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ABSTRACT

Work Meaningfulness and Effort*

Self-determination theory posits that individuals are motivated at work when their inherent psychological needs for competence, autonomy, and relatedness are satisfied. Drawing on this theory, this paper presents a new conceptual model explaining how work meaningfulness influences effort at work. In our model, motivation decreases the disutility of exerting effort and paves the way for experiencing meaningful work, which, in turn, boosts effort. We find empirical support for our model's propositions using new data from the Dutch LISS panel. Specifically, work meaningfulness is positively associated with effort. We also show that self-determination enhances work meaningfulness, especially for individuals experiencing high levels of competence, autonomy, and relatedness. Overall, our findings suggest that satisfying workers' psychological needs from working enhances work meaningfulness, motivation, and effort, providing valuable insights for economic models of effort and productivity.

JEL Classification: J01, J30, J32, J81, I30, I31, M50

Keywords: meaningful work, motivation, non-monetary benefits of work, labor market outcomes, self-determination theory

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1 Introduction

Economists are paying growing attention to work meaningfulness (e.g., Ashraf et al., 2024; Cotofan et al., 2023; Cassar & Meier, 2018; Kesternich et al., 2020; Nikolova & Cnossen, 2020). This development reflects a broader trend seen in policy discussions and increased employer focus on non-monetary aspects of work and employee well-being (e.g., Nurski & Hoffmann, 2022; Hart & Zingales, 2017; Henderson & Van Den Steen, 2015; Cassar and Meier, 2018). Yet, whether and how work meaningfulness influences effort remains a relatively unexplored question in economics. Existing evidence suggests that higher job quality among workers corresponds to increased customer satisfaction, greater company profits, and lower turnover (e.g., Bryson et al., 2017; Bellet et al., 2024; Ifcher et al. 2021; Oswald et al., 2016).¹ Furthermore, work meaningfulness is associated with reduced absenteeism and retirement intentions (Nikolova & Cnossen, 2020). Nevertheless, formal theoretical models that integrate the meaning of work into workers' labor supply decisions remain scarce. This is unfortunate because such models could guide empirical work that helps optimize worker productivity and well-being.

This paper fills this research gap by developing a novel model that directly links meaningful work to effort. We base our model on merging insights from standard labor economics models and Self Determination Theory (SDT) (Ryan & Deci, 2000). SDT suggests that individuals are motivated when their actions align with their personal goals, especially when they experience a sense of self-efficacy (Bandura, 1997). Furthermore, SDT highlights that people's innate personal growth tendencies, and their strive to fulfill their psychological needs for autonomy, competence, and relatedness drive self-motivation (Ryan & Deci, 2000). Satisfying one's autonomy, competence, and relatedness needs from work is a pre-condition for achieving work meaningfulness (Nikolova & Cnossen, 2020). Self-determination theory, is, therefore, key to understanding the working conditions and circumstances that can help

¹ The job satisfaction of workers is also linked to firm value in terms of stock market performance (Edmans, 2011; 2012).

foster motivation and, therefore, work meaningfulness. We argue that a model of work meaningfulness needs to consider that the disutility of effort decreases as motivation increases, making effort less taxing for more motivated individuals. Additionally, self-determination theory introduces a minimum level of motivation required to gain utility from meaningful work. Ignoring this threshold could significantly limit our understanding of how and why work meaningfulness influences workplace behaviors. Based on these considerations, the key propositions of our model are that i) motivation is a precondition for experiencing utility from meaningfulness and ii) workers exert more effort when they experience meaningful work.

While the scholarship on the determinants and consequences of work meaningfulness is growing (e.g., Burbano et al., 2023; Nikolova & Cnossen, 2020; Nikolova et al., 2023; Nikolova et al., 2024), few conceptual models integrate work meaningfulness in standard labor economics models. Several papers (e.g., Burbano et al., 2023; Nikolova & Cnossen) specifically build on SDT (Deci & Ryan, 1985) in their understanding of work meaningfulness and empirically study the association between these psychological needs from work and work meaningfulness but do not offer a formal conceptual model.

Furthermore, several related papers to date offer insights into incorporating *preferences for meaning* in economics models. Specifically, Cassar and Meier (2018), Kesternich et al. (2021), and Schouer et al. (2023) sketch out a standard utility function that, in addition to wages and effort, captures preferences for meaning. Our model is fundamentally different from the preference for meaning framework (e.g., Cassar & Meier, 2018; Kesternich et al., 2021; Schouer et al., 2023), which utilizes a traditional opportunity-cost framework of labor supply, describing individuals as deriving utility from both meaning and income, while also experiencing disutility from effort. In the preference for meaning framework, moreover, effort is fixed and cannot be altered, which is different from our assumption that the cost of exerting effort is decreasing in motivation.

This paper makes two main contributions to the literature. First, it offers a novel model of work meaningfulness, motivation, and effort based on merging insights from SDT and

standard labor economics models. Second, to our knowledge, it is one of the first papers using work meaningfulness measured using the gold-standard Work As Meaning Inventory (WAMI) as part of a nationally representative survey (Bailey et al., 2019; Steger et al., 2012). We also empirically study the determinants and consequences of work meaningfulness and find support for the conjectures arising from our model.

Specifically, consistent with the predictions of our theoretical model, work meaningfulness enhances effort—not only in terms of the actual effort exerted at work but also in beliefs about whether workers should be doing their best at work. Furthermore, we find that low levels of self-determination—comprising the joint satisfaction autonomy, competence, and relatedness—are detrimental to work meaningfulness. At low levels of self-determination, workers cannot experience motivation or work meaningfulness, and thus cannot thrive at work. Conversely, high levels of self-determination contribute positively to experiencing work meaningfulness. Our findings also suggest the threshold for experiencing work meaningfulness exists at the 50th percentile of self-determination.

Our findings suggest that understanding and enhancing work meaningfulness are crucial for improving employee well-being, organizational performance, and overall economic productivity. Our paper's implications highlight the need for integrating SDT into economic models to better capture the factors driving work meaningfulness and its impact on labor markets. Our work lays the foundation for future research explorations beyond the traditional wage-leisure maximization models, offering a more comprehensive and realistic depiction of human behavior (del Rio-Chanona et al., 2023).

2 Literature insights

The burgeoning literature on work meaningfulness² in economics has two main branches. First, *experimental* studies vary task significance across respondents and study the

² Our paper distinctly focuses on meaningfulness, and not on ‘purpose.’ Purpose involves seeing one’s life as having direction and goals aligned with core values. Meaning in life encompasses understanding the broader significance and value of one’s actions and existence and is conceptually more directly linked to self-determination than purpose.

implications for reservation wages or other outcomes. For instance, in certain studies (e.g., Ariely et al., 2008; Chadi et al., 2016; Chandler & Kapelner, 2013; Kesternich et al., 2021; Kosfeld et al., 2017), participants in the control group are either informed or shown that the simple tasks they completed have no practical use—for instance, by destroying the completed work or stating it won't be utilized further. Conversely, participants in the treatment group are told that their output will be preserved and used, or that it will make a difference – e.g., it will help finance student scholarships (e.g., Grant, 2008) or with advancing research (e.g., Kosfeld et al., 2017). Workers who are assigned “significant” tasks are more likely to increase their output compared to the control group (e.g., Chander & Kapelner, 2013; Kosfeld et al., 2017). Typically, the goal of such experimental studies is to elicit respondents’ reservation wages in light of meaningful or meaningless tasks, though the evidence is mixed. Some studies demonstrate that tasks that appear significant elicit a lower reservation wage in some cases (e.g., Ariely et al, 2008; Bäker & Mechtel, 2018; Hu & Hirsch, 2017) but not in others (e.g., Chandler & Kapelner, 2013).

