterogeneity among temporary contracts into consideration. To address the complexities of the current labour market, Aronsson [1] has developed a conceptual model in which employment contracts are differentiated based on degree of job insecurity along an axis between the core and the periphery of the labour market. The core-periphery model[8, 13, 14] aims to capture this heterogeneity by regarding the permanent employees as the ‘core work force’ with favourable working conditions and temporary employees as the ‘periphery work force’ with reduced benefits. The structure of the model is based on aspects along the core-periphery axis, ranging from the core of permanent workers, to employment on projects/probationary employment, substitutes, and last the seasonal and on-call workers being closest to the periphery. The model suggests that the core represents the group with most secure conditions, with insecurity increasing the further from the core and the closer to the periphery one comes. In addition, the core-periphery axis also describes increasingly unfavourable working conditions the further from the core one comes, e.g. in terms of duration of contract, skill development, influence on decision-making, education, and support from supervisors [15]. Project and object employment resembles the working conditions in the core, substitute’s contracts represents somewhere in the middle and on-call and seasonal workers are the groups with working conditions that least resembles the working conditions of the core [1]. The model also suggests that there is a health gradient running along the core periphery axis, with worse health among those closer to the periphery. In the present study we consider the relative hierarchy between different employment contracts along the core-periphery axis, accumulated across a 12-year period, as an determinant for health.
2.2. The focus in this study is on gender differences because, as you stated, women are overrepresented in some peripheral contracts and possible gender differences regarding the type of employment and health have been overlooked. If so, this implies that gender differences can thus be expected. However, could you please explain why gender differences can be expected, especially in relation to your research questions (i.e. with regard to the association between exposure to temporary employment and psychological distress and self-rated health)?

Response: We introduced the issue of potential different health impact of temporary employment for women and men because little attention has been paid to this topic in previous research and few studies have done analysis stratified on gender. Our aim was to empirically address an understudied research question. In light of the meagre empirical support, we did not have much evidence to support expectations of either difference or similarity between women and men. What we did at the outset is that we recognised that different association in women and men was a possibility. As the reviewer correctly points out, the reasons why we considered this possibility at all are not explicitly stated in the manuscript. We have therefore added a paragraph in the introduction (page 5) to clarify our point of departure:

> Gender discrimination on the labour market has led to women being compelled to take on less beneficial non-standard employments[4], with temporary employment being more common among women than men in Europe, North America as well as Asia[4, 5]. However, so far research has shown some inconsistencies as to whether women’s and men’s health are affected by temporary employment to a similar or different degree [5, 6]. As such, whether temporary employment, particularly over time, affects women’s and men’s health to the same degree is a question that needs to be addressed.

2.3. What do you expect regarding the second aim of the study? Do you expect the associations to remain significant after controlling for baseline health, socio-demographics and periods of unemployment and out-of-labour market? Either way, please explain what you expect and why this can be expected.

Response: The second aim was merely emphasising the particularities of the analytical procedure and how we statistically addressed the influence of potential confounders. This aim thus did not represent a substantive research question by itself but rather a description of the measures taken to mitigate threats to validity. Therefore, we have decided to remove this part of the aim from the list of aims, while retaining the parts of the aim that are our substantive research question.

This study aims at examining whether 1) the accumulation of time in peripheral labour market positions is associated with psychological distress and poor or average self-rated health; 2) the proposed association is different among women than among men.
Minor Essential Revisions

Method

2.4. Did you leave the periods of unemployment and out-of-labour market out of the mean score of exposure to temporary employment? If so, the exposure measure may not have accurately captured the duration of exposure to temporary employment. Why did you control for this, instead of subtracting these periods from the ‘exposure-to-temporary-employment’ variable?

Response: The text about the operationalisation has been rewritten in order to convey a more lucid picture of the operationalisation, and the particular issues brought up by the reviewer have been directly addressed in this revised paragraph (page 7). We hope that these changes make the operationalisation clear. See below for an elaborated response to the reviewer’s concerns, and further below for the rewritten text.

