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ABSTRACT

Working Hours and Top Management Appointments: Evidence from Linked Employer-Employee Data*

By combining Danish registry data covering the population of Danish workers with the Danish Labor Force Survey (DLFS) which provides detailed data on working hours, we provide fresh evidence and insights on a potentially important role that career concerns/considerations play in accounting for the incidence of long working hours. First, we obtain new and robust evidence with external validity on a positive association between working hours and career success (measured by top management appointments). Second, we illuminate that the observed positive association between working hours and career success is consistent with three distinct theories: (i) human capital; (ii) rat race; and (iii) tournament. Third, guided by each theory, we go beyond a simple association between the quantity of working hours and career success, and explore what kinds of working hours are more beneficial for career advancement. Specifically we find: (i) for managers, working long hours will help them increase their odds of top management appointments in the same firm, while not in a different firm, while for non-managerial professionals and other workers, both internal and external hours will help them raise their odds of career success; (ii) the odds of top management appointments will rise significantly by becoming the longest working hour person among the peers; (iii) working nonstandard hours (evening/night) will be beneficial for career advancement; and (iv) workers with high desired hours will enjoy greater odds of top management appointments even after controlling for actual hours. We interpret each finding from the three theoretical perspectives.

JEL Classification: M5

Keywords: working hours, top management appointments, promotions, human capital, job assignment, rat race, adverse selection, tournament

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I. Introduction

A positive association between working hours and subsequent career success (often measured by promotions to higher job levels) is predicted by the three major theories, human capital theory; rat race theory; and tournament theory. First, workers who spend more time on the job accumulate more human capital through OJT (On-The-Job Training), and possess more skill and knowledge that make them more qualified for promotions to top management. As such, workers with longer working hours are more likely to be promoted to top managers (see, for example, Arrow, 1962, and Rosen, 1972). Gibbons and Waldman (1999; 2006) extended the simple OJT human capital theory, and explored interplays between job assignment and OJT. Workers with higher ability self-select efficiently into career jobs with higher returns to OJT (hence spend more time on the job) and greater promotion opportunities. In contrast, workers with lower ability self-select efficiently into non-career jobs with lower return to OJT (spend less time on the job) and limited promotion opportunities.

Second, adverse selection or "rat race" theory also predicts a positive correlation between hours and future career success (e.g., Akerlof, 1976, Landers, Rebitzer and Taylor, 1996, Kato, Ogawa and Owan, 2016). The worker's willingness and ability to work long hours, or his/her cost of working long hours is an important qualification for top management. However, each worker's cost of working long hours is his/her private information. The firm will set the threshold number of hours worked, h*, and use the following promotion policy---the worker will be promoted if his/her working hours exceeds h*. However, h* is set inefficiently high due to adverse selection caused by some workers with high cost of working long hours who find it beneficial to pretend to be workers with low cost of working long hours.

Third, promotion tournament with heterogeneous ability and no handicap yields "superstar effect" (Brown, 2011). High-ability workers face higher expected net benefit of tournament win and hence put more effort (work longer hours), AND win *ex post*. Low-ability workers face lower expected net benefit, and put less effort (work shorter hours), AND fail to win *ex post.*

There is only limited empirical evidence on the relationship between long working hours and career success in general and the aforementioned specific mechanisms. Most studies are based on data from very specific professions. For instance, Landers, Rebitzer and Taylor (1996) analyse their unique data on lawyers and provide evidence on their rat race model, while Brown (2011) focuses on professional golfers and yield evidence on her tournament model. More recently, Gicheva (2013), which is the closest to our study, applies the Gibbons and Waldman (1999; 2006)'s job assignment model to GMAT registrants (MBA-bound high-achievers mostly from top U.S. universities) and uncover a positive relationship between working hours and wages/promotions. Most recently, Kato, Ogawa, and Owan (2016) develop a rat race model with two-sided asymmetric information and yield supporting evidence from an econometric case study of a large manufacturing firm in Japan.

The main objective of this paper is to provide more compelling and richer evidence on the association between long working hours and career success, and shed new light on particular mechanisms behind the hours-career success link. Specifically, as discussed above, the empirical literature consists of case studies. While rich and precise, the case study approach lacks external validity. Using registry data comprising workers in Denmark (from different industries, with different education levels and different types of education) we obtain more externally valid evidence on the positive association between working hours and career success.

Second, external validity is not the only advantage of our study. By combining Danish registry data with data from Danish Labor Force Survey (DLFS), we are able to go beyond a simple association between the quantity of working hours and career success, and explore what kinds of working hours are more beneficial for career success, including internal (within the same firm) working hours as opposed to external working hours; absolute vs. relative working hours; standard vs. nonstandard working hours; and actual vs. desired working hours. The findings will be interpreted from the aforementioned three different theoretical perspectives.