The main advantage of these studies is that they provide causal insights into motivation, effort, productivity, and reservation wages. At the same time, the main downside is that temporary perceptions of task significance are not the same as experiencing work meaningfulness in one’s job. The psychology literature clearly distinguishes the “meaning” and “meaningfulness” of work (Rosso et al., 2017). In the context of work, meaning is the result of having understood the importance or interpretation of a work activity. It is about grasping what an activity represents or how it fits into a larger pattern or purpose. For instance, a person might find meaning in work by recognizing how their daily tasks contribute to broader organizational goals. Perceptions of meaning are person-specific but are shaped by the work environment as well, typically by peers and colleagues (Wrzesniewski et al., 2003).

In contrast, "meaningfulness" concerns the *amount* of personal significance, worth, or value that work tasks and activities hold for the individual. It is about the depth of impact that work has on a person's life, often providing a sense of fulfillment, satisfaction, or purpose. Work is meaningful when it deeply resonates with one's values or desires, providing a feeling

that what one is doing is worthwhile. Experimental studies thus manipulate one aspect of work meaning, namely, *job meaning*, which relates to the task content and interpreted value of the task (Wrzesniewski et al., 2003). In short, "meaning" is about understanding the significance of the work, while "meaningfulness" is about the personal value and overall fulfillment derived from the work.

Furthermore, as Nikolova and Cnossen (2020) and Burbano et al., (2023) argue, work meaningfulness stems from the satisfaction of one's own innate needs for competence, autonomy, and relatedness, given the overall working conditions offered by the employer. Therefore, as pointed out by Bäker and Mechtel (2018), it is unclear whether experimental conditions are sufficiently realistic in painting an overall work environment and whether task significance can be induced by destroying or not destroying the created output.

The economics literature on work meaningfulness is much smaller compared to the job meaning and task significance scholarship outlined above. First, Nikolova and Cnossen (2020) view work meaningfulness as a eudaimonic dimension of work well-being, which is separate but related to affective well-being at work (e.g., engagement or stress at work) and evaluative work well-being (e.g., job satisfaction). Borrowing insights from SDT, Nikolova and Cnossen (2020) explore the role of autonomy, competence, and relatedness in enhancing work meaningfulness, demonstrating that these intrinsic factors significantly contribute to perceptions of work meaningfulness, while extrinsic factors like income and performance pay play a lesser role. The analysis utilizes data from the European Working Conditions Survey and reveals that meaningful work correlates with reduced absenteeism, higher participation in training, and a tendency to delay retirement. The paper advocates integrating the concept of meaningful work into economic models, arguing that it provides crucial insights into labor market behaviors and the structuring of work environments. The main shortcomings of the study are the lack of a panel dataset and the measurement of work meaningfulness based on just two items capturing fulfillment and greater good motivations.

Another paper grounded in SDT is Burbano et al., (2023), which investigates the gender gap in perceptions of meaningful work using a comprehensive dataset from Sweden. The

authors integrate nationally representative survey data with extensive administrative records, highlighting a pronounced and increasing trend where women perceive their work as more meaningful than men. The study identifies a strong link between occupations characterized by high levels of beneficence and the perception of meaningful work, with such roles predominantly occupied by women, suggesting that the nature of work significantly contributes to the gender disparity in job meaningfulness. Their findings underscore the potential of meaningful work to act as a compensating differential in the labor market, particularly in lower-paid positions, suggesting that work meaningfulness could play a vital role in reducing the gender wage gap.

Furthermore, Dur and van Lent (2018) examine the determinants of having a socially useless job, an aspect of greater good motivations, in a sample of 47 countries and over 100,000 workers. They find that approximately 8% of workers consider their jobs socially useless, with variations across countries, sectors, and occupations. The study also highlights that workers who deem their jobs as socially useless report lower job satisfaction.

Two other studies – based on time-use data – also explore work meaningfulness in a non-experimental setting. Specifically, Kaplan and Schulhofer-Wohl (2018) examine how the nonpecuniary aspects of work, including meaningfulness, have evolved in the United States from 1950 to the present, using data from the American Time Use Survey and other sources. They find that low-educated women experience their work as more meaningful and happier. However, higher-educated women and men have seen a decline in work meaningfulness and happiness. The study highlights significant differences across gender, education levels, and race, driven by major shifts in occupational structures over time. Finally, Wolf et al. (2022) examine the experienced well-being of employed and unemployed workers using data from the German Socio-Economic Panel Study (SOEP-IS) for 2012 - 2015. The study employs the Day Reconstruction Method (DRM) to assess daily activities and uses both evaluative (life satisfaction, job satisfaction) and experiential (P-index) measures of well-being. The main findings indicate that while the unemployed experience more pleasurable minutes in their day

due to the absence of work-related activities, employment provides a sense of meaningfulness that significantly contributes to overall well-being.

Despite the great strides to better understand the formation (e.g., Cotofan et al., 2021) and determinants of work meaningfulness in economics (e.g., Burbano et al., 2023; Dur & van Lent, 2018; Nikolova et al., 2023; Nikolova et al., 2024), several research gaps remain. First, no study in economics to date has used the Work As Meaning Inventory (WAMI), which is the gold standard for measuring work meaningfulness. Second, the predictive power of work meaningfulness for labor market behaviors is not fully understood beyond the few outcomes that Nikolova and Cnossen (2020) have studied. Third, the literature based on *work meaningfulness* has no formal conceptual model concerning SDT, on which it is based (e.g., Burbano et al., 2023; Nikolova & Cnossen, 2020).

This paper adds to the literature by closing these three knowledge gaps. Building on the conceptual framework of self-determination theory and related research on work meaningfulness, as well as analyses based on new empirical data, we propose a structured framework that integrates motivation, meaning, and utility. This model aims to advance the understanding of meaningful work within the field of labor economics and provide a basis for further research.

3 Conceptual framework: labor supply, effort, and motivation

3.1 A model of motivation and meaning

Standard neoclassical labor supply models view work effort as a disutility because it implies foregone leisure. Individuals will therefore work an additional hour if the compensation w is high enough to outweigh their disutility of exerting effort e . This ‘opportunity-cost view’ of work assumes that employees only care about the monetary returns from work, and can only be motivated by extrinsic rewards, such as income and benefits. In contrast, SDT posits that humans are motivated if they feel that their actions directly impact

their personal goals, i.e., when they experience self-efficacy (Bandura, 1997, Deci & Ryan, 2000).

We propose a simple theoretical framework that incorporates SDT into utility theory. As such, our framework differs from the preferences for meaning framework, first outlined in Cassar and Meier (2018) and then in Kesternich et al. (2021) and Schower et al. (2023). Unlike the preferences for meaning framework, which assumes that effort is fixed, we assume that the disutility of effort decreases as motivation increases. Furthermore, unlike the preferences for meaning framework, our model includes a minimum threshold of motivation necessary to exert any effort and gain utility from meaningful work. Finally, in the preferences for meaning framework, workers have different likings for meaning and if these preferences are low, workers do not derive any meaning from work. In contrast, our model does not view work meaningfulness as a preference, but as the result of the satisfaction of the innate psychological needs from work related to autonomy, competence, and relatedness.

Like Cassar and Meier's preferences for meaning model (2018), in our framework, a worker's utility function U depends on three arguments: utility from income Y , utility from meaning M , and utility from leisure, which negatively enters the model as the cost of exerting effort C . Income Y is a function of wages w and effort e with decreasing marginal returns to effort. In this model, workers endogenously choose an effort level that equalizes the marginal benefits from income and meaning, and the marginal costs of exerting effort.

We treat effort and motivation as two inputs in the utility function that underlies the individual's labor supply decision, where motivation is a vector a of the satisfaction of the three psychological needs competence, relatedness, and autonomy.³ *Autonomy* in SDT refers to the degree to which a person feels their behavior is self-chosen and self-endorsed. It emphasizes acting with a sense of volition and having the freedom to make choices that align with one's interests and values. Furthermore, *competence* is about having a sense of efficacy and mastery

³ Mathematically, the vector a can consist of all combinations of levels of competence, relatedness, and autonomy, including those where workers experience no autonomy, but experience relatedness, and competence. Theoretically, all needs need to be fulfilled at a minimum level to lead to self-determination (Ryan & Deci, 2000).

in one's actions. It refers to the feeling that one is capable of what one does and can effectively accomplish projects and achieve goals. Finally, *relatedness* refers to the need for connection with others (Deci & Ryan, 2000). It emphasizes the importance of forming meaningful relationships and feeling a sense of attachment to other individuals, such as colleagues, clients, and superiors. When individuals experience a supportive social environment that fosters a sense of connectedness, they are more likely to thrive and exhibit optimal functioning and health.