Unemployment and out of the labour market were left out of the score in the sense that neither counted towards the score, i.e. each period of unemployment/out of the labour market yielded a score of “0” for that particular period similar to permanent employment. When we summarised the measure we have considered all 24 half-year periods regardless of labour market position, thus yielding the mean score of peripheral employment across the entire 12-year period. Since neither unemployment nor being out of the labour market (nor permanent employment) can be considered peripheral employment, we would regard it as inappropriate to include them in a measure of peripheral employment. Subtracting the periods of unemployment/out of the labour market would lead to a peripheral employment score only reflecting the periods for which the participants were employed. We are concerned that this manner of operationalisation would lead to a biased high peripheral employment score for participants who have been unemployed or out of the labour market, compared to those with no spells of unemployment or out of the labour market. We therefore regard our particular operationalisation as appropriate and the most straightforward option.

Nevertheless, as the risk of becoming unemployed/out of the labour market is higher among temporarily employed [7] and also might impact on health[3], we consider these labour market situations as potential confounders. We therefore adjusted for unemployment and being out of the labour market.

Peripheral Employment Score

The peripheral employment score was measured by the self-administered questionnaire as completed by participants in 2007, by applying an extended version of Aronsson’s original core-periphery model[1]. This extended version of Aronsson’s model also includes self-employed, active in labour market and other temporary employment contracts and also incorporates the dimension of time. Although being in a labour market programme is not considered employment per se, it might share some important aspects with peripheral employment more than with unemployment (e.g., regarding latent functions of employment), and was therefore included in the exposure. Participants’ labour market position from 1996 to 2007 was measured with a matrix consisting of columns representing half-year periods and lines representing different labour market positions. With the instruction “During which periods have you been employed permanently or have had some type of temporary job contract or have been out of job?” the respondents were advised to choose between 11 employment options for each half-year period: ‘permanently employed’,...
entrepreneur’, ‘employed in project’, ‘substitute’, ‘probationary employment’, ‘on-demand worker’, ‘seasonal worker’, ‘temporary employee for other reasons’, ‘in employment policy measure’, ‘unemployed’, ‘out of the labour market’. The order of the different employment contracts is based on the relative hierarchy in relation to degree of insecurity, reaching from the most core to the most peripheral employment contract.

Each response option was given a score for each half-year period according to the core-periphery structure: permanent (coded as 0), self-employed (=1), project/object employed (=2), probationary (trial period of maximum 6 months after which employer decides whether the employee is hired permanently or let go) (=3), substitute (temporary replacement of ordinary employee, e.g. filling in while an ordinary employee is on parental leave) (=4), seasonal (=5), on-call (to meet emergency requirements) (=6), active in labour market programme (=7) and other temporary employment (=4; the mean score among temporary employment contracts). If more than one option per column was marked, the alternative closest to 0 (i.e., closest to the core) was used.

In order to yield a cumulative measure of cumulative peripheral employment reflecting the entire 12-year period, the scores for all 24 half-year periods were averaged, generating a variable with range 1–7. The peripheral employment score can thus be viewed as the average degree of peripheral employment across the entire 12-year period, thus considering both duration (accumulated time in different contracts) and degree (type of temporary contract) of exposure to peripheral employment. This variable was very skewed, and in order to yield a variable more suitable for our analyses, the score was therefore divided into four groups: 0= no experience of temporary employment; with experience of temporary employment or self-employment divided into tertiles of exposure, separately by gender: tertile 1= ‘low exposure’, tertile 2= ‘medium exposure’, tertile 3= ‘high exposure’. This four-level variable of cumulative peripheral employment was used in all analyses.

2.5. If I understood it correctly, the peripheral employment score and also the periods of unemployment and out-of-labour market were based on a matrix only included in the 2007 questionnaire. This means the participants had to recall their employment status over the past 12 years. I have serious doubts about the accuracy of this measure. Are there similar studies available using this method and is there anything known about the validity and reliability of such a measure?