While making specific contributions to the field of personnel economics/organizational economics, the paper can have some broader appeal. First, the paper can enrich labor supply theory by providing new evidence and insight on a potentially important role that career concerns/considerations play in the worker's labor supply decision. Second, researchers, policymakers, and the public in general around the world are increasingly interested in work-life balance (OECD, 2011). For instance, in the U.S., almost one in four male employees age 25-64 was reported to work 49 or more hours a week in 2005 (Kuhn and Lozario, 2008). In Japan, over 40 percent of male employees age 25-64 was reported to work 49 or more hours in 2012, and nearly one in five male employees was reported to work 60 or more hours per week (Asai, Kambayashi and Kato, 2015). Understanding how career concerns/considerations can play an important role in the worker's labor supply decision is crucial in developing and implementing effective policy responses to the work-life balance challenge that many workers face around the globe.

In the next section we introduce the data that are uniquely suitable for our study, and present our overall empirical strategy. In section III, we present the econometric specification and the key results. In section IV, we go deeper into the nature of working hours, provide novel

findings, and interpret them from the three theoretical perspectives. Concluding remarks are provided in section V.

II. Empirical Strategy and Data

To determine the relation between hours and promotions we use the Integrated Database for Labor Market Research (IDA) constructed by Statistics Denmark. The IDA is one of the most comprehensive Linked Employer and Employee Datasets available and it provides detailed annual information on all employees in Denmark and their firms longitudinally. However, as is typically the case for register based datasets they lack reliable information on working hours. To this end, we merge the IDA with information from the Danish Labor Force Survey (DLFS) which is also collected by Statistics Denmark. The DLFS provides reliable data on working hours (such as weekly working hours, weekend work, evening work, and desired work hours) for a randomly drawn sample of nearly 168,499 Danish employees between 1994 and 2010. The DLFS is sampled as a running panel, i.e. the individuals are interviewed multiple times. During the period 1994 to 2006 individuals were surveyed three times and from 2007 individuals were surveyed 4 times. Our main specification uses the initial hours observation (h_1), but in some regressions we make use of the repeated observations for the second and third waves: h_2 (working hours for the 53rd week since the initial survey week) and h_3 (working hours for the 70th week since the initial survey week).

Since the survey data are merged with register data, we can follow each individual beyond the time of the survey. Of particular importance for the purpose of our paper, is the availability of data on Organizational Hierarchy Codes for individual workers both at the time the survey is conducted (year t) and one year after the survey is conducted (year t+1). Organizational Hierarchy Codes are comprised of: Level 4 Top Managers (comparable to C-

Class Executives in U.S. firms); Level 3 Managers (other executives and managers with supervisory responsibilities); Level 2 White-collar (other managerial and professional workers); and Level 1 Blue/Grey-collar (manual/clerical/other workers). As such we can estimate the odds of appointment to top management positions between year t and year t+1 as a function of working hours in year t. As shown in Table 1, Top Managers are indeed scarce, with only 2.7 percent of all workers in the LFS sample holding such positions. Managers comprise 16.9 percent of the sample, White Collars make up 19 percent and the largest group by far is Blue/Grey Collars who account for 61.5 percent of the sample.

Since the DLFS samples all workers in Denmark randomly, those entering the survey are representative of the population of Danish workers. To underline this we present, in Table 1, the distribution of organizational hierarchy levels from the DLFS across all years and for the year 2005 together with the distribution of organizational hierarchy levels for the population in 2005. Reassuringly the two distributions of organizational hierarchy levels are very close.

Descriptive statistics for our regression sample are presented in Table 2. The sample comprising a total of 168,499 employees is almost equally split between men and women. The average employee is close to 40 years old with 16 years of general work experience and a little over 4 years of tenure. The average number of children is around 0.7, and close to 70 percent of all employees are either married or cohabiting. There are a little over 70 percent of them with high school or less; 5 percent with vocational training; 16 percent with a Bachelor's degree; and 7 percent with a graduate degree. Twenty eight percent of them work in the public sector.

We focus our analysis on appointments to top management positions. As discussed in Frederiksen and Kato (2017) and Smith et al. (2013), top manager appointments are a reasonable definition of career success for many workers in Denmark. In fact, Frederiksen and Kato (2017) show that employees appointed to such positions come from a broad set of lower level

occupations. This picture is confirmed in Table 3 where we present the probability of appointment to a top management position conditional on the worker's current occupation (Managers , White-collar, and Blue/Grey-collar). Not too surprisingly managers enjoy the highest annual appointment probabilities of 1.6 percent (every year on average 16 out of 1000 managers earn top management appointments). For white-collar and blue/grey-collar workers, the odds of top management appointments are 0.9 and 0.5 percent respectively.