We assume that motivation is formed through the interplay between the work environment offered by the employer and the person-specific needs for autonomy, relatedness, and competence. For instance, an employer might grant equal levels of autonomy to all employees, but individuals may interpret these differently, depending on their desire for and understanding of working independently. We assume that the psychological needs of workers are fixed over time,⁴ and that employers can create an environment in which employees' needs are satisfied. Employers' increased investment in relatedness in the workplace by fostering stronger collegiality, for example, will increase motivation a , but the size of this increase will differ between workers.

More formally, we introduce a cost-of-effort function that is related to both motivation (a) and effort (e). In standard utility theory, the disutility of work is always increasing in effort. We argue that when people are motivated, they have a decreasing disutility of effort. Motivation also reduces the reservation wage, as workers receive utility from contributing to the end goal in a meaningful way. Therefore, motivated individuals experience a lower trade-off between work and leisure. As such, the cost function $C(e, a)$ is characterized by diminishing returns to motivation, such that $\frac{dC}{da} < 0$. Conversely, the cost of exerting effort is massive at low levels of motivation (i.e., amotivation) and the marginal benefit of motivation reduces with effort, and will therefore have decreasing returns, such that $\frac{d^2C}{da^2} > 0$.

⁴ Martela et al. (2021; 2024) provide empirical evidence that the average values of autonomy, competence, and relatedness vary little over short periods. Nevertheless, future research should investigate the temporal stability of the self-determination variables.

The other element in the cost function is effort e . Although the initial effort is costly, the marginal cost of extra effort diminishes ($\frac{dC}{de} < 0$ and $\frac{d^2C}{de^2} > 0$). In our model, both motivation and effort are constrained: a worker's ability to exert effort is not limitless. This is reflected by $e < E$, where E stands for the “burn-out level of effort.” Similarly, motivation is capped at a level A , which is the level of complete autonomous motivation that requires no extrinsic rewards (e.g., income). In this scenario, individuals do not need high monetary compensation to be motivated, even though they can still get utility from income. We formalize this constraint as $a < A$.

Furthermore, we argue that work meaningfulness is only possible when the psychological needs of competence, relatedness, and autonomy are fulfilled, such that individuals experience motivation and self-efficacy, which lead to the ability to derive meaningfulness from work (Ryan & Deci, 2000). This is in line with the empirical findings of Nikolova and Cnossen (2020), who show that the preconditions for motivation – autonomy, competence, and relatedness – are stronger predictors of meaningful work compared with objective working conditions, such as income and performance pay. Therefore, we conceptualize work meaningfulness M as a function of motivation a . The building blocks of our model give rise to the following utility function:⁵

$$U = Y(w, e) + M(a) - C(e, a) \tag{1}$$

where, as in Cassar and Meier (2018), $Y(w, e)$ is the utility from income as a means to consumption, which consists of monetary rewards (e.g., income and performance pay) w received for a certain level of effort e . In this setting, effort can reflect working hours or the intensity of work, for example.⁶ Income is positively related to exerted effort, but with

⁵ Note that the standard utility function takes the form $U(e)=Y(w,e) - C(e)$, where effort e increases with income, but due to the assumption of effort as a cost, effort decreases utility.

⁶ Effort is conceptually different from productivity, as each person has a different level output for the same level of effort. Therefore, our simple model could be extended to include in Y a personal productivity parameter that determines the marginal output of extra effort.

diminishing returns such that $\frac{dY}{de} > 0$ and $\frac{d^2Y}{de^2} < 0$. Workers will maximize utility by endogenously choosing an effort level e , taking into account their level of motivation a .⁷ Consequently, motivation will increase effort through the decreased cost of exerting effort. If a increases, then $C(e, a)$ decreases, and thus the worker will increase their optimal level of effort e . This gives rise to the empirical prediction that individuals who experience more work meaningfulness because they have fulfilled their basic psychological needs from work should exert more effort in their jobs. This leads to the first hypothesis:

H1: Higher levels of work meaningfulness are associated with higher effort levels.

⁷ In contrast, the preferences for meaning framework assumes that workers choose their effort level based on the wage (e.g., see Kesternich et al., (2021)).

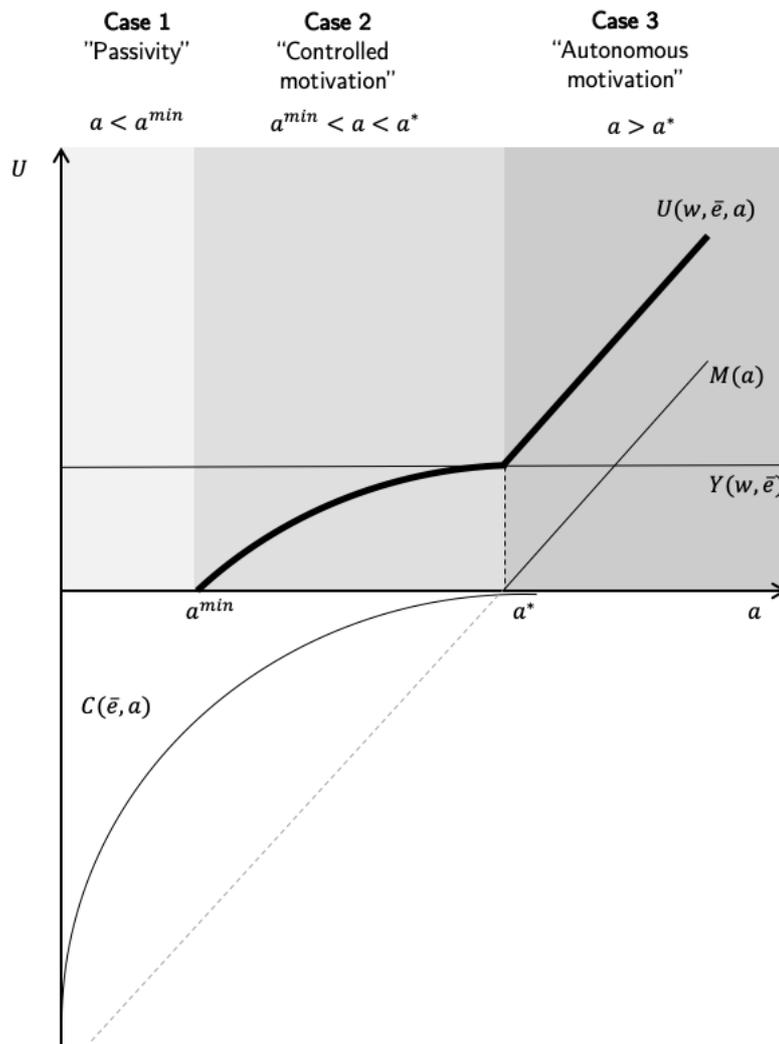


Figure 1 Graphical representation of the model of work meaningfulness

3.2 States of motivation

Next, building on Ryan and Deci (2000), we model the different states of motivation, namely, *amotivation* (passivity), *controlled motivation*, and *autonomous motivation*. Figure 1 graphically represents these states in light of the functions for meaning M , income Y , and cost C , as well as total utility U . In the graph, the level of effort is fixed, to facilitate the discussion. This allows us to derive behavioral consequences related to achieving work meaningfulness given different levels of motivation, which arise in the interplay of workers'

needs and the working conditions that employers offer, and thus allows for drawing recommendations for employer policies.

First, we argue that for each worker, there is a threshold a^{min} reflecting the minimum level of motivation necessary to provide any effort and move out of passivity. This happens from the point where $Y(w, e) \geq C(e, a)$, whereby the utility of income outweighs the costs of exerting effort. From this break-even point onward, people choose to supply labor. Individuals with a motivation below this level a^{min} will not supply labor and will have a utility of 0.⁸ They are in a state of amotivation, or passivity.

