Erasmus University Rotterdam

Erasmus School of Economics

Master Thesis Behavioural Economics

Workability, Productivity & Happiness: The New Trinity?

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Date: August 2018

ABSTRACT

The primary focus of this study has been to identify causal relations between the concepts happiness, productivity and workability. The motivation was the lack of research on the causality and direction of influences within this triangle. Another aim is to show that a worker's happiness isn't a separate goal, next to profit maximization, but merely an integral part of it. Operating with these three aspects in mind will create value for companies in three ways: on a financial level, on a social level and an individual level.

The Lewbel estimator was used on data from surveys conducted by PreventNed (N=4,994). The results suggest that there is a causal relation between workability and productivity and for happiness on workability. For the regressions of Productivity on happiness, happiness on productivity and workability on happiness, causality was only concluded for workers over forty.

Even though not all relations are significant, all three concepts are important for the relations that were found and therefore should be of great interest to companies. A focus on these concepts can improve efficiency, reduce operating costs, improve employability, motivate workers and lower medical expenses. For these reasons ways to influence, measure and control workability, happiness and productivity should be examined and experimented with in the future.

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1. Introduction

An experiment conducted by Dan Ariely shows how happiness can be an important factor for performance of employees. In his experiment, four groups of workers were promised different rewards if they hit their productivity target. One group was offered a voucher for a free pizza, one a $30 cash bonus, one a compliment from the boss and the fourth group was the control group that wasn't promised anything. The result might surprise some "classical" economist and managers: the group that was promised the compliment from the boss turned out to be most productive (Ariely, 2016). As findings like these gain popularity, companies start to focus more and more on the happiness aspect, both of their employees and of their customers (Bhagwat, 2018). For example in Unilever's sustainable living plan one of the goals is to improve the living standard of their farmers. Even Coca-Cola tries to inspire their customers to believe in a better future with "reasons to believe" campaign; because they know: meaningfulness creates happiness (Dujardin, 2014).

The concepts workability and productivity are already without a doubt of great interest to every company seeking to improve or have insight in their efficiency. The two seem undeniably connected and a loss in productivity can cause a company a lot of money. As employees are less able to work, because of physical or emotional issues or exhaustion, they cannot perform as well as they used to or would be able to under better circumstances. Therefore this influences their productivity in a negative way. Lately, with the new insights mentioned above in mind, happiness has earned a spot in this relation as well, making it a triangle of related and inter influencing concepts (figure 1). Theories suggest that happiness can help increase both workability and productivity (Sjögren-Rönkä, Ojanen, Leskinen, Mustalampi, & Mälkiä, 2002; Seitsamo & Ilmarinen, 1997; Hirt, Melton, McDonald, & Harackiewicz, 1996; Amabile, 2005). Moreover, if workers are happy they are less likely to quit their job, absenteeism decreases, accidents are less likely to happen and a company will attract better employees (Böckerman & Ilmakunnas, 2012). This shows that worker's happiness isn't a separate goal, next to profit maximization, but merely an integral part of it. However, it is not completely clear how the three concepts in this triangle interact, and how exactly they influence each other, if at all.

1.1 Relevance

Previous research on interactions between the three concepts have led to ambiguous results; especially with regards to the relationship between happiness and productivity. The relationship between workability and

productivity seems most straightforward and all previous research finds a positive correlation. The relationship between workability and happiness is the least researched and therefore this relationship remains unclear. Both the effect of productivity on the workability index and the effect of happiness on the workability index have not been researched yet. These relationship will be included in this thesis. or all three concepts Based on the previous research, there seems to be a relationship between all three of the concepts, but the direction and the possibility of causality is still missing in the literature and remains to be examined. Therefore, the research question of this thesis is: *"Is there reciprocal causality between the concepts happiness, productivity and workability?"*.

Creating scientific evidence to support this triangle of concepts and emphasize its importance, will make it easier to convince companies to change their strategy, eventually resulting in better results for the company and a happier population. The triangle creates value in three different ways: financial, social and on an individual level. Financially, it will be interesting for companies to know how the three concepts interact exactly as it will make it easier to improve their efficiency. No manager needs to be convinced of the importance of productivity. The operating costs can be lowered and optimized by improving the employability of the workers and thus increasing the efficiency of the company. Ignoring workers' happiness and workability cannot only affect the company financially, but also in spirit. This is the second way the triangle can create value, namely on a social level. Because if the company is affected in spirit, the motivation and employability of the workers will decrease. This is often combined with an increased sense of workload and a higher risk of workers dropping out of the company. Getting insights on the social situation of the workers will prevent and solve these problems, resulting in lower medical expenses, costs for possible turnover, having to search for new suitable workers and having to train them. Thirdly, it will affect workers on an individual level, since it will improve happiness.

Besides that, happy workers, or the "social capital" of a company, have shown to be 33% more profitable, 300% more innovative and have 37% higher sales (Maas, 2016). These are objective findings that show the end results of focusing on the full triangle. The additional value of looking at workability and happiness of workers, next to the more obvious factor productivity, is the subjective data the company obtains. This will provide an opportunity for the company to fix or improve internal problems that might not have affected the sales, or objective outcomes *yet.* In this way managers can be ahead of the problems and stay in control of the situation, and anticipate on possible losses. Thus, keeping an eye on all three dimensions will create and preserve value for a company over time (Maas, 2016). To make the argument more convincing I will

quantify the productivity loss suffered through reduced workability and happiness of workers, if the expected relationship is found.

1.2 Road map

The paper is structured as follows: first, the concepts used are thoroughly described and defined, after which I will discuss the theoretical background of the relationships, which includes related works and theories and the relationships I expect to find in this research. Then the empirical approach of this thesis is described, which includes the dataset, measures of the variables used and reasoning for the statistical methods used. Next, the statistical results are presented and interpreted. After this, implications of the results are discussed, together with the relationship of the findings compared to earlier research. I will end with a conclusion.

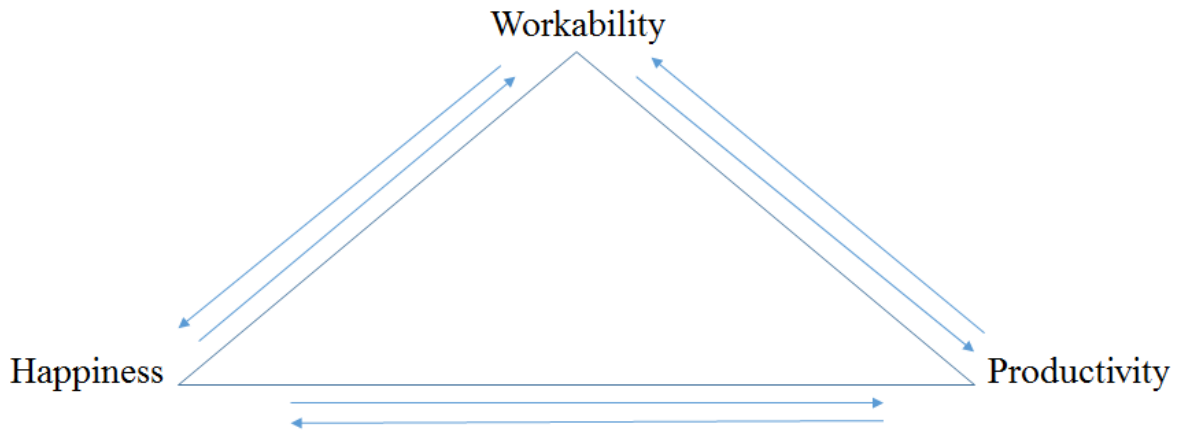

Fig. 1: Triangle Workability, Happiness and Productivity

2. Theoretical background

To explore how the triangle happiness, productivity and work ability interact it is important to define these terms properly. Later in this section it is found that previous research has concluded various relationships and correlations, sometimes contradicting each other. This could be due to the use of different interpretations of the same terms. In the next section I will define the terms that will be used in this research clearly to overcome this problem.