A preliminary investigation of the hours-appointment relationship is conducted in Table 4. In this table, we provide simple cross-tabulations between the first working hours observation (in year t) and the employee's change in occupation between year t and t+1. We find that Managers who are not appointed to Top Manager positions between year t and year t+1 on average work 36.5 hours per week, while those receiving top management appointments during this period work on average 42.1 hours per week. Hence, Managers who are appointed to Top Managers positions work 15 percent more per week than the average non-appointed Manager. For White-collar, those appointed work 11.1 percent more per week than those white-collar workers who were not appointed. These numbers suggest a positive relationship between working long hours and the probability of a subsequent appointment to top management positions.

Note that the Table also reveals some useful facts about working hours of Danish workers. While the average working hours of Danish workers do not strike us as particularly long (standard work week in Denmark is 37 hours), long working hours are not rare for top managers as well as for other managers. Thus, over 30 percent of top managers work 50 or more hours a week and one in ten top managers work 60 or more hours a week. Even for other managers, one in ten works 50 or more hours a week.

III. Econometric Specifications and Results:

To provide rigorous and systematic evidence on the interplay between working hours and career success, we begin by estimating the following baseline logit model of top management appointments for Managers, White-collar, and Blue/Grey-collar separately:

(1) $\ln[Pr(appoint_{it})/1-Pr(appoint_{it})] = \alpha + \beta hours_{it} + \mathbf{Z_{it}}\boldsymbol{\gamma} + u_{it}$

where $appoint_{it}$ =1 if worker i is appointed to a top management position between year t and t+1, zero otherwise; $hours_{it}$ = the number of weekly hours of worker i in year t.; and $\mathbf{Z_{it}}$ is a column vector of other control variables for worker i in year t. The control variables include: a dummy variable for gender, quadratics in age, tenure, experience, and number of children, four education dummy variables, a dummy variable for cohabiting/marriage, industry dummy variables (12), 2-digit occupation dummy variables (33). In addition, we include year dummies to control for any year-specific shocks that affect the odds of top management appointments for all workers. α and β, as well as a vector $\boldsymbol{\gamma}$ are the parameters to be estimated. Hereafter subscripts i and t will be omitted for simplicity of exposition.

The sign and significance of the estimated coefficient on hours can be used to test our baseline hypothesis -- the probability of being assigned to a top management position will increase with the number of hours worked.

The logit estimates of Eq. (1) are presented in columns (i)-(iii) of Table 5. The estimated marginal effects of hours are positive and statistically significant at the 1 percent level for all three groups of workers, showing that the probability of being appointed to a top management position rises significantly with working hours, after controlling for quadratics in age, tenure, experience, and number of children, four education dummies, gender, cohabiting/marriage, public sector together with industry fixed effects (12 industries), 2-digit occupation fixed effects (33 occupations), and year fixed effects. The magnitude of the marginal effect is modest yet

economically meaningful. For example, the average annual probability of earning a top management appointment for Managers is 1.6 percent (see Table 3). One standard-deviation increase in working hours (11 hours) will lead to an increase in the annual odds of a top management appointment by 0.26 percentage points, which amounts to a 16-percent increase in the annual odds of a top management appointment from 1.6 percent to 1.86 percent.

As Gicheva (2013) report, the relationship between working hours and career success can be nonlinear. To allow for such possible nonlinear relationships between working hours and career success, we replace hours with a set of dummy variables: (i) $0 < h < 37$=1 if worker i works less than standard work week of 37 in year t, and zero otherwise; (ii) 38⩽h⩽47=1 if worker i works more than standard hours but less than 47 hours, and zero otherwise; and (iii) h⩾ 48=1 if worker i works 48 or more hours, zero otherwise. The omitted reference category is working standard hours of 37. The estimated marginal effects are reported in (i)'-(iii)' of Table 5. On the one hand, the estimated marginal effect of $0 < h < 37$ is not statistically different from zero, pointing to a low probability of top management appointments if working hours are below or at Denmark's standard work week of 37 hours. On the other hand, the estimated marginal effect of $38 \leq h \leq 47$ is positive and statistically significant at the 5 percent level, suggesting that the odds of top management appointments will be higher by 0.5 percentage points for Managers (0.4 for White-collar and 0.3 for Blue/Grey-collar) if working hours go beyond the standard work week of 37 but do not exceed 47 hours per week. Likewise, the marginal effect of $h \geq 48$ is also positive and statistically significant at the 1 percent level. If working hours exceed 48 hours, as compared to the standard work week of 37 hours, the odds of career success will be higher by 0.9 percentage points for Managers (0.6 percentage points for White-collar and 0.5

percentage points for Blue/grey-collar). In sum, the results in Table 5 indicate that long working hours are associated with career success.[1]

For some workers, long working hours may not result in career success quickly. To allow for lags in the effects of working hours on career success, we modify our dependent variable, the odds of top management appointment, to $appoint_{it+5}$, and repeat the above analysis. The results are summarized in Table 6. As expected, the estimated marginal effects of working hours are positive and statistically significant at the 1 percent level for all three categories of workers, and are larger than those in our baseline model.