Response: What you bring up is of course a vital part to discuss regarding the limitations of the study. There are indeed possibilities that using a retrospective measure can introduce random as well as systematic error. Unfortunately, we have no means to directly assess the metric properties of the measure. We have therefore added a word of caution in the methodological subsection (page 16-17):

The measurement of temporary employment over an extended period of time is a great asset of this study. However, the sole reliance on self-reported retrospective assessment could introduce recall bias, e.g. that those with health
problems over- or under-report the exposure, which could skew the estimates in either direction, or a general under-reporting of the exposure, which would lead to reduced estimates. In addition, difficulties in accurately recalling employment situations over as much as 12 years could also introduce random error of the exposure, which would be expected to reduce the estimated associations. These issues with respect to measurement should be considered when interpreting the results. However, retrospective questions about occupational history have previously been shown to hold good quality in terms of agreement with census data[8].

2.6. I wonder if socioeconomic position can be seen as a continuous variable the way you have categorized it. Did you dummy-code this variable before using it in the analyses?

Response: The SEP variable was entered as a categorical covariate in the analyses. We have clarified this in the methods section (page 9):

Socioeconomic position (SEP) at age 42 was based self-reported occupation, which was classified according to the Swedish socioeconomic classification (SEI) of occupational categories:[9] upper white-collar and self-employed were coded as 0, lower white-collar workers were coded as 1 and blue-collar workers were coded as 2 and were used as categorical variables in the analysis.

Results / Discussion

2.7. What is the role of which control variable? To be more precisely, which control variables make the odds go non-significant or lead to the largest reduction in significance levels? Moreover, what does this mean and how can this be explained?

Response: First, we want to emphasise that the intended focus of the present manuscript is on the health impact of temporary employment, and that the other variables are merely covariates that are included to make sure we do not draw faulty conclusions about the potential health effects of temporary employment. The covariates are thus only included to address potential threats to validity, and their inclusion does not represent a main aim of the manuscript. We have clarified our view on the role of the covariates by excluding aim 3, which placed too much focus on this analytical part (see comment 2.3).

Nevertheless, we agree that some information on which factor stands for the most important OR attenuation is valuable complementary information. However, disentangling which particular covariate contributes to attenuation of the exposure OR is difficult to assess. For example, entering the covariates one by one in separate models only assesses how they reduce the OR singly, but our final model is a multivariate model where the interrelationships between the covariates also need to be considered.

To give a small indication of which covariates appear to be most important in this context, Tables 2 and 3 report three adjusted models, where models 1 and 2 represent partially adjusted models (adjusted for demographics and employment situations, respectively). These intermediate models thus give some indication as to how demographic/previous health or employment situation, as separate sets of covariates, affect the estimates of the main
association. In the revised manuscript, we have supplemented this information with additions to the text in the results section describing the contribution of the individual covariates most strongly related to the outcome in the adjusted models. We do not want to delve too deeply into these complementary results, but hope that the revised presentation gives a sufficient indication of the question that the reviewer brings up. (page 12)

[In relation to table 2, data not shown] In model 3, psychological distress at age 30 (women OR 3.57 (2.17–5.87), men OR 3.63 (2.33–5.66)), being out of the labour market (women OR 1.07 (1.01–1.12), men OR 1.07 (1.00–1.14)) and for women marital status single (OR 3.18 (1.82–5.55)) were significantly related to psychological distress at age 42. None of the other covariates were related to psychological distress at age 42 in any of the models.

[In relation to table 3, data not shown] In model 3, poor or average self-rated health at age 30 (women OR 3.53 (2.22–5.61) men OR 4.06 (2.52–6.55), for women blue collar worker (OR 1.99(1.24–3.17)) and single marital status OR (2.29 (1.33–3.95)) and for men being out of the labour market (OR 1.09 (1.02–1.17)) were significantly related to poor or average self-rated health at age 42. The only other covariate that was significant was being out of the labour market for women in model 2 (OR 1.08 (1.03–1.32)).