2.1 Defining Workability

Juhani Ilmarinen first described the concept of workability in the 1980s. Over the past few decades, people's life expectancy rapidly increased. As people became older the Finnish government foresaw the possible financial problems this phenomenon would be accompanied with. They realized the importance of having a tool to monitor people's ability to work (and their ability to keep working in the future). The concept workability is based on the balance between work and personal resources; the result of an interaction between work and an individual. The "optimal" balance between these two elements can change throughout the years, as people's personal resources change and new balances have to be sought (Ilmarinen, 2009). With this concept of workability the Finnish Insitute of Occupational Health developed an index to define to what extend a worker is able and competent to do his work (Ilmarinen, 2007). More specifically, it was designed to answer the question "How good are workers at present and in the near future and how able are they to do their job with respect to work demands, health, and mental resources?" (Ilmarinen, Tuomi & Klockars, 1997).The index takes into account what the jobs demands are, the worker's health status and resources. The questions are asked in relation to the job demands, therefore this is automatically part of the equation. For example, if the physical capacity of two workers is identical, but their activities at work differ with respect to physical load their score for physical capacity will differ. The score for health status of a worker in this questionnaire is narrowed down to amount of diagnosed diseases and injuries the worker is suffering from at the moment combined with the mental and physical capacity they have to perform their job. The mental resources are measured by asking how hopeful for the future the workers are, if they feel alert and active and if they are able to enjoy their daily activities (Silva Junior, Vasconcelos, Griep & Rotenberg, 2013). In essence this measures the resilience and emotional buffer the workers have. The workability helps determine, both for the employer and the employees, what kind of work and competences are expected from employees and what work conditions he is working in.

To define the concept more clearly, and understand the complexity of all its dimensions, Tengland (2011) has analyzed the workability and defined all the different elements that are part of the index. The score of the index is based on a workers' health, basic standard competence, occupational competence, occupational virtues, and motivation. Because of the broad measures for the workability index, ones workability is not independent from their life outside of work (Ilmarinen, 2009). For example, obesity and lack of physical activity in a workers free time have a negative impact on the workability (El Fassi, Bocquet, Majery, Lair, Couffignal & Mairiaux, 2013). A common finding in workability research is a decrease in workability as the workers age (Ilmarinen, 2009). Other, job-related, factors causing a decrease in workability are high mental requirements, lack of autonomy and heavy physical workload (van den Berg, Elders, de Zwart & Burdorf (2008). A low workability is the result of an imbalance between demands of work and energy. If the workability is low, and thus balance is distorted, workers can get physically tired, socially tired, and thus reduced in their ability to communicate with colleagues or clients, or mentally tired, which can affect the concentration level.

The workability index is measured with both objective findings, like amount of sick days, and subjective estimates, including opinions on subjects' own abilities. For each of the following criteria a worker is given points on different scales, where after the index can be derived through summation of the points: a subjective estimation of present work compared to the lifetime best, a subjective work ability in relation to work demands, objective amount of diagnosed diseases, subjective estimation of work impairment, objective number of days of sickness absence during past year, own prediction of work ability after 2 years and psychological resources (Snel & Cremer, 1995).

2.2 Defining Productivity

Productivity can be defined as the output of goods and services compared to the input of resources (Sharpe, 2002). The resource of input that is relevant for this thesis is labour. Labour productivity is the most used measure of productivity: measuring the ratio of output to the labour input, which is usually employment per hour (Sharpe, 2002). However, for a lot of industries labour productivity can be hard to measure in this way and it is even harder to compare these productivity results between industries. Especially when the output is not the production of actual goods but more abstract as problem solving or supervising. Because the output is hard to quantify, arbitrarily assessing numbers complicates the between industry comparison. Therefore a lot of different measures and definitions of productivity exist, with measures as efficiency, turnover, supervisor ratings or amount of sick days (Lucas & Diener, 2004). Not all these measures are very

successful in measuring the variable of interest, productivity. Meyer & Gupta (1995) show that many of these measure don't have a high correlation with actual performance.

2.3 Defining Happiness

Happiness is difficult to define and even more difficult to measure because of its complex nature. Different processes that have different correlates with different effects will result in diverse constructs of happiness (Lucas & Diener, 2004). Happiness can be measured in negative affect; feelings of sadness or fear, or positive affect; feelings of happiness and joy. That can either be for a longer period (a mood) or a short-lived reaction (emotion). Another way to measure happiness is to measure the cognitive judgements somebody makes about their life or job in total. This way of measuring happiness is more "long-term", as it is not directly affected by positive and negative affects (Lucas & Diener, 2004).

More recently, another distinguish in happiness has been made, namely; eudaimonic happiness and hedonic happiness. Eudaimonic happiness is based on meaning and purpose of life; doing work and activities where one can use their talents and potential. Hedonic happiness is evaluating life as satisfying: experiencing a high frequency of positive affect, and a low frequency of negative affect (Kashdan, Biswas-Diener & King, 2008). Empirical evidence has shown that it is likely the two operate together. Veenhoven (2013) has made a framework describing happiness in a broader sense. He divided the concept happiness in four elements: the life-chances and life-results both for "inner" (valued by oneself) and "outer" (valued by the environment). The inner qualities of life-results, also called the appreciation of life, is the definition of happiness one would usually think of when confronted with the concept. However, defining happiness like this would be too narrow. For this research, both "inner" and "outer" life-results are of interest: the inner valuation, related to the question if one is satisfied with their life, and the outer valuation of the results, related to the question of one thinks that they do meaningful/useful things with their life. These two elements are similar to the concepts of eudaimonic and hedonic happiness mentioned earlier. The answers of the two questions naturally correlate, and same goes for the concepts (Veenhoven, 2013). Therefore, the measure of happiness that is used in this research includes both. To measure the happiness level subjects are asked how happy they are overall, how content they are with their life and if they feel like they are doing meaningful things in their life.

3. Links between workability, productivity and happiness

In this section previous research on the interactions between the three concepts is examined and based on these findings the hypotheses are formulated.

3.1 Workability and productivity

The relation between workability and productivity naturally feels like a positive one: if a worker is less able to work, he produces less. Previous research has confirmed this correlation on several aspects of the workability index. Several research has shown that medical conditions, for example migraine, back pain or depression, are related to reduced productivity (Lipton, Stewart, & Scher, 2001; Lerner, Adler, Chang, Lapitsky, Hood, Perissinotto, & Rogers, 2004; Goetzel, Long, Ozminkowski, Hawkins,Wang & Lynch, 2004). Weight has been shown to influence both workability and productivity. Burton, Conti, Chen, Schultz & Edington (1999) have shown that people with a high BMI, are very likely to be below the productivity standard. In a similar way Gates, Succop, Brehm, Gillespie & Sommers (2008) have shown that obesity is related to both absence at work and productivity loss. Bad health conditions are strongly related to low workability scores. GP's are also more likely to assess a lower workability when a patient has medical conditions and not when a patient has non-medical complaints (Reiso, Nygård, Brage, Gulbrandsen & Tellnes, 2000). The finding that a sickness is associated with a lower productivity is important because the cost of unhealthy workers are easily underestimated by simply looking at the amount of sickness absence days. Vänni, Virtanen, Luukkaala & Nygård (2012) showed this numerically by performing a test in a big food company where the total amount of "lost" work days due to sickness was 17.786. 60% of these days were lost due to actual sickness absences, but 40% was due to decreased productivity. This was compared to the optimal scenario where all the workers exert the maximum amount of effort, with zero productivity loss.

Besides the effect of merely health problems, other factors might also play a role in productivity loss. Researchers in the field of workability, that apart from health also includes lifestyle factors, job demands and individual characteristics, have found results with a similar tenor. Reiso, Nygård, Brage, Gulbrandsen & Tellnes (2001) found that a lower workability index in patients that are already sick was correlated with a longer duration of the sickness period. Older patients (50+) were more likely to have longer periods of sickness than their younger colleagues. They also found that the job satisfaction of a patient was associated with the duration of the sickness absence. Only work demands were not associated with the durations of sick leave. In another study they found that gender played a role in work ability and sickness absence: for

women was a low workability stronger associated with sickness that for men. In the same study they also found an age effect where low workability in younger workers is more associated with sickness (Nygård, Arola, Siukola, Savinainen, LuukkaalaTaskinen & Virtanen, 2005). More specifically, measuring the workability index of younger workers can to some extent predict long-term sickness leave (Kujala, Tammelin, Remes, Vammavaara & Laitinen 2006). Alavinia, Molenaar, & Burdorf (2009) also found a correlation between low workability and decreased productivity at work, with lack of job control being the factor with the strongest correlation.