Finally, as in the case of most labor force surveys around the world, data on working hours from the DLFS are the actual weekly working hours for the survey week rather than the usual (typical) working hours. It is possible that the survey week happens to be an unusually busy (or slow) week for some workers and thus that their reported working hours may not be usual (typical) working hours. In all three theoretical perspectives we consider, usual working hours are more relevant to career success. In the human capital perspective, those with high returns to OJT are assigned to career jobs with long working hours; significant human capital accumulations through OJT; and prospects for promotions, while those with low returns to OJT are assigned to non-career jobs without long working hours; human capital accumulation and promotions. It is possible that even non-career jobs may require long working hours at times but not as norm. As such, usual working hours appear to be more relevant to career success than actual working hours. From the rat race perspective, the relevant source of asymmetric information is the worker's willingness and ability to work long hours not just one time but regularly. From the perspective of the tournament theory with heterogeneous ability contestants,

[1] For the remainder of the paper, we present the results, using the baseline model, Eq. (1) with a linear relationship between working hours and career success. We relaxed the linear relationship and redid the rest of the analysis, assuming a nonlinear relationship. Reassuringly there was no discernible change in the key results although there was some modest efficiency loss. These as well as all other unreported results are available upon request from the corresponding author at tkato@colgate.edu.

the high-ability contestant enjoys a greater expected net benefit from winning the tournament and thus puts more effort (working long hours consistently), which results in winning. Again, it is usual working hours that matter for career success in the tournament theory.

Fortunately the DLFS collects data on working hours from the same individuals on multiple occasions, h_1(working hours for the initial survey week), h_2 (working hours for the 53rd week since the initial survey week), and h_3 (working hours for the 70th week since the initial survey week).[2] Hence, we construct a measure of **usual working hours** as the average working hours across the three hours observations (we also show alternative estimations where we include individuals who do not have full information on hours in three surveys). The results are shown in Table 7 where we restrict attention to the years 1994-2006 where employees are surveyed 3 times. As expected, the estimated marginal effects of usual working hours are positive and significant at the 1 percent level (at the 5 percent level for column (iii) for White-collar). Moreover, the estimated marginal effects of average working hours are larger than those of working hours during the initial survey week, especially when we use only those individuals with all three hours data, $h_{1,}$ $h_{2,}$ and $h_{3,}$ as shown in column (iii). Usual hours appear to be indeed more relevant than actual hours for career success, as all three theoretical perspectives suggest. There is, however, an alternative interpretation of the larger marginal effects of average hours in column (iii) ---those individuals without complete hours data may well be those who gave up on their initial careers and decided to pursue alternative careers, such as returning to schools and specializing in household production. By restricting the regression sample to those with complete hours data, we may be systematically dropping those who are less likely to win top management appointments. Thus, our results ought to be interpreted with caution.

[2]In 2007, the DLFS started collecting data on working hours from the same individuals four times instead of three times.

IV. Different Kinds of Working Hours and Career Success

IV.1 Internal and external working hours

There are two ways to become a Top Manager, internal promotion and external recruitment (e.g., DeVaro and Morita, 2013; and Frederiksen and Kato, 2017). Will long working hours help getting a top management appointment elsewhere? From the human capital perspective, it will depend on the degree of firm-specificity of human capital acquired through OJT. The more firm-specific human capital accumulated on the job is, the less will long working hours help getting a top management appointment elsewhere. The rat race perspective provides a useful insight on the role of working hours in career success elsewhere. If working hours are not readily observable by outsiders, long working hours will not serve as a useful signal for outsiders, and hence long working hours will not help earning a top management appointment elsewhere through external recruit.[3] To this end, the rat race combined with some mechanisms to make working hours public knowledge (e.g., an old boy network and an alumni organization) can explain a significant role of working hours in career success elsewhere.

Finally, the tournament perspective applies only to internal promotion, and external recruitment is beyond the scope of the tournament theory. Any positive correlations between working hours and top management appointments elsewhere will need to be explained by the human capital perspective with OJT yielding general human capital and the rat race perspective with public knowledge of working hours.