Second, workers who attain the level a^{min} are *extrinsically* motivated by the wage they receive, as the utility of income outweighs the costs of exerting effort. Graphically, this is represented in Figure 1 by the fact that the horizontal Y function⁹ lies above the U function, as determined by the decrease in the utility of wages by the disutility of exerting effort. In this stage, workers are unable to derive utility from meaning, even though their costs of effort decrease when motivation does. Third, we define a threshold level of motivation a^* , whereby workers can derive meaning from their work. Reaching a^* , the point of autonomous motivation, requires the full satisfaction of the needs for autonomy, relatedness, and competence.

In Figure 1, the transition between these states of motivation is graphically represented by the movement from amotivation $a < a^{min}$ to passive compliance/extrinsic motivation ($a^{min} < a < a^*$), to active personal commitment ($a \geq a^*$). The point a^* must differ from a^{min} as the innate needs for autonomy, competence, and relatedness must be at least minimally satisfied to trigger some form of action and move out of passivity, but this minimum level is not enough to additionally derive utility from it through the channel of meaning. The threshold of a^*

⁸ Empirically, we only observe workers, who by definition have $a > a^{min}$, which is a necessary condition for supplying labor. Nevertheless, other work highlights the absence of motivation for unemployed workers and argues for active labor market policies that provide circumstances to experience basic psychological needs for active participation. One such study shows that increasing motivation in unemployed workers increases their job search behavior (van der Vaart et al., 2020).

⁹ Note that in the current description of the states of motivation, effort e is fixed. In the full model, where both a and e vary, higher motivation will lead to more effort, and thus to a higher income.

denotes the minimum level of motivation needed to start deriving utility from meaning, after the needs of autonomy, competence, and relatedness are fully satisfied. These considerations give rise to the following piece-wise utility function describing the progression along the states of motivation:

$$U = \begin{cases} 0 & \text{if } a < a^{\min} \\ Y(w, e) - C(e, a) & \text{if } a^{\min} \leq a \leq a^* \\ Y(w, e) + M(a) - C(e, a) & \text{if } a \geq a^* \end{cases} \quad (2)$$

The model demonstrates how different states of motivation affect the experience of work meaningfulness. Importantly, motivation is not fixed over time and is subject to changing policies at the firm level, such as the introduction of a working-from-home policy, providing training, or organizing social events. Such policies can have different impacts on the experienced levels of motivation resulting in varying levels of effort throughout the employment duration, regardless of any firm or occupational switches.¹⁰

Our model highlights how varying levels of motivation lead to different experiences of work meaningfulness, showing that this heterogeneity may be due to differences in work motivation, which can prevent some individuals from deriving utility from meaning. Specifically, when motivation is below a^* deriving utility from meaning is impossible. Based on the insights outlined above, we test the following hypotheses:

H2: Low levels of autonomy, competence, and relatedness, are associated with low work meaningfulness levels.

Conversely,

H3: At high levels of experienced autonomy, competence, and relatedness, workers experience more motivation, and therefore experience more work meaningfulness.

¹⁰ Potentially, changing motivation could trigger job quits or occupational switches, which is an empirical question that future research should investigate.

4 Empirical framework

To investigate the influence of work meaningfulness on employee effort and workers' belief in consistently doing their best at work (i.e., test H1), we estimate:

$$Y_i = \beta_0 + \beta_1 W_i + X_i \gamma + \epsilon_i \quad (5)$$

where Y_i represents the dependent variables for each individual i , specifically self-reported effort and the belief that employees should always be doing their best at work. Furthermore, W_i denotes work meaningfulness, measured using the Work and Meaning Inventory (WAMI). X_i is a vector of control variables, which includes age, biological sex, marital status, presence of children in the household, urban versus rural residence, education, income, self-employment status, occupation, working hours, public employee status, permanent contract status, and tenure. Both dependent variables and the WAMI are standardized to have a mean of 0 and a standard deviation of 1.

To test H2 and H3 we estimate the following equation:

$$W_i = \beta_0 + \beta_1 A_i + \beta_2 C_i + \beta_3 R_i + X_i \gamma + \epsilon_i \quad (6)$$

where A , C , and R relate to autonomy, competence, and relatedness, and the rest of the variables are defined in Equation (5). We create indicator variables denoting whether respondents belong to each of the following percentiles – bottom 10th, 20th, 30th, 40th percentiles, 50th percentile or higher, or the top 60th, 70th, 80th, 80th, and 90th percentiles of each of the self-determination variables autonomy, competence, and relatedness perceptions, respectively. In alternative specifications, we also test whether respondents belong *simultaneously* to each of the percentiles (10th percentile to the 90th percentile) of autonomy, competence, and relatedness in a single dummy variable.

We estimate Equations (5) and (6) using OLS and we offer results with the exogenous controls only or the full set of controls.

5 Data and variables

The dataset we use is based on Nikolova (2024), which was collected as part of the Dutch LISS panel study.¹¹ The dataset includes working respondents in the LISS (2525 respondents, response rate of 73.3%) in April-May, 2023. The LISS panel generally reflects the demographic composition of the Dutch population. For this survey, the data provider CenterData selected all actively employed panel members, ensuring that the sample broadly represents the Dutch working population. The dataset is a single cross-section, even though it was collected as part of a panel study. We hope that this paper will inspire longitudinal data collection efforts.

We adjust the analysis sample as follows: we exclude those with a non-working status as of May 2023 (16 individuals), respondents with missing information on the WAMI, autonomy, competence, or relatedness variables (325 respondents), 40 individuals who are 67 or older, and 2 respondents who reported that they are reaching normal retirement age and are aged 66 and older. The final sample comprises 2,142 respondents.

We measured work meaningfulness using Steger et al.'s (2012) Work As Meaning Inventory (WAMI). The Appendix contains the wording of all items. The WAMI captures work meaningfulness through three interrelated dimensions: positive meaning, meaning-making through work, and greater good motivations. The first dimension (positive meaning) captures the intrinsic value of work, recognizing the personal significance and worth individuals find in their work tasks, reflecting a deep-seated sense of purpose. The second dimension (meaning-making through work) explores the role of work in an individual's life, specifically how work contributes to broader personal and existential goals, facilitating self-understanding and growth. Finally, the WAMI considers the altruistic impact of work, focusing on motivations that extend beyond personal benefit to contribute positively to society at large. Collectively, these dimensions provide a comprehensive view of how work can be a profound source of

¹¹ The dataset is available free of charge on the website of the LISS data archive: <https://www.dataarchive.lissdata.nl/study-units/view/1474>.

meaning, which is instrumental in promoting employee satisfaction and enhancing organizational outcomes.

To create the WAMI, we first computed the three sub-indices using polychoric principal component analysis (Olsson, 1979). We report the correlation coefficients between all items comprising the WAMI scale in Table A1. These correlations are moderately high (around 0.4) to high (above 0.7). The Cronbach's α for the items comprising the positive meaning sub-scale is 0.89, that for the items comprising the meaning-making through work sub-scale: 0.85, and that for the greater good motivations – 0.92. Figure 2 shows the distribution of the WAMI and its sub-components.

We measure autonomy, competence, and relatedness using variables from the Work and Schooling – LISS Core Study, Wave 16, which we merged with the Nikolova (2024) dataset. Specifically, we measure autonomy using the item: “There is very little freedom for me to determine how to do my work,” on a 1-4 disagree-agree scale, which we reverse-code, and we subsequently standardize to have a mean of 0 and standard deviation of 1.

Competence is a composite index, combined using polychoric principal component analysis, based on two variables: respondents reporting that their i) education level and ii) skills and knowledge are approximately at the level required by their work. The Cronbach's $\alpha = 0.92$. We standardized the variables before including them in the index. The index itself is also standardized.

Relatedness is based on two items – respondents stating that they get the appreciation they deserve at work and that they get sufficient support as related to work in difficult situations, Cronbach's $\alpha = 0.73$.