Previous research mainly focused on correlations between productivity and workability. As seen above, the result is fairly homogenous: the studies find a positive correlation. The theories suggest that a lower workability causes a decrease in productivity, because someone who is sick or in a "reduced" personal condition will not be able to exert the same amount of effort they could have in an optimal condition. Therefore there is an expected causal relation, namely a lower workability *causes* a decrease in productivity. Not many theories can be found on the possible effect of decreased productivity on an individual's workability index. But since the index indicates how capable people are of doing their job, a higher productivity seems partly caused by higher workability. This leads to the following hypotheses:

H1: workability has a causal effect on productivity
H2: Productivity has a causal effect on workability

3.2 Workability and happiness

The relationship between workability and happiness has not been as extensively researched as the relationships between workability and productivity or productivity and happiness. However, in theory one would expect a causal relationship between the two, because certain elements of the workability index (health and work) show to have an effect on happiness. For example, Palmer (1985) found that several elements influence life satisfaction, namely; health or lack of physical disability, socioeconomic status, social activity, work and marriage & sexual activity. As health and work are part of the workability index, workability is expected to influence life satisfaction as well.

A lower workability correlates with a difficult life situation outside of work, which is closely related to an individual's happiness (Pohjonen, 2001). Other factors closely related to happiness, as self-confidence and mental stress, were also associated to workability (van den Berg et al., 2008; Judge, Erez & Bono, 1998).

Sjögren-Rönkä, Ojanen, Leskinen, Mustalampi, & Mälkiä (2002) found that workability had a direct effect on subjective well-being. For musculoskeletal symptoms and mental stress at work, which are part of workability, they found an indirect effect on general subjective well-being. Seitsamo & Ilmarinen (1997) found a similar effect for workability on life satisfaction. In a follow up study they found that workers with a steady, good or moderate, workability were more satisfied with their life in the follow up questionnaire. If the workers workability had decreased their life satisfaction also decreased. The effect of workability on life satisfaction was strong, and even greater for men (Seitsamo & Ilmarinen, 1997). This could suggest that it is harder for men to cope with a decreasing workability compared to women.

The discussed research mainly examines the effect of workability on happiness. A causal relationship here is likely to be positive. However, the effect of happiness on workability is not discussed. I expect a causal relationship here as well, as happiness can been seen as a personal resource. A happy worker is more likely to be resilient and might not call in sick as fast an unhappy worker would. Therefore the third hypothesis is the following:

H3: workability has a causal effect on happiness
H4: happiness has a causal effect on workability

3.3 Productivity and happiness

Previous research conducted in the field of happiness and productivity hasn't resulted in one clear answer about the existence of the relation between happiness and productivity. Although the results differ quite a bit, it seems most likely that the relation is a positive one, e.g. happier workers are more productive. The extent to which this would hold depends on the type of work. If the job requires social interactions with colleagues or clients, a happier worker is more likely to be productive or provide satisfying results. However, Brayfield and Crockett (1985) conducted a meta-analysis on the relationship between job satisfaction and productivity and concluded that the relationship was non-existent or minimal. However, they only reviewed nine studies and the definition of happiness was limited to happiness at work.

In history, there has also been argued that happiness leads to less productivity. Especially philosophers have come up with theories stressing this. They have suggested that happy people don't feel the need to improve and search for better things. This is thought of to be bad for the creative abilities (Veenhoven, 1988).

Besides the lacking strive for better, happiness could lead to individualism and selfish behaviour. This will weaken the social bonds and create egoists, which will have its effect on the work environment (Veenhoven, 1991).

Some research does support this negative view on happiness. Zhou & George (2003) found that under the right circumstances a negative mood can have a positive impact on creative work. A negative job affect can even be a trigger for a workers' creativity. They found that this does not hold in all situations or types of employees, as a negative affect can also result into shirking behaviour. Kaufmann & Vosburg (1997) found that subjects in a negative mood were better and more creative in problem solving than the subjects in a neutral of positive mood. They argued in a similar way to Veenhoven (1988) that the subjects in a positive mood had more confidence which resulted in an attitude where they worked until they met the threshold (satisficing). The subjects in a negative mood were confronted with the fact that the status quo could be better for them and therefore their results were more creative (Kaufmann & Vosburg, 1997). Although individuals in a negative mood tend to be more pessimistic, they are more likely and able to identify problems and detect errors (Zhou & George, 2003). The negative moods alert individuals on their shortcomings, which motivates them to exert higher levels of output so the situation can be changed (George & Zhou, 2007).

Contrary to the negative philosophies there are a lot of psychologist theorizing the opposite: happiness has a positive effect on productivity. The main principle differs: here one can argue that people are motivated by growth and thus pulled by pleasure instead of pushed by pain, which is the starting point for the negative view (Maslow). Second, psychologists have argued that happiness stimulates activity and awareness, this should be due to the fact that a happy brain is not distracted by frustrations. Studies have shown that people in a negative mood tend to brain wander more (Killingsworth & Gilbert, 2010; Smallwood, Fitzgerald, Miles & Phillips, 2009). In a happy mood there is this increased "space" in the brain, therefore creativity should flourish with happiness and can at the same time facilitate social contact. Happiness can also be used as a buffer for negativity and helps workers take downfalls more lightly and make them overcome it more easily (Veenhoven, 1988).

Researchers have found evidence for positive effects of happiness. Hirt, Melton, McDonald, & Harackiewicz (1996) found that, in contrast to what is mentioned before, subjects induced into a happy, good mood had more interest and showed more creative solutions for tasks. Amabile (2005) draw a similar conclusion suggesting that happiness provokes more creativity in a work setting. Other laboratory

experiments show that people in happy moods make unusual associations, are flexible in creating ideas and organizing (Hirt, Melton, McDonald, & Harackiewicz, 1996; Kaufmann, 2003). Vosburg (1998) found that a happy mood increases the amount of generated ideas, but not the quality of these ideas. Sanna et al. (1996) found that individuals in a negative mood exert a higher level of effort when asked to do as much as they can, however when they are asked to do as much as they like happy people exert more effort. Lucas, Diener & Suh (1996) found that self-esteem, generalized self-efficacy and locus of control are important predictors of performance. These factors are strongly correlated to happiness. They argue argue that it is likely that there are other traits related to well-being that influence productivity (Lucas & Diener, 2004). Boehm and Lyubomirsky (2008) show in a longitudinal study that people who have a natural tendency to be more happy and experience positive emotions regularly are more likely to have a successful career, countering the often made conclusion that successful people are happy because they are successful.

Although the relationship is not without counter arguments, it is most likely that there is a causal effect of happiness on productivity. The effect of productivity on happiness is not discussed above. Fisher (2010) has found that workers are happier than normal when they believe they perform better than normal. In that spirit one can argue that if a worker is more productive they feel they have more purpose and use their full abilities. These are also factors that are measured to determine the happiness level in this research. Therefore the expected relation is as follows:

H5: happiness has a causal effect on productivity
H6: productivity has a causal effect on happiness

Hypothesis 1	Workability has a causal effect on productivity
Hypothesis 2	Productivity has a causal effect on workability
Hypothesis 3	Workability has a causal effect on happiness
Hypothesis 4	Happiness has a causal effect on workability
Hypothesis 5	Happiness has a causal effect on productivity
Hypothesis 6	Productivity has a causal effect on happiness

Table 1: summary of hypotheses

4. Method

4.1 Sample

The data used for this thesis is obtained by the company PreventNed. PreventNed researches and helps improve the workability and employability of their clients' workers. Part of their research is a questionnaire including questions on workability, productivity and happiness. In total 4,994 different workers filled in the questionnaire in the years 2017 and 2018. 1,895 of these workers were males (37.95%) and 3,099 females (62.02%). The data includes information from 9 different branches. Most observations are of workers in the health sector (55.41%), but the sample also includes workers from industry, education, culture & sports, research, wholesale & retail trade, government and real estate. The sample consisted of workers employed only in the Netherlands. The age of the workers varied from 15 until 68, with a mean of 44.6. The highest finished level of education was primary school for 46 of the workers (0.92%), VMBO for 543 (10.87%), Havo/VWO for 295 (5.91%), MBO for 1,713 (34.30%), HBO for 1,942 (38.89%), university for 425 (8.51%) and 30 of the workers never finished any education (0.6%).