To examine the importance of working hours for career success through internal promotion as compared to external recruitment, we extend our baseline model to a multinomial logit framework with three destinations: (i) being appointed to a top management position

[3] Note that it is still possible that long working hours will help winning a top management appointment through internal promotion, and then having observed the internal promotion, other firms may infer the worker's private information and try to appoint him/her to their top management positions, which in turn results in inefficient promotions (Waldman, 1984).

internally (internal promotion); (ii) being appointed to a top management position elsewhere (external recruitment); and (iii) not being appointed to a top management position. The results are presented in Table 8. For White-collar and Blue/Grey-collar, the marginal effects of working hours on the odds of top management appointments through internal promotion as well as via external recruitment are positive and statistically significant, suggesting that top management appointments for white-collar and blue/grey-collar cannot be explained entirely by the tournament theory. Furthermore, the marginal effects of hours tend to be larger for internal promotion than for external recruitment, implying that not all human capital accumulated on the job is general, and that working hours may not be fully known to outsiders. Finally for Managers, in contrast, the marginal effects of hours on the odds of top management appointments through external recruitment are considerably smaller than the marginal effects on the odds through internal promotion and not even significant at the 10 percent level, which is consistent with the tournament theory (as well as the human capital perspective with firm-specific OJT and the rat race perspective without public knowledge of working hours).

IV.2 Relative hours

The distinguishing feature of the tournament theory is its focus on relative incentive as opposed to absolute incentive. It is not the absolute amount of effort (working hours) but the relative amount of effort (own working hours relative to the peers' hours). Our registry data are particularly powerful in providing new evidence and insight on the relevance of the tournament theory. For each worker and for each year, his/her firm ID is recorded in the Registry data. As such, we can identify all of his/her peers who work in the same firm in the same year, which will enable us to create a dummy variable, Longest hours among peers$_{it}$ = 1 if worker i in year t is the longest working hour person in the same firm for the same year, 0 otherwise. An alternative way

to identify each worker's peers is to use each worker's workplace address which is also recorded in the registry, and identify all workers who work in the same workplace address for the same year.

Table 8 shows the two sets of results, one using firm-year to define the peers and the other using workplace-year to define the peers. For the first set of results with the peers defined using firm-year, the estimated marginal effects of **Longest hours among peers** are positive and statistically significant for all three categories of workers. Even after controlling for **Hours/100**, the estimated marginal effects are found to be still positive and statistically significant for Managers and White-collar (still positive yet no longer significant for Blue/Grey-collar). When we define the Peers using workplace-year, the estimated marginal effects of **Longest hours among peers** are again found to be positive and statistically significant with and without controlling for **Hours/100** for Managers, while the marginal effects are estimated less precisely for White-collar and Blue/Grey-collar. In sum, the odds of top management appointments will rise significantly by becoming the champion of long working hours among the peers. This is true even if we control for absolute hours. Relative hours (even after controlling for absolute hours) are found to matter for career success, which supports the tournament perspective. Note that the relevance of relative hours to career success is not necessarily inconsistent with the human capital and rat race perspective.[4]

Finally, though not reported here, we also repeat the same analysis using the multinomial logit framework as we did in **IV.1 Internal and external working hours**. While the results are slightly less precise, we find that overall **Longest hours among peers** matter for internal

[4] From the human capital perspective, the significant marginal effects of Longest hours among peers mean that the worker with the greatest amount of human capital acquired through OJT in the workplace is more likely to become a Top Manager. Likewise, from the rat race perspective, the worker who works the longest hours in the workplace happens to be exceeding the threshold working hour for a promotion.

promotion but not for external recruitment, which is consistent with the human capital and rat race perspectives as discussed in the previous section.

IV.3 Nonstandard hours

Thus far we have focused on the length of working hours, and have not paid attention to the timing of working hours. In this section, we explore the possible consequence of working nonstandard hours (evening/night and weekend) for career success. From the human capital perspective, the answer depends on the production process of human capital. If the worker accumulates more human capital by working non-standard hours than by working standard hours (daytime and weekday), working non-standard hours will be beneficial for career success. However, this will be unlikely if the bulk of top management task involves coordination of various departments and constituencies within the firm, and hence requires internal social capital such as extensive network of people within the firm (see, for instance, Kim, 2002 and Kim and Cannella, Jr., 2008). Considering that key personnel often work standard hours, it will be harder to develop such an extensive network by working non-standard hours.[5]

From the rat race perspective, if the worker's willingness and ability to work nonstandard hours is important for carrying out the talk of top management successfully, working nonstandard hours currently will raise the future odds of top management appointments.

While the tournament perspective does not appear to speak to the issue of nonstandard working hours directly, if relative performance measures include an experience with nonstandard work schedules, working nonstandard hours presently will probably increase the future odds of career success.