We make use of two dependent variables. First, effort is measured on a scale of 0 to 100 based on the question “How much are you currently putting into your main paid job?” and it is standardized to have a mean of 0 and a standard deviation of 1. Furthermore, *Doing best work* is based on the statement *Employees should always try to do their best at work*, measured on a 5-point agree-disagree scale, and standardized to have a mean of 0 and standard deviation of 1. This variable elicits attitudes towards effort at work, not effort per se.

We use standard socio-demographic controls and their summary statistics are reported in Table 1. We combined our survey data with additional information from the Work and Schooling LISS Core Study Wave 16. Specifically, we sourced information on occupation, job satisfaction, tenure (number of years with the same employer), a permanent/non-permanent contract, public/private employee, and working hours.

We also made use of the Personality data file (study cp22n) and the Big-5 personality traits (variables cp22n020 - cp22n069) based on Goldberg's IPIP scale (Goldberg, 1992) collected in May and June 2022, which is the most recent information available.

Figure 2: Histograms of WAMI and its sub-scales

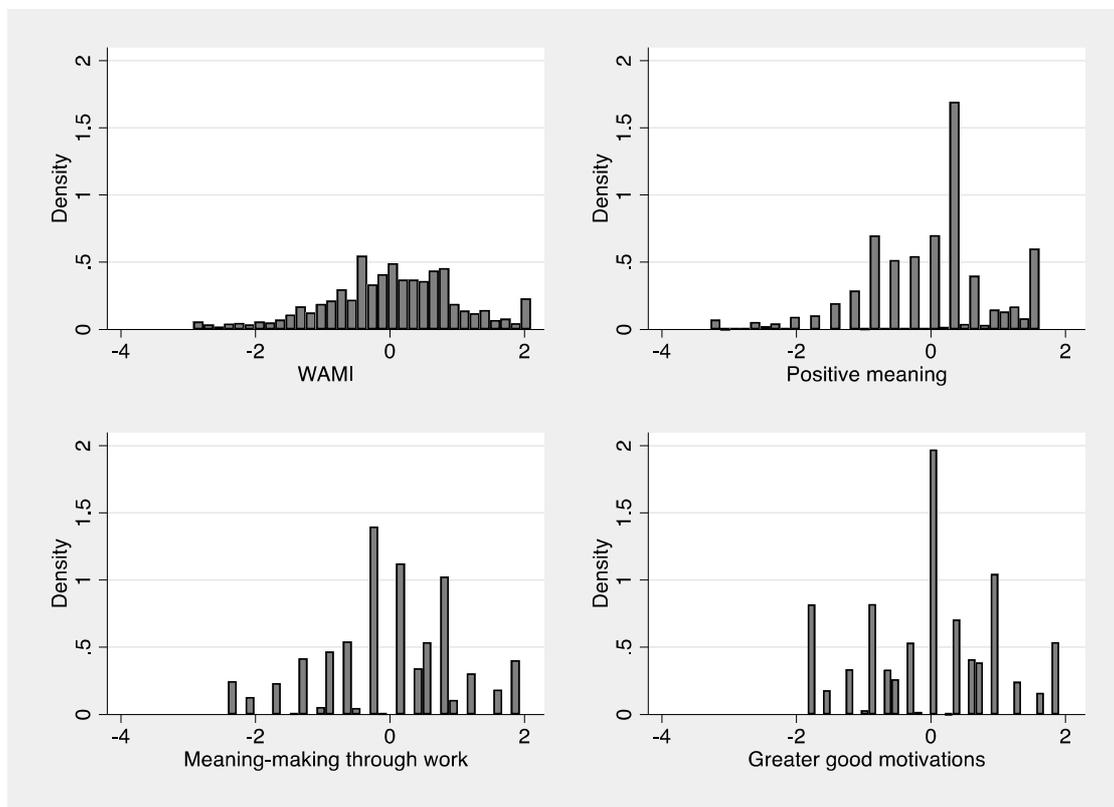


Table 1: Summary statistics, analysis sample

Variable	Mean	Std. Dev.
Effort	0.000	1.000
Best work	0.000	1.000
Work meaningfulness	0.000	1.000
Positive meaning	0.000	1.000
Meaning-making through work	0.000	1.000
Greater good motivations	0.000	1.000
Autonomy	0.002	0.995
Competence	0.000	1.000
Relatedness	0.000	1.000
Age	46.796	12.249
Biological sex		
Female and "other"	0.497	0.500
Male	0.503	0.500
Marital status		
Not married (single, divorced/separated, widowed)	0.483	0.500
Married	0.517	0.500
Children in household		
No children	0.537	0.499
One or more children	0.463	0.499
Urbanity		
Non-urban	0.504	0.500
Urban	0.495	0.500
No information	0.001	0.031
Higher education		
No	0.481	0.500
Yes (WO and HBO)	0.514	0.500
No information	0.005	0.068
Personal net income tertile		
Poorest	0.307	0.461
Middle	0.317	0.465
Richest	0.317	0.465
No information	0.060	0.237
Employee status		
Self-employed	0.099	0.298
Employee	0.901	0.298
Profession		
Advanced Academic/Professional (Architect, Physician, Scholar)	0.144	0.351
Senior Management (Manager, Director, Company Owner)	0.098	0.297
Intermediate Professional (Teacher, Artist, Nurse)	0.299	0.458

Mid-Level Supervisory/Commercial (Department Manager, Shopkeeper)	0.118	0.323
Clerical and Support Work (Administrative Assistant, Accountant)	0.185	0.388
Skilled Manual Work (Car Mechanic, Foreman)	0.059	0.235
Semi-Skilled Manual Work (Driver, Factory Worker)	0.061	0.240
Basic Manual Labor (Cleaner, Packer) and Agricultural Work (Farm Worker, Farmer)	0.036	0.187
Working hours		
Less than 30 hours per week	0.334	0.472
31-40 hours per week	0.501	0.500
>40 hours per week	0.165	0.371
Public employee		
Not a public employee	0.561	0.496
Public employee	0.341	0.474
Missing information	0.098	0.297
Permanent contract		
Yes	0.824	0.381
No	0.176	0.381
Number of years with the employer		
1 year or less	0.139	0.346
2-5 years	0.263	0.441
6 or more years	0.596	0.491
Missing information	0.002	0.048

Note: N=2,142

Table 2 details the main determinants of work meaningfulness, as measured by the WAMI scale. Model (1) includes autonomy, competence, and relatedness and a set of exogenous controls. The rest of the models sequentially add controls – Model (2) adds personal characteristics and occupation fixed effects, Model (3) augments the specification with work controls, Model (4) adds the personality traits, and Column (5) excludes the personality traits but includes a job satisfaction control.

All in all, competence and relatedness are rather robust predictors of work meaningfulness, whereby, based on the preferred specification (3), one standard deviation in relatedness is associated with a 24% of a standard deviation increase in work meaningfulness, which is sizeable. Meanwhile, a one standard deviation in competence and autonomy corresponds to a 6.4% and 4.6% standard deviation rise in work meaningfulness, respectively. The coefficient estimate for autonomy drops in magnitude and loses its significance when we

add personality controls in Model (4), implying that perceptions of autonomy are partially capturing personality differences. This suggests that certain personality traits may mediate the relationship between perceived autonomy and the sense of finding work meaningful. As such, personality characteristics could potentially buffer or enhance the perceived value of autonomy in contributing to job satisfaction and overall work meaningfulness. These results are broadly in line with the findings of Nikolova and Cnossen (2020).

Age appears to be unassociated with work meaningfulness, suggesting that workers of all ages experience similar levels of work meaningfulness. Like Nikolova and Cnossen (2020) and Burbano et al. (2023), we find that women find their jobs more meaningful compared with men. Those with a tertiary education find their work more meaningful compared to their less educated counterparts. Marital status, having children, living in an urban area, income, self-employment, having a permanent contract, and tenure do not seem to matter for experiencing work meaningfulness, meanwhile. However, working less than 30 hours and more than 40 hours are both associated with higher work meaning, and so is being a public employee, and having a skilled occupation.