4.2 Measures

The questionnaires were sent to the workers by mail and filled in by them on a secure website. The workers were guaranteed that all data was strictly confidential and all potentially identifying data would be removed from the database before data transfer. The questionnaire obtains data about productivity, happiness and workability, next to some general individual characteristics.

4.2.1 Variable: productivity

Optimally, labour productivity would be measured both with subjective and objective measures to obtain the most reliable results. For the scope of this thesis, the measurement of productivity is self-reported productivity, focused on productivity loss. Meerding (2005) has shown that this method of measuring productivity correlated significantly with objective output. The self-reported productivity loss was measured via the Quantity and Quality method on a ten-point scale. The respondents were asked how productive they had been on their previous workday, compared to a normal day. The answer 0 would mean the respondent had done nothing on their previous workday, and 10 they would have worked "normal".

4.2.2 Variable: happiness

The subjective valuation of someone's life and happiness is easier to measure than a form of objective "happiness". Usually, this subjective valuation is asked via a questionnaire because it is something that people have in mind. The best way to measure this might be to ask people repeatedly how they feel about their life right now and average out the results. Moods are easier for people to recognize and report than more abstract long-term states. Besides that, the possible mood effects interfering with the value of the "true" satisfaction would be ruled out using this method. However, this method, called experience sampling, takes much time and is quite expensive (Veenhoven, 2013). Therefore, another method is to ask the respondents how they generally feel about their life all together. This is also considered a good method because it *is* possible for people to estimate how they generally feel about life and report that (Veenhoven, 2013). Although there are some arguments against this way of collecting data, which I will discuss in more detail in the self-report section (4.3), answers to questions about appreciation of life-as-a-whole suffice (Veenhoven, 2013).

Because this latter method is the most efficient and suitable, happiness is measured in this way. The dependent variable happiness consists of the mean of the answers of two questions: "All things considered, how happy would you say you are?" and "All things considered, how satisfied are you with your life?". The respondents answer these questions on a ten-point scale, with 0 being very unhappy/ very unsatisfied and 10 being very happy/ very satisfied.

4.2.3 Variable: workability

The original workability index is build up from seven different dimensions **(**Tuomi, Ilmarinen, Jahkola, Katajarinne & Tulkki, 1994). The first dimension compares the current workability to the workers' lifetime best, measured on a ten-point scale. The second dimension measures the workability compared to physical and mental workload, measured on a five-point scale varying from very good (5) to very bad (1). The third dimension is an extensive list of 13 categories of diseases in which the respondent answers if they have this disease, diagnosed by a doctor. Dimension 4 addresses limitations due to health issues or injuries, which is divided in six yes/no sub questions. Dimension 5 measures the amount of sick days in the last year. The sixth dimension asks for the respondents thoughts on their own workability in 2 years time. The final dimension measures the mental resources, this is split up in three sub questions on feeling fit and active, the ability to have fun and excitement for the future. The total index score ranges from 7 to 49 points and

assigns a worker in one of the four categories of having a workability that is: poor (7–27 points), moderate (28–36 points), good (37–43 points), or excellent (44–49 points).

Some variables were added to the original workability index by PreventNed, because they show to be of interest. First, the physical load is determined by several questions about the job circumstances: weird positions of the back, little variation in postures and carrying heavy loads. These questions are measured on a four-point scale with ‘‘seldom or never,’’ ‘‘now and then,’’ ‘‘often,’’ and ‘‘always’’ as possible answers. The answers ‘‘often’’ and ‘‘always’’ are seen as high exposure (Elders and Burdorf, 2001). The psychosocial risk factors are determined by 3 categories: *job control*, which measures the input/control a worker has on his own day, *variety*, which includes creativity, variety in tasks and skills, and finally *work demand*s, including questions on workload, how hard subjects have to work and time pressure. These questions are measured in the same four-point scale as the physical load. A score higher than the median sum score is seen as having a psychosocial risk. This is based on the demand–control model defined by Karasek, Brisson,Kawakami, Houtman, Bongers & Amick (1998). A final addition is the BMI, as it has been shown to have a strong influence on sickness and longitude of the sick leave (Robroek, van den Berg, Plat & Burdorf, 2010). The BMI is calculated by dividing body weight in kilogram by the square of body height in meters. Workers are categorized as normal if they have a BMI below 25, overweight if their BMI is between 25 and 30, or obese if their BMI is above 30.

4.2.4 Control Variables

In order to make sure the effect of the variables isn’t over- or underestimated, or falsely includes the effect of other non-included variables (confounding factors), some variables are controlled for. First of all, I controlled for several personal characteristics, namely: *age*, *gender*, and highest finished level of education *(education)*.

Other factors that could possibly influence a workers’ happiness, workability or productivity are job characteristics. The amount of leisure time someone has and the kind of job can possibly influence happiness productivity or/and workability (Lu & Hu, 2005; Brouwer, Koopmanschap & Rutten, 1997; Kelly & Kelly, 1994; Tuomi, Ilmarinen, Martikainen, Aalto & Klockars, 1997) Therefore I controlled for the amount of hours someone works every week (*hourweek*), the amount of days a week someone works (*dayweek*), if the job is mainly physically strenuous, mentally strenuous, or both (*functiontype*), the type of employment: permanent employment, temporary employment, temporary agency worker, calling force /

temporary worker, self-employed or else (*employment*), if the work schedule is irregular (*irregular*) and the amount of years the respondent has worked for this company (*workyear*).

Thirdly, some lifestyle factors have been included as control variables because lifestyle has shown to have an effect on workability, happiness and productivity **(**Tuomi et al., 1997; Robroek, van Lenthe & Burdorf, 2013; Robroek et al., 2010; Argyle, 2013). Therefore I controlled for if the respondent is incapacitated at this moment (*sick*), if the respondent eats fruit at least 5 times a week (*fruit*), if the respondent eats vegetables at least 5 times a week (*vegetables*), if the respondent drinks alcohol (*alcohol*), if the respondent drinks more than 10 glasses of alcohol a week (*muchalcohol*), if the respondent smokes (*smoking*), if the respondent smokes more than 20 cigarettes a day (*muchsmoking*), if the respondent sleeps enough (*sleep*), and if the respondent exercises at least 30 minutes a day (*exercise*).

Finally, another happiness-related factors can influence the results. For example, overall mood effects can influence the way someone feels about their own productivity, happiness or workability and therefore the way they fill in this survey (Hlebec & Ferligoj, 2001). To control for this the variable *mood* is included in all the regressions. Mood measures how happy the respondent feels today on a ten-point scale.

4.3 Self-reports

In the field of behavioral economics experiments are a common way to collect data about behaviour. This in contrast to psychology, where self-reports are a common used measure (Bönte, Lombardo & Urbig, 2017). To measure the workability, productivity and happiness of workers' self-reports have been used. These self-reports are subjective and therefore over- or underestimation for all three factors is possible. Another problem with self-reports is that subjects can be influenced in their answer by the way the questions are posed (Schwarz, 1999). However, for measuring these factors specifically self-reports are an often used tool.