[5] The limited opportunities to develop relational capital in non-standard work schedules (which tend to be more pervasive among women) have been pointed out as a possible culprit for the gender gap in promotions (see, for instance, Kato and Kodama, 2018).

Table 10 shows the logit estimates of our baseline equation augmented by two nonstandard hours variables, **Evening/night work**$_{it}$ = 1 if worker i in year t works evening or night hours, 0 otherwise; and **Weekend work**$_{it}$ = 1 if worker i in year t works weekend, 0 otherwise. The estimated marginal effects of **Evening/night work** are positive and statistically significant for Managers and White-collar but not for Blue/Grey-collar, while the estimated marginal effects of **Weekend work** are small and not statistically significant for any of the three categories of workers.

In short, insofar as evening/night work is concerned, there is some evidence that working such nonstandard hours is beneficial for career success. From the human capital perspective, it means that working evening/night hours will add more human capital, conditional on the actual working hours. As discussed above, considering the potential importance of internal social capital for the task of top management, the human capital interpretation does not strike us as particularly convincing. The rat race perspective interprets the significant marginal effects of evening/night hours as an indication that presently working evening/night hours serves as a signal of the worker's private information on the cost of working evening/night hours. Considering an increasingly globalizing nature of business and rapidly changing business environments, it is plausible that the willingness and ability to work evening/night hours may be an important qualification for top management. As such, we find the rat race interpretation reasonable. Finally, the tournament perspective does not speak to the issue of nonstandard hours directly.

IV. 4 Desired hours

The DLFS asks each survey respondent actual hours as well as desired hours. While we acknowledge the inherent ambiguity of subjective data such as desired hours, we could plausibly

interpret desired hours as an indication of each worker's private information on the cost of working long hours. That is, conditional on occupations and industries, the cost of working hours would be negatively correlated with his/her desired hours. If this interpretation of desired hours is correct, the rat race perspective will suggest that in rat race equilibrium those with greater desired hours (or lower cost of working hours) are more likely to become Top managers, or to have positive marginal effects of desired hours. Note that the human capital and tournament perspectives do not speak to the issue of desired hours directly.

The logit estimates of our baseline model, Eq. (1) with actual hours replaced by desired hours are presented in Table 11. The estimated marginal effects of desired hours are positive and statistically significant at the 5 percent level for Managers and at the 1 percent level for the other two categories. Provided that our proposed interpretation of desired hours as the cost of working hours is valid, the results are consistent with the rat race perspective. The positive and significant marginal effects of desired hours are robust to the inclusion of actual hours as a control for White-collar. However, for Managers and Blue/Grey-collar, the inclusion of actual hours as a control makes the estimated marginal effects of desired hours less precise.

V. Concluding Remarks

By combining Danish registry data covering the population of Danish workers with the Danish Labor Force Survey which includes detailed data on working hours, we have provided fresh evidence and insights on a potentially important role that career concerns/considerations play in accounting for the incidence of long working hours. First, we have obtained new and robust evidence with external validity on a positive association between working hours and career success (measured by top management appointments). Second, we have illuminated that the observed positive association between working hours and career success is consistent with

three distinct theories: (i) human capital; (ii) rat race; and (iii) tournament. Third, guided by each theory, we have analysed our unique data and have obtained a number of new findings.

1. For Managers, working long hours will help them increase their odds of top management appointments in the same firm, while not in a different firm. That internal hours help career but not external hours is consistent with the tournament theory as well as with the human capital theory with OJT producing firm-specific human capital; and the rat race theory with working hours being not known to outsiders.
2. For White-collar and Blue/Grey-collar, both internal and external hours will help them raise their odds of career success, which cannot be explained by the tournament theory but by the human capital theory with OJT producing both general and firm-specific human capital; and the rat race theory with working hours being known to outsiders.
3. The odds of top management appointments will rise significantly by becoming the champion of long working hours among the peers. That relative hours (even after controlling for absolute hours) matter for career success fits the fundamental feature of the tournament theory well.
4. Working nonstandard hours (evening/night) will be beneficial for career advancement, which is particularly consistent with the rat race theory.
5. Workers with high desired hours will enjoy greater odds of top management appointments even after controlling for actual hours. Interpreting high desired hours as an indication of low cost of working long hours, positive associations between desired hours and top management appointments are particularly congruous with the rat race theory.