Table 2: The determinants of work meaningfulness

	(1)	(2)	(3)	(4)	(5)
	Work meaningfulness	Work meaningfulness	Work meaningfulness	Work meaningfulness	Work meaningfulness
Autonomy	0.064*** (0.024)	0.046** (0.023)	0.046** (0.022)	0.025 (0.024)	0.040* (0.023)
Competence	0.126*** (0.021)	0.064*** (0.020)	0.064*** (0.019)	0.101*** (0.020)	0.063*** (0.019)
Relatedness	0.241*** (0.023)	0.235*** (0.022)	0.239*** (0.022)	0.232*** (0.023)	0.234*** (0.022)
Age	-0.008 (0.013)	-0.001 (0.013)	-0.003 (0.013)	0.001 (0.014)	-0.004 (0.013)
Age squared	-0.002 (0.015)	-0.005 (0.015)	-0.004 (0.015)	-0.009 (0.015)	-0.004 (0.015)
Male	-0.124*** (0.041)	-0.105** (0.043)	-0.100** (0.043)	-0.044 (0.047)	-0.096** (0.043)
Married		0.045 (0.042)	0.042 (0.041)	0.020 (0.043)	0.041 (0.041)
Children		0.021 (0.040)	0.014 (0.040)	0.042 (0.042)	0.014 (0.040)
Urban		0.015 (0.040)	0.004 (0.039)	0.002 (0.040)	0.003 (0.039)
Urbanity missing		-0.104 (0.651)	0.058 (0.610)	0.295 (0.545)	0.043 (0.612)
College (WO & HBO)		0.181*** (0.047)	0.153*** (0.047)	0.113** (0.049)	0.153*** (0.047)
No information on education		0.463* (0.251)	0.522** (0.251)	0.609*** (0.226)	0.520** (0.252)
Second income tertile		0.036 (0.053)	0.034 (0.055)	0.027 (0.057)	0.033 (0.055)
Third income tertile		0.091 (0.059)	0.074 (0.061)	0.062 (0.064)	0.069 (0.061)
Income tertile missing		0.137 (0.086)	0.136 (0.086)	0.072 (0.091)	0.134 (0.086)
Non-self- employed		-0.102 (0.068)	-0.081 (0.151)	-0.030 (0.160)	-0.086 (0.150)
Senior Management (Manager,		-0.072	-0.120	-0.154**	-0.119

Director, Company Owner)	(0.077)	(0.075)	(0.077)	(0.075)
Intermediate Professional (Teacher, Artist, Nurse)	0.078 (0.062)	0.026 (0.062)	-0.007 (0.065)	0.026 (0.062)
Mid-Level Supervisory/C ommercial (Department Manager, Shopkeeper)	-0.426*** (0.078)	-0.406*** (0.076)	-0.400*** (0.080)	-0.403*** (0.076)
Clerical and Support Work (Administrativ e Assistant, Accountant)	-0.572*** (0.069)	-0.547*** (0.068)	-0.499*** (0.072)	-0.548*** (0.068)
Skilled Manual Work (Car Mechanic, Foreman)	-0.444*** (0.103)	-0.379*** (0.103)	-0.341*** (0.111)	-0.375*** (0.103)
Semi-Skilled Manual Work (Driver, Factory Worker)	-0.501*** (0.109)	-0.448*** (0.109)	-0.362*** (0.114)	-0.446*** (0.108)
Basic Manual Labor (Cleaner, Packer) and Agricultural Work (Farm Worker, Farmer)	-0.635*** (0.154)	-0.646*** (0.152)	-0.464*** (0.155)	-0.646*** (0.151)
Working hours 31-40		-0.088* (0.047)	-0.088* (0.048)	-0.088* (0.047)
Working hours >40		0.195*** (0.063)	0.172*** (0.065)	0.199*** (0.063)
Public employee		0.300*** (0.045)	0.281*** (0.046)	0.299*** (0.044)

Public employee missing			0.234 (0.170)	0.223 (0.182)	0.227 (0.169)
Non-permanent contract			-0.124 (0.079)	-0.132 (0.085)	-0.121 (0.080)
2-5 years with the same employer			-0.080 (0.065)	-0.073 (0.069)	-0.077 (0.065)
6 or more years with the same employer			-0.062 (0.066)	-0.049 (0.070)	-0.058 (0.066)
Number of years with employer missing			-0.317 (0.290)	-0.213 (0.325)	-0.395 (0.295)
Extraversion				0.058** (0.023)	
Agreeableness				0.106*** (0.026)	
Conscientiousness				0.018 (0.024)	
Emotional stability				0.030 (0.023)	
Imagination				0.078*** (0.024)	
Job satisfaction score 8 or above					0.054 (0.039)
Constant	0.480* (0.282)	0.367 (0.278)	0.430 (0.308)	0.274 (0.326)	0.370 (0.310)
Observations	2,142	2,142	2,142	1,948	2,142
Adjusted R ²	0.117	0.223	0.245	0.273	0.245

Notes: Robust standard errors in parentheses, the reported estimates are based on OLS. The reference categories are: for profession - Advanced Academic/Professional (Architect, Physician, Scholar); for working hours is 0-30 hours, for public employee - non-public employee; for contract type - permanent contract; for tenure - 1 year or less with the employer; for job satisfaction - job satisfaction scores of 7 and below. Work meaningfulness, autonomy, competence, relatedness, and the personality traits (extraversion, agreeableness, conscientiousness, emotional stability, imagination) are standardized.

*** p<0.01, ** p<0.05, * p<0.1

6 Hypotheses tests

We next turn to the tests of H1 - H3 outlined in Section 3 above. Table 3 provides a test of H1, which relates to the consequences of work meaningfulness and motivation vis-à-vis effort. Models (1) and (5) include only the exogenous controls for the models where effort and beliefs about effort are the dependent variables, respectively, and the rest of the models sequentially add controls. Based on our preferred specification, in Models (2) and (6), work meaningfulness predicts a 9% of a standard deviation in effort, and 21% of a standard deviation in belief in doing one's best at work at all times. The predictive power of work meaningfulness is rather substantial, being several times higher than that of personality traits, for example. All in all, work meaningfulness appears to be a stable predictor of effort and opinions about effort, above and beyond the included socio-demographics, work characteristics, personality traits, and the self-determination variables related to autonomy, competence, and relatedness. As such, these results provide strong support for the main hypothesis of our model: work meaning predicts effort.

Furthermore, H2 and H3 relate to our theoretical prediction that at low levels of autonomy, competence, and relatedness, individuals are unable to experience work meaningfulness. We test this in two ways. First, in Table 4, we show the associations between being at the bottom, middle, and top of the distribution of each SDT variable – autonomy, competence, and relatedness. For example, the results in Model (1) of Table 4 suggest that being in the 10th percentile or lower of autonomy is associated with a 24% of a standard deviation decline in work meaningfulness, being at the 10th percent or lower in competence corresponds to a 18% of a standard deviation decline in work meaningfulness, and being in the 10th percentile or lower of relatedness entails a reduction in work meaningfulness of 34% of a standard deviation. The main conclusion of Table 4 is that in line with Hypothesis 2, at low levels of autonomy, as well as competence, and relatedness, workers experience lower levels of meaningfulness. The opposite is true starting at the 50th percentile of each of the self-

determination variables, in line with H 3. Interestingly, being in certain autonomy percentiles (20th, 30th, 40th or below, and 80th or 90th) is unassociated with work meaningfulness, although the coefficient estimates have the expected signs.

Table 5 offers a further test of H2-H3. The main difference between Table 4 and Table 5 is that Table 5 investigates whether respondents belong to the particular percentile of all three self-determination variables simultaneously. The findings reveal that low levels of self-determination are associated with lower levels of work meaningfulness, and only after being at the median level of self-determination provides work meaningfulness benefits. The results in Tables 4 and 5 also identify a minimum threshold level of being at the median level of autonomy, competence, and relatedness beyond which self-determination contributes to motivation, and therefore, to work meaningfulness.