Bound (1989) researched workers' health and ability to work both with objective and subjective measures. He found that there are some biases and problems with objective measures as well, as they tend to overestimate the effect for what they measure, whilst factors that are impossible to measure objectively (e.g. pain) are overlooked. Self-reports turned out to be more reliable than expected, but were more likely to be sensitive to psychological biases. Bound could, after researching both methods, not conclude which of the two was more reliable.

With measuring happiness we have to take into account that it is an abstract concept and it could be hard for subjects to translate how they feel and how happy they are on the spot (Schwarz, 1999). To measure happiness, individual differences in the way language is used and interpreted may be present, but studies have found that answers on self-reports are mainly driven by the feelings they ask for and could therefore be considered reliable (Lyubomirsky & Lepper, 1999; Barrett, 2004).

Another important critique on self-reports are context effects, for example: people tend to state they are more satisfied with their lives on sunny days, or are influenced by the questions before on specific parts of their lives and their answer on their overall happiness correlates (Strack et al., 1988; Schwarz and Clore, 1983). However, replication of these studies found the context effect to be (very) small (Lucas and Lawless, 2013; Schimmack and Oishi, 2005).

Although there are some arguments against the use of self-reports, there is not enough evidence to suggest that their data will not be reliable. On top of that, there is no instrument more reliable available at this point. Therefore self-reports are the best measure to use for this research.

4.4 Analysis

4.4.1 Linear regression

In order to test the relationships between the variables happiness, productivity and workability six linear regression models were set up. In these six models the dependent and independent variables switch between the three concepts. In order to test the models, StataMP 14.1 was used and a P-value of smaller than 0.05 was considered significant.

1. $happiness = \beta_0 + \beta_1 * productivity + \beta_2 * sector + \beta_3 * age + \beta_4 * gender + \beta_5 * education + \beta_6 * hourweek + \beta_7 * dayweek + \beta_8 * functiontype + \beta_9 * employment + \beta_{10} * irregular + \beta_{11} * sick + \beta_{12} * workyear + \beta_{13} * fruit + \beta_{14} * vegetables + \beta_{15} * alcohol + \beta_{16} muchalcohol + \beta_{17} * smoking + \beta_{19} * muchsmoking + \beta_{20} * sleep + \beta_{21} * exercise + \beta_{22} * meaningfulness + \beta_{23} * mood + \epsilon$

2. $happiness = \beta_0 + \beta_1 * waitotal + \beta_2 * sector + \beta_3 * age + \beta_4 * gender + \beta_5 * education + \beta_6 * hourweek + \beta_7 * dayweek + \beta_8 * functiontype + \beta_9 * employment + \beta_{10} * irregular + \beta_{11} * sick + \beta_{12} * workyear + \beta_{13} * fruit + \beta_{14} * vegetables + \beta_{15} * alcohol + \beta_{16} muchalcohol + \beta_{17} * smoking + \beta_{19} * muchsmoking + \beta_{20} * sleep + \beta_{21} * exercise + \beta_{22} * meaningfulness + \beta_{23} * mood + \epsilon$

3. $productivity = \beta_0 + \beta_1 * happiness + \beta_2 * sector + \beta_3 * age + \beta_4 * gender + \beta_5 * education + \beta_6 * hourweek + \beta_7 * dayweek + \beta_8 * functiontype + \beta_9 * employment + \beta_{10} * irregular + \beta_{11} * sick + \beta_{12} * workyear + \beta_{13} * fruit + \beta_{14} * vegetables + \beta_{15} * alcohol + \beta_{16} muchalcohol + \beta_{17} * smoking + \beta_{19} * muchsmoking + \beta_{20} * sleep + \beta_{21} * exercise + \beta_{22} * meaningfulness + \beta_{23} * mood + \epsilon$

4. $productivity = \beta_0 + \beta_1 * waitotal + \beta_2 * sector + \beta_3 * age + \beta_4 * gender + \beta_5 * education + \beta_6 * hourweek + \beta_7 * dayweek + \beta_8 * functiontype + \beta_9 * employment + \beta_{10} * irregular + \beta_{11} * sick + \beta_{12} * workyear + \beta_{13} * fruit + \beta_{14} * vegetables + \beta_{15} * alcohol + \beta_{16} muchalcohol + \beta_{17} * smoking + \beta_{19} * muchsmoking + \beta_{20} * sleep + \beta_{21} * exercise + \beta_{22} * meaningfulness + \beta_{23} * mood + \epsilon$

5. $waitotal = \beta_0 + \beta_1 * productivity + \beta_2 * sector + \beta_3 * age + \beta_4 * gender + \beta_5 * education + \beta_6 * hourweek + \beta_7 * dayweek + \beta_8 * functiontype + \beta_9 * employment + \beta_{10} * irregular + \beta_{11} * sick + \beta_{12} * workyear + \beta_{13} * fruit + \beta_{14} * vegetables + \beta_{15} * alcohol + \beta_{16} muchalcohol + \beta_{17} * smoking + \beta_{19} * muchsmoking + \beta_{20} * sleep + \beta_{21} * exercise + \beta_{22} * meaningfulness + \beta_{23} * mood + \epsilon$

6. $waitotal = \beta_0 + \beta_1 * happiness + \beta_2 * sector + \beta_3 * age + \beta_4 * gender + \beta_5 * education + \beta_6 * hourweek + \beta_7 * dayweek + \beta_8 * functiontype + \beta_9 * employment + \beta_{10} * irregular + \beta_{11} * sick + \beta_{12} * workyear + \beta_{13} * fruit + \beta_{14} * vegetables + \beta_{15} * alcohol + \beta_{16} muchalcohol + \beta_{17} * smoking + \beta_{19} * muchsmoking + \beta_{20} * sleep + \beta_{21} * exercise + \beta_{22} * meaningfulness + \beta_{23} * mood + \epsilon$

4.4.2 Instrumental variable estimation

A causal relation can be estimated if the OLS regression satisfies certain assumptions. The regression cannot have omitted variable bias, reverse causality or functional form misspecification. On top of that the zero conditional mean assumption must hold. Omitted variables are variables that influence both the dependent and independent variable. In the case of an omitted variable the independent variable is called endogenous. This can influence the estimates because the estimated relation between the endogenous variable and the dependent variable includes an upwards or downwards bias. In the case of reverse causality the dependent variable influences the independent variable too, causing the zero conditional mean to not be satisfied. Depending on the direction of the relation between the variables, the causal effect will be over- or underestimated. The zero conditional mean assumption also fails to hold if the model misses important nonlinearities. In practice, these assumptions can be hard to satisfy. Especially in the case of this thesis reverse causality will most likely be a problem and therefore I cannot discard the possibility of endogeneity.

As a solution for this problem I can include instruments in the regression and perform a two-stages least squares regression (2SLS). An instrument is a variable that only correlates with the endogenous variable and not with the error term (or with the dependent variable). Only a part of the variation in the endogenous variable is correlated with the error term. With this instrument the part of the endogenous variable that is independent of the error term can be isolated and thus will be suitable to use for the regression. However an instrumental variable has to satisfy certain assumptions as well. The variable has to be correlated with the endogenous variable in order to be a relevant instrument. This correlation must be strong enough to be able to call it a strong instrument. Finally, to be a valid, exogenous instrument it cannot be correlated with any other determinant of the regression. In this way the instrument will only influence the dependent variable through the endogenous variable. This final assumption, the validity of the instrument, can never be fully tested and will have to be based on economic theory and reasoning. (Schmidheiny, 2016)

Based on these criteria there is no useful, valid instrument in the dataset I can use for the regression. Because the concepts happiness, productivity and workability are broad and influenced by a multitude of factors finding suitable instruments can be challenging. Another statistical method is available in this case: Lewbels' estimator.