2.8. Please explain why other studies found more profound associations between temporary employment and health in women, whereas the current study found rather equal associations for both genders.

Response: We have now brought up this issue in the discussion. We consider that the answer to this question could lie in how the exposure is measured and whether men or women dominate in the most peripheral type of employment contracts in the specific sample. As the exposure often is just two groups being compared, e.g. standard vs. non-standard, as opposed to our more detailed formulation, it is possible that some of the results regarding gender differences stem from the relation to specific types of contract rather than consequences in health being different for men and women. More specifically in Kim et al. [5] more women than men are day labourers (very precarious) and in Kim et al.[10] more men are contingent than women and more women than men are part-time (which still can be a permanent more core position).

Possible explanations as to why we found similar associations among women and men, whilst some previous studies found more profound associations among women[5], could depend on how we measured the exposure, as we consider the type of contracts in greater detail than previous research[5, 10, 11]. For example, the divergent results could partly depend on whether women or men more frequently have the most peripheral type of contracts, with the most peripheral types of contracts having greater implications for health. As our results indicate, it might not be gender per se but type of contract that has the greatest importance for health. However, it is also possible that gender discrimination has different implications depending on the specific cultural context[5].
2.9. In the discussion you mention ‘common-method bias’ as a limitation. However, the existence of this phenomenon is at least questionable (see e.g. Spector, 2006). Therefore, I would suggest to only mention the specific kind of bias(es) that may have occurred. (Spector PE (2006) Method variance in organizational research: Truth or urban legend? Organ Res Methods 9:221-232)

Response: We have altered this section and specified that we consider a risk of recall bias. See also our response to comment 2.5

All data were based on self-reported data, which might introduce recall bias; this could lead to an underestimation of time in temporary contracts.

2.10. The discussion mainly focuses on theoretical implications. Are there also more practical implications of the current study? For example, if the core-periphery structure implies that peripheral workers are at risk for health problems, what should be undertaken to prevent such a negative consequences?

Response: This is an important point and practical implications should definitely be considered. We have added a section in the paper regarding policy implications.

Policy changes should aim at reducing health inequalities between those employed in the core and the periphery of the labour market. Further, policy measures should help to promote transitions towards the core of the labour market, prevent transitions towards the periphery and help those who potentially are trapped in peripheral employment.

Discretionary Revisions

Introduction
2.11. You mention that health implications of temporary employment may be dependent on the social context, such as labour market policies, educational system and legislation (p. 5). However, this study does not really attend to these aspects, so why mentioning these here?

Response: We agree with the reviewer and have decided to move this sentence to the discussion section regarding generalisation.

Method
2.12. You probably examined psychological distress and self-rated health by dividing these measures into the ’worst’ quartile vs. the rest? However, this is not entirely clear. I would suggest stating this more clearly at the start of the paragraph describing these measures.

Response: We have clarified that we examined the measures psychological distress and self-rated health in the quartile reporting the worst health versus the rest.

The worst quartile, reporting one or more of the six symptoms was coded as 1 and the rest reporting none as 0 for men. For women both at age 30 and 42, the
worst quartile reported 2 or more symptoms and was coded as 1 and less as was coded as 0.

The responses were dichotomised into the quartile with the worst health (average or bad) coded as 1, and the rest (good) coded as 0.

Tables
2.13. Could you clarify in the tables which individual odd ratios are significant? I would also like to see how the different models fit the data, including the amount of explained variance.

Response: We have added p-values(*) indicating significance level to clarify which individual odds ratios that are significant and Nagelkerke R^2 in table 2 and 3.

In addition we have reported in the text what covariates that were most significant.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being Published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:
I declare that I have no competing interest