Table 3: Work meaningfulness predicts effort and opinions about doing best work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Effort	Effort	Effort	Effort	Doing best work	Doing best work	Doing best work	Doing best work
Work meaningfulness	0.103*** (0.023)	0.090*** (0.025)	0.069*** (0.027)	0.080*** (0.026)	0.181*** (0.024)	0.213*** (0.025)	0.189*** (0.026)	0.191*** (0.027)
Age	0.022 (0.013)	0.028** (0.014)	0.028* (0.015)	0.030** (0.014)	0.051*** (0.014)	0.034** (0.014)	0.031** (0.015)	0.036** (0.014)
Age squared	-0.034** (0.015)	-0.036** (0.016)	-0.035** (0.017)	-0.037** (0.016)	-0.042*** (0.015)	-0.027* (0.016)	-0.027* (0.016)	-0.030* (0.015)
Male	-0.218*** (0.043)	-0.316*** (0.048)	-0.253*** (0.054)	-0.313*** (0.048)	-0.177*** (0.043)	-0.310*** (0.050)	-0.199*** (0.053)	-0.312*** (0.050)
Married		-0.122*** (0.046)	-0.123** (0.049)	-0.126*** (0.046)		0.012 (0.045)	-0.013 (0.046)	0.006 (0.045)
Children		0.034 (0.045)	0.054 (0.048)	0.035 (0.045)		-0.010 (0.043)	0.017 (0.044)	-0.006 (0.043)
Urban		-0.049 (0.044)	-0.064 (0.046)	-0.048 (0.044)		-0.164*** (0.042)	-0.137*** (0.043)	-0.165*** (0.042)
Urbanity missing		0.238 (0.401)	0.373 (0.398)	0.251 (0.411)		-0.411 (1.493)	-0.313 (1.423)	-0.415 (1.523)
College (WO & HBO)		0.003 (0.052)	-0.020 (0.054)	0.006 (0.052)		-0.216*** (0.051)	-0.209*** (0.051)	-0.206*** (0.050)
No info. on education		-0.517 (0.351)	-0.502 (0.362)	-0.520 (0.346)		-0.309 (0.246)	-0.233 (0.237)	-0.326 (0.246)
Second income tertile		0.104* (0.061)	0.126* (0.064)	0.103* (0.061)		0.102* (0.058)	0.089 (0.058)	0.106* (0.057)
Third income tertile		0.090 (0.070)	0.139* (0.073)	0.087 (0.070)		0.150** (0.068)	0.129* (0.068)	0.144** (0.068)
Income tertile missing		0.059 (0.107)	0.148 (0.116)	0.053 (0.107)		0.082 (0.089)	0.099 (0.086)	0.102 (0.088)
Non-self-employed		-0.177 (0.164)	-0.135 (0.174)	-0.180 (0.165)		0.116 (0.179)	0.001 (0.183)	0.136 (0.178)
Senior Management (Manager, Director, Company Owner)		0.005	0.048	0.004		0.249***	0.204**	0.220**

Intermediate Professional (Teacher, Artist, Nurse)	(0.086) 0.098 (0.065)	(0.091) 0.122* (0.070)	(0.086) 0.100 (0.066)	(0.087) 0.119 (0.079)	(0.089) 0.106 (0.081)	(0.087) 0.118 (0.079)
Mid-Level Supervisory/Commercial (Department Manager, Shopkeeper)	0.108 (0.084)	0.112 (0.088)	0.116 (0.085)	0.198** (0.090)	0.132 (0.093)	0.173* (0.091)
Clerical and Support Work (Administrative Assistant, Accountant)	-0.036 (0.081)	-0.013 (0.085)	-0.035 (0.081)	0.171* (0.089)	0.147 (0.090)	0.141 (0.089)
Skilled Manual Work (Car Mechanic, Foreman)	0.021 (0.120)	0.018 (0.127)	0.025 (0.120)	0.173 (0.122)	0.136 (0.128)	0.176 (0.121)
Semi-Skilled Manual Work (Driver, Factory Worker)	0.075 (0.123)	0.105 (0.128)	0.079 (0.124)	0.201* (0.120)	0.237* (0.124)	0.197 (0.121)
Basic Manual Labor (Cleaner, Packer) and Agricultural Work (Farm Worker, Farmer)	0.117 (0.143)	0.149 (0.149)	0.129 (0.146)	0.337** (0.138)	0.345** (0.144)	0.295** (0.139)
Working hours 31-40	0.117** (0.055)	0.127** (0.057)	0.116** (0.055)	0.077 (0.052)	0.086 (0.053)	0.067 (0.052)
Working hours >40	0.345*** (0.073)	0.366*** (0.076)	0.349*** (0.073)	0.329*** (0.075)	0.311*** (0.077)	0.338*** (0.075)
Public employee	-0.015 (0.050)	-0.035 (0.053)	-0.011 (0.050)	-0.074 (0.050)	-0.072 (0.051)	-0.069 (0.050)
Public employee missing	-0.298 (0.186)	-0.329* (0.196)	-0.289 (0.187)	0.157 (0.204)	0.033 (0.208)	0.146 (0.203)
Non-permanent contract	-0.008 (0.081)	0.047 (0.085)	-0.007 (0.082)	-0.102 (0.094)	-0.069 (0.094)	-0.093 (0.093)
2-5 years with the same employer	-0.038	-0.010	-0.038	0.042	-0.012	0.064

		(0.068)	(0.074)	(0.068)		(0.077)	(0.076)	(0.077)
6 or more years with the same employer		-0.109	-0.078	-0.108		0.092	0.026	0.132*
		(0.069)	(0.074)	(0.070)		(0.074)	(0.073)	(0.074)
Number of years with employer missing		-1.080**	-1.032**	-1.055**		-0.417	-0.294	-0.340
		(0.513)	(0.473)	(0.515)		(0.357)	(0.349)	(0.342)
Extraversion			-0.003				0.002	
			(0.004)				(0.004)	
Agreeableness			0.020***				0.017***	
			(0.005)				(0.005)	
Conscientiousness			0.002				0.031***	
			(0.005)				(0.005)	
Emotional stability			-0.011***				0.003	
			(0.003)				(0.004)	
Imagination			0.004				-0.011**	
			(0.005)				(0.005)	
Autonomy				-0.018				0.047*
				(0.023)				(0.025)
Competence				0.017				-0.053**
				(0.023)				(0.021)
Relatedness				0.032				0.077***
				(0.024)				(0.025)
Constant	-0.120	-0.209	-0.885**	-0.237	-1.288***	-1.085***	-2.417***	-1.156***
	(0.279)	(0.331)	(0.419)	(0.334)	(0.307)	(0.356)	(0.433)	(0.355)
Observations	2,142	2,142	1,948	2,142	2,142	2,142	1,948	2,142
Adjusted R ²	0.041	0.058	0.069	0.058	0.058	0.095	0.131	0.104

Notes: Robust standard errors in parentheses, the reported estimates are based on OLS. The dependent variables are effort (originally measured on a 0-100 scale and standardized to have a mean of 0 and standard deviation of 1), and best work is measured using the statement "Employees should always try to do their best at work", originally measured on a 5-point agree-disagree scale, and normalized to have a mean of 0 and standard deviation of 1. Work meaningfulness, autonomy, competence, relatedness, and the personality traits (extraversion, agreeableness, conscientiousness, emotional stability, imagination) are standardized. The reference categories are: for profession - Advanced Academic/Professional (Architect, Physician, Scholar); for working hours is 0-30 hours, for public employee - non-public employee; for contract type - permanent contract; for tenure - 1 year or less with the employer; for job satisfaction - job satisfaction scores of 7 and below. *** p<0.01, ** p<0.05, * p<0.1