4.4.3 Lewbel estimator

In the case that there are no suitable instruments available Lewbel (2012) has developed a method where 2SLS can be used with generated instruments. These instruments are generated from the errors in the first-stage regression, if they are heteroskedastic. The generated instruments are constructed from regressed squared residuals from the equations, multiplied by all the exogenous variables in the regression. The correlation between the generated instruments and the included endogenous variables will be higher (=stronger instrument) if the "degree of scale heteroscedasticity in the error process" is greater (Baum, Lewbel, Schaffer & Talavera, 2013). New instruments will be generated from all the exogenous regressors. These instruments are created through regressors that are uncorrelated with the product of heteroskedastic errors. Not all these instruments are equally useful and thus I will have to select the most suitable of the generated instruments. To be able to use this method, the errors thus have to be heteroskedastic. In order to test for this a Pagan-Hall test will be performed, if this test is significant Lewbel's method can be used.

5. Results

5.1 Error check

After running the OLS regressions (results in Appendix B**)**, the Pagan-Hall test (ivhettest) was performed to check if the errors are heteroskedastic. With a chi-square value of 519.205 for the regression of happiness on WAI, a chi-square value of 379.657 for the regression of productivity on WAI, a chi-square value of 114.614 for the regression of WAI on productivity, a chi-square value of 96.195 for the regression of happiness on productivity, a chi-square value of 365.390 for the regression of WAI on happiness and finally a chi-square value of 379.018 for the regression of productivity on happiness, I can conclude that all these tests are significant and have a P-value of 0.00. Therefore the null hypothesis that the disturbance is homoscedastic can be rejected and Lewbel's method can be used for all six of the regressions.

5.2 Generating instruments

In order to generate the instruments the command "ivreg2h" is used. Before I can use the output from this command, several tests have to be checked that should meet the criteria. The first test being the Anderson canon correlation statistic, or Kleibergen-Paap statistic, which tests for under identification. A failure to reject the null hypothesis suggests that the model is unidentified (Baum, Schaffer & Stillman, 2007). The

second is the weak identification test, or the Cragg-Donald Wald F statistic. This is tests the overall strength of the instruments, if this test is not rejected it suggest that the instruments are weak. Stock and Yogo have formulated critical values of the minimum eigenvalue of the statistic of the Cragg-Donald Wald test. This test should be rejected at a Stock-Yogo value of 15% max (Sanderson & Windmeijer, 2016). The final test is the over identification test of the instruments, or the Sargan/ Hansen J statistic. The joint null hypothesis is that the instruments are valid, meaning that the instruments are uncorrelated with the error term and the excluded instruments are correctly excluded (Wanderley & Frezatti, 2014). Therefore this is the only test that should not be significant.

For the regression with productivity as dependent variable and WAI as independent variable, the Anderson test can be rejected with a value of 1809.149 and a p-value of 0.0000. The Cragg-Donald test can be rejected at a 5% level with a value of 75.520. The Sargan statistic is rejected with a value of 54.447 at a p-value of 0.025. In the regression where happiness is the dependent variable and WAI is the independent variable, the Anderson test can be rejected with a value of 1809.149 and a p-value of 0.000. The Cragg-Donald test can be rejected at 5%, with a value of 75.520 (and the maximum IV size at 10%). The Sargan statistic is also rejected with a value of 138.975and a p-value of 0.000. In the regression with WAI as dependent and happiness as independent variable the Anderson test has a value of 1072.590 and a p-value of 0.000, and thus the null is rejected. Cragg-Donald has a value of 36.364 and can be rejected at 5%. The Sargan statistic cannot be rejected with a value of 38.690, and a p-value of 0.3491. For the regression with productivity as the dependent variable and happiness as independent variable, the Anderson test can be rejected with a value of 1072.590 and a p-value of 0.000. The Cragg-Donald test can be rejected at 5%, but the maximum IV size cannot be rejected at 15%. The Sargan statistic can be rejected with a value of 51.695 and a p-value of 0.0437. For the regression with happiness as dependent variable and productivity as independent variable, the Anderson test can be rejected at a p-value of 0.000 with a value of 699.448. The Cragg-Donald test can be rejected at 5%, with a value of 21.653. The Sargan statistic can be rejected with a value of 75.293 and a p-value of 0.0001.

For the regressions that don't meet the criteria, there needs to be selected on suitability of the instruments. As explained in the method section there needs to be a strong correlation between the independent variable and the instrument and a low correlation between the instrument and the dependent variable in order for the instrument to be strong.

5.3 Regressions

5.3.1 Relation between workability and productivity

For the regression of workability on productivity the instruments *waitotal_gender_g, waitotal__Ieducation_7_g, waitotal__Iemploymen_5_g, waitotal_sick_g* & *waitotal_workyear_g* meet the criteria (bold in table 2, appendix C). These instruments are plugged into an ivreg2 regression as instruments for WAI. The full output for this regression can be found in table 1 & table 7, appendix D. The Hansen J statistic (Sargan) can no longer be rejected with a p-value of 0.3806. The under identification test and weak identification test are still significant, therefore this output can be used. Waitotal has a value of 0.066 and is significant with a p-value of 0.000. A 1 point increase of somebody's workability index increases their self-reported productivity with 0.066 points, ceteris paribus. This is in line with hypothesis 1: there is evidence for a causal effect of workability on productivity.

For the regression of productivity on workability the instruments *prod_sick_g, prod__ISector_4_g, prod_sleep_g* & *prod_mood_g* meet the criteria (bold in table 3, appendix C). These instruments are plugged into an ivreg2 regression as instruments for productivity. The full output for this regression can be found in table 2 & table 8, appendix D. The Hansen J statistic (Sargan) can no longer be rejected with a p-value of 0.9110. The under identification test and weak identification test are still significant, therefore this output can be used. Productivity has a value of 0.59 and is significant with a p-value of 0.000. A 1 point increase of somebody's self-reported productivity increases their workability index with 0.59 points, ceteris paribus. This is in line with hypothesis 2: there is evidence for a causal effect of productivity on workability.

5.3.2 Relation between workability and happiness

For the regression of workability on happiness the instruments *waitotal_age_g waitotal__Ieducation_7_g waitotal__Ifunctiont_2_g waitotal_sick_g waitotal_workyear_g* & *waitotal_mood_g* meet the criteria (bold in table 1, appendix C**)**. These instruments are plugged into an ivreg2 regression as instruments for workability. However, the Hansen J statistic (Sargan) is still rejected with a p-value of 0.0128. Therefore this output cannot be used. After dropping the instrument *waitotal_mood_g*, the Hansen J statistic is no longer significant with a p-value of 0.1590, and the under identification test and weak identification test are still significant. The new output for this regression can be used and found in table 3 & table 9 in appendix D. Workability has a value of 0.011 and a p-value of 0.355. Therefore the null hypothesis that workability has no effect on happiness cannot be rejected. This is not in line with hypothesis 5, where a causal relation was expected.

For the regression of happiness on workability, all the tests were sufficient. Therefore the output of the ivreg2h regression can be used **(**table 4 & table 10, appendix D). Happiness has a value of 1.29 and is significant at a p-value of 0.000. A 1 point increase in self-reported overall happiness and increases workability with 1.29 point, ceteris paribus. This is in line with hypothesis 4: there is evidence for a causal effect of happiness on workability.

5.3.3 Relation between productivity and happiness

For the regression of happiness on productivity the instruments *happiness_mood_g, happiness_sleep_g & happiness_sick_g* meet the criteria (bold in table 4, appendix C). These instruments are plugged into an ivreg2 regression as instruments for happiness. The output for this regression can be found in table 5 & table 11, appendix D. The Hansen J statistic (Sargan) can no longer be rejected with a p-value of 0.4702. The under identification test and weak identification test are still significant, therefore this output can be used. Happiness has a value of .133 and a p-value of 0.249. Therefore the null hypothesis that happiness has no effect on productivity cannot be rejected. This is not in line with hypothesis 5, where a causal relation was expected.

For the regression of productivity on happiness the instruments *prod_sleep_g, prod_mood_g, prod_sick_g & prod__ISector_4_g* meet the criteria (bold in table 5, appendix C). These instruments are plugged into an ivreg2 regression as instruments for productivity. The output for this regression can be found in table 6 & table 12, appendix D. The Hansen J statistic (Sargan) can no longer be rejected with a p-value of 0.7505. The under identification test and weak identification test are still significant, therefore this output can be used. Productivity has a value of .052 and a p-value of 0.227. Therefore the null hypothesis that productivity has no effect on happiness cannot be rejected. This is not in line with hypothesis 6, where a causal relation was expected.