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Table 1 Occupational classification in the DLFS and IDA data

	Top Managers	Managers	White-collar	Blue/Grey-collar	Observations
			----- Percent -----		
Sample from DLFS	2.7	16.9	19.0	61.5	168,499
Sample from DLFS in 2005	2.9	14.2	18.5	64.4	8,689
Population in 2005	2.9	13.3	18.0	65.8	2,374,290

(Sources) IDA data merged with data from the Danish Labor Force Survey

Table 2: Mean and standard deviation for control variables

	Mean	Std. Dev.
Woman	0.49	0.50
Age	39.69	13.01
Work experience	15.91	11.26
Tenure	4.25	6.02
Number of Children	0.73	0.99
Married or cohabiting	0.69	0.46
High school or less	0.72	0.45
Vocational	0.05	0.22
Bachelors	0.16	0.36
Graduates or PhD	0.07	0.26
Public sector	0.28	0.45
Observations	168,499	

(Sources) IDA data merged with data from the Danish Labor Force Survey

Table 3. Yearly appointment probabilities to top management positions

Current job	Percentage
Managers	0.016
White-collar	0.009
Blue/Grey-collar	0.005

(Sources) IDA data merged with data from the Danish Labor Force Survey

Table 4. Working hours: workers with and without top management appointment

	Top Managers	Managers	Managers with top management appointments	White-collar	White-collar with top management appointments	Blue/Grey-collar	Blue/Grey-collar with top management appointments
$\bar{h} = E(h)$	43.39	36.50	42.13	35.06	40.92	32.51	41.46
$sd(h)$	11.87	11.22	10.57	9.90	10.56	12.53	13.36
Proportion exceeding:							
40 hours	0.663	0.340	0.622	0.240	0.559	0.180	0.574
50 hours	0.306	0.102	0.261	0.060	0.210	0.057	0.284
60 hours	0.111	0.033	0.070	0.018	0.066	0.023	0.109
Observations	4,491	28,409	444	31,946	290	103,653	476

(Sources) IDA data merged with data from the Danish Labor Force Survey

Table 5. Top management appointments and working hours

Dependent variable: Top management appointments between t and t+1	(i) **Managers**	(ii) **White- collar**	(iii) **Blue/Grey-collar**	(i)' **Managers**	(ii)' **White-collar**	(iii)' **Blue/Grey-collar**
h/100	0.023***	0.022***	0.011***			
	(0.007)	(0.006)	(0.002)			
$0 < h < 37$				-0.001	-0.002	-0.000
				(0.002)	(0.002)	(0.001)
$h = 37$ (standard hours)				omitted as a reference category		
$38 \leq h \leq 47$				0.005**	0.004**	0.003***
				(0.002)	(0.002)	(0.001)
$h \geq 48$				0.009***	0.006***	0.005***
				(0.002)	(0.002)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,931	26,266	103,072	27,931	26,266	103,072

(Sources) IDA data merged with data from the Danish Labor Force Survey

Notes: The reported coefficients are marginal effects. All regressions control for: Quadratics in age, tenure, experience, and number of children, four education dummies, dummies for gender, cohabiting/marriage and public sector together with industry dummies (12), 2-digit occupation dummies (33), and year fixed-effects. Observations are dropped in regressions if occupation codes are too small or there is no variation in the dependent variable within the occupation code.
*** p < 0.01, ** p < 0.05 and * p < 0.10.

Table 6. Top management appointments in five years

Dependent variable: top management appointments between t and t+5	**Managers**	**White-collar**	**Blue/Grey-collar**
Hours/100	0.083***	0.076***	0.044***
	(0.015)	(0.011)	(0.004)
Observations	17,709	20,114	64,263

(Sources) IDA data merged with data from the Danish Labor Force Survey

Notes: The reported coefficients are marginal effects. All regressions control for: Quadratics in age, tenure, experience, and number of children, four education dummies, dummies for gender, cohabiting/marriage and public sector together with industry dummies (12), 2-digit occupation dummies (33), and year fixed-effects. Observations are dropped in regressions if occupation codes are too small or there is no variation in the dependent variable within the occupation code.
*** $p < 0.01$

Table 7. Top management appointments and usual working hours

Dependent variable: Top management appointment between t and t+1	*1994 - 2010*	*1994 - 2006*	
	(i)	***(ii)***	***(iii)***
	ALL	***ALL***	***Employees with three hours observations***
Managers			
Usual hours/100	0.039***	0.036***	0.087***
	(0.007)	(0.010)	(0.021)
Controls	Yes	Yes	Yes
Observations	31,094	19,201	7,042
White-collar			
Usual hours/100	0.032***	0.025***	0.047**
	(0.007)	(0.008)	(0.020)
Controls	Yes	Yes	Yes
Observations	29,233	16,259	5,118
Blue/Grey-collar			
Usual hours/100	0.015***	0.011***	0.033***
	(0.002)	(0.002)	(0.008)
Controls	Yes	Yes	Yes
Observations	112,360	67,995	14,451