Table 4: The association between different levels of autonomy, competence, relatedness, and work meaningfulness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	10th percentile or below	20th percentile or below	30th percentile or below	40th percentile or below	50th percentile or above	60th percentile or above	70th percentile or above	80th percentile or above	90th percentile or above
Autonomy XXth percentile	-0.242*** (0.054)	-0.052 (0.046)	-0.052 (0.046)	-0.011 (0.047)	0.204*** (0.054)	0.206*** (0.054)	0.206*** (0.054)	0.053 (0.046)	0.023 (0.047)
Competence XXth percentile	-0.175*** (0.044)	-0.146*** (0.043)	-0.146*** (0.043)	-0.143*** (0.040)	0.084** (0.040)	0.100** (0.039)	0.100** (0.039)	0.107*** (0.039)	0.140*** (0.039)
Relatedness XXth percentile	-0.341*** (0.065)	-0.406*** (0.043)	-0.406*** (0.043)	-0.524*** (0.053)	0.398*** (0.043)	0.397*** (0.043)	0.397*** (0.043)	0.423*** (0.043)	0.536*** (0.059)
Constant	0.719** (0.325)	0.734** (0.320)	0.734** (0.320)	1.127*** (0.315)	0.027 (0.323)	0.019 (0.322)	0.019 (0.322)	0.164 (0.320)	0.492 (0.311)
Individual controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,142	2,142	2,142	2,142	2,142	2,142	2,142	2,142	2,142
Adjusted R ²	0.208	0.219	0.219	0.219	0.224	0.225	0.225	0.219	0.215

Notes: Robust standard errors in parentheses, the reported estimates are based on OLS. The dependent variable in all regressions is work meaningfulness, which is standardized to have a mean of 0 and a standard deviation of 1. The controls include age, age squared, biological sex, marital status, children in the household, home ownership, urban/rural residence, college degree, personal income tertile, employee or self-employed status, occupation, working hours, public employee status, permanent contract status, and tenure. Each column denotes the percentile of autonomy, competence, and relatedness, respectively, i.e., whether the individual belongs to the respective percentile of autonomy, the respective percentile of competence, and the respective percentile of relatedness.

Table 5: The association between different combined levels of autonomy, competence, relatedness, and work meaningfulness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	WM	WM	WM	WM	WM	WM	WM	WM	WM
Autonomy, competence, and relatedness at the 10th percentile or below	-0.676*** (0.145)								
Autonomy, competence, and relatedness at the 20th percentile or below		-0.533*** (0.065)							
Autonomy, competence, and relatedness at the 30th percentile or below			-0.533*** (0.065)						
Autonomy, competence, and relatedness at the 40th percentile or below				-0.287*** (0.045)					
Autonomy, competence, and relatedness at the 50th percentile or above					0.265*** (0.040)				
Autonomy, competence, and relatedness at the 60th percentile or above						0.269*** (0.041)			
Autonomy, competence, and relatedness at the 70th percentile or above							0.269*** (0.041)		
Autonomy, competence, and relatedness at the 80th percentile or above								0.226*** (0.064)	
Autonomy, competence, and relatedness at the 90th percentile or above									0.449*** (0.103)
Constant									
Individual controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,142	2,142	2,142	2,142	2,142	2,142	2,142	2,142	2,142

Adjusted R ²	0.184	0.202	0.202	0.191	0.191	0.189	0.189	0.179	0.181
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Notes: Robust standard errors in parentheses, the reported estimates are based on OLS. The dependent variable in all regressions is work meaningfulness, which is standardized to have a mean of 0 and a standard deviation of 1. The controls include age, age squared, biological sex, marital status, children in the household, home ownership, urban/rural residence, college degree, personal income tertile, employee or self-employed status, occupation, working hours, public employee status, permanent contract status, and tenure. Each column denotes the percentile of autonomy, competence, and relatedness, respectively, i.e., whether the individual belongs to the respective percentile of all three elements - autonomy, competence, and relatedness (e.g., whether the respondent's values of autonomy, competence, and relatedness are all at the 10th percentile or below).

*** p<0.01, ** p<0.05, * p<0.1

7 *Discussion and conclusion*

This paper introduces a theoretical model that integrates self-determination theory into standard economic utility models, offering novel insights into the interplay between work meaningfulness and labor dynamics. We find supportive evidence of our model's predictions based on data from the Dutch LISS panel.

Our model postulates the fact that the cost of effort decreases as motivation increases and that workers can experience positive utility from work, as long as they feel motivated. We find that when the psychological needs of autonomy, competence, and relatedness are satisfied, individuals experience increased work meaningfulness. We identify a theoretical threshold a^* of need satisfaction beyond which this occurs, and find empirical evidence for such a threshold to exist at the 50th percentile.

Furthermore, our model predicts that individuals whose needs are met and who can experience work meaningfulness should be willing to exert more effort. We provide evidence that workers who experience meaningful work are willing to exert more effort and are more likely to agree with the normative statement that people *should* exert effort at work.

The implications of these findings are significant for labor economics. They suggest that enhancing employee motivation extends beyond economic incentives. By fulfilling employees' intrinsic psychological needs, organizations can enhance productivity and worker well-being, which could lead to broader economic benefits such as reduced turnover rates, improved employee health, and higher overall productivity.

All in all, this paper makes several contributions to the field of labor economics. Firstly, it introduces a new theoretical model that merges self-determination theory with traditional utility models, highlighting the role of intrinsic psychological needs in enhancing work meaningfulness and motivating effort. This adds more nuance to the traditional view of economic theory that emphasizes direct compensation as the primary motivator for effort. Second, our empirical findings provide robust support for the model, demonstrating that satisfying employees' needs for autonomy, competence, and relatedness significantly

enhances work meaningfulness, which in turn boosts motivation and effort. This suggests a possible paradigm shift in economics in understanding employee motivation and engagement, advocating for a holistic approach that considers both intrinsic and extrinsic factors. These contributions not only enrich academic discourse but also offer practical insights for organizations aiming to foster more meaningful and productive work environments.

Looking forward, the research agenda should explore further the thresholds of self-determination that impact work meaningfulness and effort. Future studies could also examine the applicability of our model across different cultures and economic sectors to validate and potentially expand our findings. Additionally, it would be beneficial to investigate the long-term effects of work meaningfulness on employee retention, providing deeper insights into the dynamics between employee well-being and productivity. Using longitudinal data and tracking work meaningfulness over time are crucial in this respect.

Appendix A

Work as Meaning Inventory (WAMI) questionnaire from Steger et al., (2012). Questions. Q1-Q4 comprise the “positive meaning” sub-scale, Q5-Q7 are the “meaning-making through work” sub-scale, Q8-Q10 form the “greater good motivations”

To what extent do the following statements about you, your work and/or career apply?

Question type: Table

Answer type: Radio buttons

Sub-questions:

Q1 I have found a meaningful career

Q2 I understand how my work contributes to my life’s meaning

Q3 I have a good sense of what makes my job meaningful

Q4 I have discovered work that has a satisfying purpose

Q5 I view my work as contributing to my personal growth

Q6 My work helps me better understand myself

Q7 My work helps me make sense of the world around me

Q8 My work really makes a difference to the world

Q9 I know my work makes a positive difference in the world

Q10 The work I do serves a greater purpose

Categories:

1. 1 Not applicable at all
2. 2
3. 3 Neutral
4. 4
5. 5 Completely applicable

Table A1: Correlations matrix, WAMI items

	Meaningful career	Work contributes to life meaning	Sense of what makes job meaningful	Work has a satisfying purpose	Work contributes to personal growth	Work helps self-understanding	Work helps makes sense of the word	Work makes a difference	Knowledge that work makes a positive difference	Greater purpose of work
Meaningful career	1									
Work contributes to life meaning	0.644	1								
Sense of what makes job meaningful	0.644	0.696	1							
Work has a satisfying purpose	0.671	0.655	0.718	1						
Work contributes to personal growth	0.571	0.596	0.559	0.590	1					
Work helps self-understanding	0.431	0.471	0.421	0.431	0.662	1				
Work helps makes sense of the word	0.402	0.455	0.430	0.399	0.558	0.724	1			
Work makes a difference	0.488	0.477	0.501	0.469	0.458	0.477	0.615	1		
Knowledge that work makes a positive difference	0.491	0.492	0.527	0.489	0.477	0.479	0.587	0.878	1	
Greater purpose of work	0.452	0.478	0.485	0.455	0.472	0.470	0.555	0.737	0.760	1

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