	Y=productivity	Y=WAI	Y=happiness
Productivity		0.59 (0.15)***	0.05 (0.04)
WAI	0.07 (0.01)***		0.04 (0.01)***
Happiness	0.13 (0.12)	1.29 (0.18)***	
controls	Yes	Yes	Yes

Table 2: Output Lewbel regressions. ***p<0.01; **p<0.05; *p<0.1; robust standard errors in parentheses

5.3 Interpretations of the regressions

The results above could be hard to interpret because the scales on which the variables are measured differ; happiness and productivity are measured on a scale of 0 to 10 and workability is measured on a scale of 7 to 49. Therefore this section will discuss what the found causal effects imply in example situations.

As discussed in the introduction, the costs accompanying productivity loss will be calculated. Because the relation between happiness and productivity has not been found, the costs of reduced productivity can, for now, only be calculated as caused through reduced workability. A one point increase in workability increases the self-reported productivity with 0.0663709. Meaning that, in the most extreme case, if somebody with the worst possible workability index, 7 points, would increase their workability to the best possible index, 49 points, their productivity would increase by 42 x 0.0663 =2.78 points. Because productivity is measured on a scale where 10 is their "normal" productivity, this employee would be working at 72.8% of their capability, and thus wasting 27.8% of their time at work. This could easily be avoided, because this employee even claims they could do more themselves, because that is what the 10 represents. In the bigger picture this would mean, that for an average Dutch employee, working 31 hours a week, 448.136 hours are wasted on a yearly basis (CBS, 2018). That is roughly 50 days a year where this employee does not produce anything, which is an unnecessary and big cost for a company.

Looking at the effect of productivity on workability, a 1 point increase of somebody's self-reported productivity increases their workability index with 0.59 points. The highest possible increase of productivity, 0 to 10, increases the workability index with 5.9 points. The workability indicates a workability that is either poor (7–27 points), moderate (28–36 points), good (37–43 points), or excellent (44–49 points). An increase of 5.9 points could improve somebody's workability category or have no effect, depending on their currents score. For happiness, a 1 point increase causes an increase in workability of 1.29 point. This means that if somebody with the worst possible overall happiness, a score of 0, becomes the happiest possible, a score of 10 increases their workability with 12.9 points. If this person has the worst possible workability (7 points), an increase in happiness like this will leave them with a poor workability (20 points). However, in all situation where the workability is above 15, it will increase their workability by at least one category.

5.4 Robustness checks

To examine the sensitivity of the results, several robustness checks were performed. For the first check, all the variables of interests were regressed in the same regression. The output can be found in appendix E. The coefficients and significance of the variables do not change compared to the results of the separate regressions and thus the same conclusions hold.

Because the regressions have a lot of control variables, one could argue that the regressions are over controlled and too conservative. Therefore, as a second robustness check is performed by running the regressions without the control variable mood. The output of these regressions can be found in appendix F. Mood has a strong correlation with happiness and can affect the results of survey questions, as discussed in the section on self-reports (4.3). Again, the same conclusions can be drawn as from the used regressions: the significance of the variables of interest does not change and the value of the coefficients remain similar to the original regressions.

As a third check, the regressions are run without the personal habits variables revolving around health; *fruit, vegetables, alcohol, muchalcohol, smoking, muchsmoking, sleep & exercise.* Health status is a big part of the workability index and therefore these variables are strongly related to the index. The output of these regressions can be found in appendix G. All the coefficients and significance levels of the variables of interest remain the same after dropping health related habits.

For the fourth robustness check the variable *sick* was dropped from the regression. This dummy represented the incapacitated workers in the sample. Being incapacitated is highly correlated with the WAI, because amount of sick days is part of the index. Besides that, a correlation with happiness is not unlikely. The output of these regressions can be found in appendix H. For the regressions were *sick* is dropped the significance remains the same as the original regressions. The value of the coefficients of some regressions does increase. For the regression of happiness on workability, the coefficient increases by 0.4 point and for the regression of productivity on workability it increases by 0.2 point.

As a final check, the regressions were run with only the general characteristics as controls: *age, gender* & *education.* Because the conclusions remain the same after all the previous checks, this "risky" regression is performed. Due to the lack of controls, t is likely these regressions have omitted variable bias. The output of the regressions with the general characteristics can be found in appendix I. Even in these regressions most conclusions do not change. Only for the regression of workability on happiness workability becomes

significant (on the border) with a value of 0.028 and at a 10% significance level. The regression of workability on productivity remains the same, for productivity on happiness the coefficient increases by 0.3 point and for happiness on workability the coefficient increases by 0.2 point.

5.5 Further analysis

The expected causal relations between productivity and happiness, and workability on happiness are not found. Possible reasons for this are discussed in the conclusion. For now, based on these results, two possible options could be examined further: mediation and moderation.

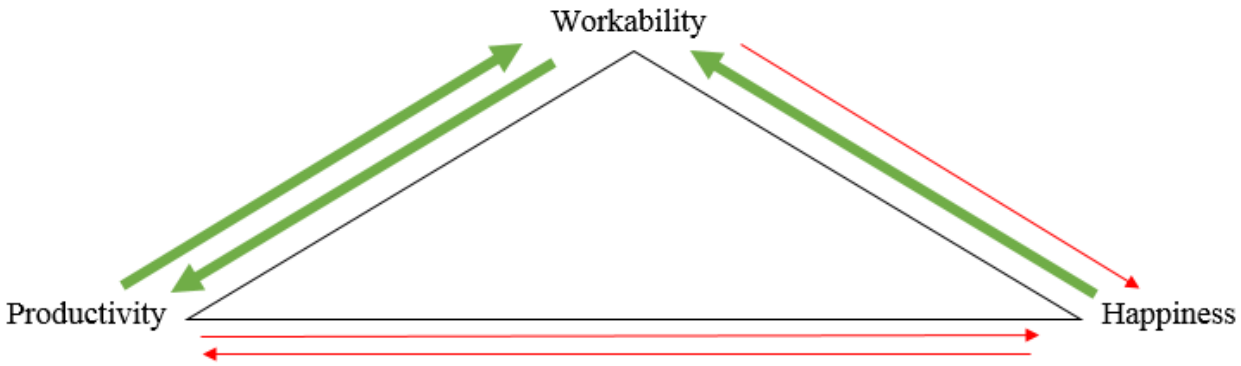

Fig. 2 Found effects in triangle Workability, Happiness and Productivity

5.5.1 Mediation

Since happiness has an effect on workability and workability in turn has an effect on productivity, there is an indirect influence of happiness on productivity through workability. This would mean that the expected triangle from the introduction changes **(**see figure 2**)**. Workability could work as a mediator variable that mediates on the effect of happiness on productivity. The Sobel-Goodman test can examine the significance of this mediation. I will explore this option briefly, more thorough research is recommended for the future. The test was run with the command "sgmediation", productivity as dependent variable, happiness as independent variable and workability as mediator. The output can be found in appendix J. Since this is a brief examination, the endogeneity of the variables is disregarded. Therefore these results should be interpreted with caution because the endogenous variables can give inconsistent estimates. In table 3 is shown that the part of the effect that is mediated is 80%. However, in line with the previous results the direct effect of happiness on productivity is not significant. However, the indirect effect has a value of .098045 and is significant with a p-value of 0. Because the direct effect is not significantly different from 0, this is a case of complete mediation: productivity only effects happiness through workability.