(Sources) IDA data merged with data from the Danish Labor Force Survey

Notes: Usual working hours are the average across hours observations for a given individual. The reported coefficients are marginal effects. All regressions control for: Quadratics in age, tenure, experience, and number of children, four education dummies, dummies for gender, cohabiting/marriage and public sector together with industry dummies (12), 2-digit occupation dummies (33), and year fixed-effects. Observations are dropped in regressions if occupation codes are too small or there is no variation in the dependent variable within the occupation code.
*** $p < 0.01$

Table 8. Internal Promotion and External Recruit (Multinomial logit)

Dependent variable: Top management appointment between t and t+1	**Managers**	**White-collar**	**Blue/Grey-collar**
Appointment within firm (internal promotion):			
Hours/100	0.019***	0.019***	0.008***
	(0.006)	(0.006)	(0.001)
Appointment across firms (external recruit):			
Hours/100	0.005	0.011***	0.004***
	(0.004)	(0.004)	(0.001)
Controls	Yes	Yes	Yes
Observations	26,538	20,392	95,654

(Sources) IDA data merged with data from the Danish Labor Force Survey

Notes: The multinomial logit model has three destinations: not appointed to top management (baseline), top management appointment in current firm (internal promotion), and top management appointment in a new firm (external recruitment). The reported coefficients are marginal effects. All regressions control for: Quadratics in age, tenure, experience, and number of children, four education dummies, dummies for gender, cohabiting/marriage and public sector together with industry dummies (12), 2-digit occupation dummies (33), and year fixed-effects. Observations are dropped in regressions if occupation codes are too small or there is no variation in the dependent variable within the occupation code.
*** $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$.

Table 9. Top management appointments and longest hours among peers

Dependent variable: top management appointment between t and t+1	**Managers**		**White-collar**		**Blue/Grey-collar**	
			Peers: firm-year			
Longest hours among peers	0.006***	0.004*	0.005**	0.004**	0.002***	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Hours/100		0.019**		0.009		0.018***
		(0.010)		(0.009)		(0.003)
Observations	14,691		13,853		36,217	
			Peers: workplace-year			
Longest hours among peers	0.008***	0.006**	0.002	0.000	0.003***	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Hours/100		0.023*		0.020		0.017***
		(0.012)		(0.020)		(0.004)
	11,977		9,515		31,645	

(Sources) IDA data merged with data from the Danish Labor Force Survey

Notes: The reported coefficients are marginal effects. All regressions control for: Quadratics in age, tenure, experience, and number of children, four education dummies, dummies for gender, cohabiting/marriage and public sector together with industry dummies (12), 2-digit occupation dummies (33), and year fixed-effects. Observations are dropped in regressions if occupation codes are too small or there is no variation in the dependent variable within the occupation code.
*** $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$.

Table 10. Top management appointments and nonstandard hours

Dependent variable: top management appointment between t and t+1	**Managers**	**White-collar**	**Blue/Grey-collar**
Evening or Night work	0.004*	0.004**	0.001
	(0.002)	(0.002)	(0.001)
Weekend work	0.002	0.000	0.000
	(0.002)	(0.001)	(0.001)
Hours/100	0.017**	0.019***	0.010***
	(0.007)	(0.006)	(0.002)
Observations	27,931	26,266	103,072

(Sources) IDA data merged with data from the Danish Labor Force Survey

Notes: The reported coefficients are marginal effects. All regressions control for: Quadratics in age, tenure, experience, and number of children, four education dummies, dummies for gender, cohabiting/marriage and public sector together with industry dummies (12), 2-digit occupation dummies (33), and year fixed-effects. Observations are dropped in regressions if occupation codes are too small or there is no variation in the dependent variable within the occupation code.
*** $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$.

Table 11. Top management appointments and desired hours

Dependent variable:						
Top management appointment between t and t+1	**Managers**		**White collar**		**Blue/Grey collar**	
Desired Hours/100	0.028**	0.018	0.040***	0.033**	0.012***	0.005
	(0.011)	(0.014)	(0.013)	(0.015)	(0.004)	(0.004)
Hours/100		0.020*		0.013		0.011***
		(0.012)		(0.012)		(0.003)
Observations	11,002		11,880		41,850	

(Sources) IDA data merged with data from the Danish Labor Force Survey

Notes: The reported coefficients are marginal effects. All regressions control for: Quadratics in age, tenure, experience, and number of children, four education dummies, dummies for gender, cohabiting/marriage and public sector together with industry dummies (12), 2-digit occupation dummies (33), and year fixed-effects. Observations are dropped in regressions if occupation codes are too small or there is no variation in the dependent variable within the occupation code. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$.