	Coef	Std Err	Z	P>Z
Sobel	.09804523	.00947315	10.35	0
Goodman-1 (Aroian)	.09804523	.0094836	10.34	0
Goodman-2	.09804523	.00946269	10.36	0
a coefficient =	1.38262	.082694	16.7197	0
b coefficient =	.070913	.005381	13.1781	0
Indirect effect =	.098045	.009473	10.3498	0
Direct effect =	.024691	.032195	.766922	.443128
Total effect =	.122736	.031864	3.85184	.000117
Proportion of total effect that is mediated:				.79883018
Ratio of indirect to direct effect:				3.9709246
Ratio of total to direct effect:				4.9709246

Table 3: Output mediation

5.5.2 Moderation

Testing the relationships in moderation examines if the effects hold over different populations. It could be the case that some of the relations that weren't found will be present for specific groups. As a start, the non-significant relations are researched in moderation with age and gender. Gender was chosen because happiness levels differ between men and women, on average (Plagnol & Easterlin, 2008; Easterlin, Hinte, Zimmermann & der Arbeit, 2010). Stress and work related conflicts affect women and men differently. Especially stress affects women's performance at work more severely (Babin & Boles, 1998). Therefore it is not unlikely that effect of happiness on productivity will be different for men than for women. The results show that with gender as moderator all three of the regressions are still insignificant. Age was chosen as moderator because all three concepts are related with age (Pohjonen, 2001; Easterlin, Hinte, Zimmermann & der Arbeit, 2010; Skirbekk, 2004). Because workability, productivity and happiness tend to change as a worker ages, the way they influence each other could change as well. For the use of age as a moderator, only the ages over 40 were used. This to examine a difference of the effect for the "older" workforce. The new sample size, without younger workers, is 3.173, which is enough to draw conclusions from. The output of the regressions can be found in appendix K. For the regression of happiness on productivity, running the regression for people over 40 made happiness significant with a value of 0.518 and a p-value of 0.000. This could mean that happiness becomes a more important factor for productivity level as a workers age increases. For the regression of productivity on happiness the instruments

prod_sick_g & *prod__ISector_4_g* were dropped as instruments, to solve the problem that the Hansen J test became significant after adding the moderator. For the sample with the age over 40, productivity has a significant causal effect on happiness, with a value of 0.188 and a p-value of 0.009. Finally, the regression of workability on happiness became significant after dropping the younger workforce, with a value of 0.031 and a p-value of 0.000. From this first examination, there is evidence to believe that the causal relations in the triangle exist, especially for the older population. If this difference with age also exist for the relationships that were already significant, how the effect changes with age exactly, and possible reasons for this interaction between age, happiness, productivity and possibly workability should be examined in more detail in the future. This could be done by creating the interaction terms age*workability, age*productivity and age*happiness and run all the regressions again, with these new variables as independent variables. In this way it can be tested to what extent age moderates the relationships and how the effects change as age increases.

	Y=productivity	Y=happiness
Productivity		0.19 (0.05)***
WAI		0.03 (0.005)***
Happiness	0.52 (0.13)***	
controls	Yes	Yes

Table 4: Output moderation regressions. ***p<0.01; **p<0.05; *p<0.1; robust standard errors in parentheses

6. Conclusion

The primary focus of this study has been to identify the relations between the concepts happiness, productivity and workability. The motivation was the lack of research on the causality and direction of influences within this triangle. On top of that this research is meant to emphasize and show the importance of not only productivity and workability, but also how this relatively new concept in this context, happiness, can create better company results. Operating with these three aspects in mind will create value in three ways: on a financial level, on a social level and an individual level.

The descriptive statistics show a causal effect for workability, happiness and productivity. Workability and productivity have a significant causal positive effect on each other. Happiness also has a significant causal positive effect on workability. The effect of productivity on happiness, happiness on productivity and workability on happiness was not found. Causality could not be concluded for these three relations, and therefore remains merely an association. However, in the brief examination of these relations in moderation, evidence for a causal relation of productivity on happiness, happiness on productivity and workability on happiness was found for the older workforce (40 years and over). As discussed in section 3.3, the relationship between productivity and happiness was ambiguous in previous research as well.

Even though not all six relations were immediately significant, all three concepts remain important for the three relations that were found. Therefore the triangle remains, and companies should still try to focus on all three aspects. The results imply that it makes sense for companies to monitor the workability of their employees, since it causes changes in their productivity. The preliminary results of moderation analysis imply that age of the workers should be taken into account when making decisions trying to influence workability, productivity and happiness. The fact that the relations may differ, and how they differ with age is interesting for employers to know and should be examined further in the future.

In section 5.3 it has been made clear how focusing on improving workability, productivity or happiness can have a significant effect on improving an employee's work. Productivity loss is not only suffered through actual sick days of employees with lowered workability, but also a structurally lowered level of productivity causes the company unnecessary loss of performance. Focusing on these concept can thus save a company valuable time and money on workers with sub-optimal workability and therefore reduced productivity. Monitoring the three concepts on a consistent basis will provide an opportunity for the company to fix or improve internal problems that might not have affected the sales, or objective outcomes *yet.* In this way managers can be ahead of the problems and stay in control of the situation, by anticipating on possible losses. Thus, keeping an eye on all three dimensions will create and preserve value for a company over time. This thesis has shown that there is evidence to believe in causality between the three concepts. This means that companies have more proof they can not only monitor, but also influence these factors that affect their employees work strongly. This will reflect positively on the companies because they have more control in improving the overall efficiency of the company by reducing the operating costs and improving employability. The company will be better in motivating workers if they can help improve their workability, and, mainly for the older workers, thereby increasing their happiness. This will improve the social situation within the company. On top of that, if a company takes employee happiness in consideration they will be able to attract better employees. Making sure all the employees are suitable for their job will decrease sick

leave, accidents at work and burn outs. This will also lower the medical expenses and sick leave expenses for the company. Not only the company benefits from this, but employees that are prevented from a burn out or sickness will be positively affected on an individual level. This will also benefit the government since the health care expenses are lowered, and people who might have become incapacitated are retained in the workforce. Thus, the government benefits from monitoring these three concepts as well. More benefits have been explained thoroughly in the introduction. In conclusion, workability, productivity and happiness should be, and show to be, of great interest for companies and the government. A focus on this triangle will create benefits for society not only financially, but also socially and on an individual level. Ways to influence, measure and control these concept should be examined and experimented with in order to have optimal control and influence over them, and in that way create the best results.

However, there are some limitations to this research. Three expected causal effects were not found in the way that was expected (a direct relation for the full population): the effect of productivity on happiness, the effect of happiness on productivity and the effect of workability on happiness. This doesn't necessarily mean that these relations do not exist. Even though the dataset contains 4,994 people, these people could not be representative of the population. A different data set might give other results. Besides that, the relations could be different in moderation. The effect could be present in some sectors and less in others. In this dataset the healthcare sector was well represented, but other sectors were too small to examine the effect of sector separately. As already mentioned in the results, examining the relations in moderation will probably give different results and is recommended for further research. Further, as discussed in the section about self-reports (4.3), some biases can occur when using data obtained through this method. In conducting a survey several behavioural biases can influence the behaviour of respondents. Personal bias due to possible misunderstanding of the questions, misinterpretation of the current emotional state and not being able or willing to judge one's productivity honestly, could for example influence the results. Another possible bias is, even though people were informed that the answers of their survey were private and not shared with their supervisors, the social desirability of the answer that is still likely to be of influence. Finally, prime effects and other factors in the surrounding and setting could make the outcome of the survey not completely reliable. Controlling for all of the above named influences is hard. Another limitation is the statistical method used. The Lewbel method uses generated instruments that have no conceptual value. The "best" instrument or best combination of instrument does not exist and therefore this method can seem arbitrary.

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Appendix

Appendix A: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
waitotal	4,994	41.03484	5.262962	11	49
productivity	4,994	8.823989	1.630024	0	10
happiness	4,994	11.97217	1.642530	0	10
age	4,994	44.5833	11.2210	15	68
gender	4,994	.6205447	.4853001	0	1
education	4,994	5.230877	1.161572	1	7
workyear	4,994	12.5813	10.26976	0	50
hourweek	4,994	30.69063	7.992975	1	60
dayweek	4,994	4.081898	.990593	1	7
functiontype	4,994	2.278134	.6260057	1	3
employment	4,994	1.154586	.5322863	1	6
irregular	4,994	.3259912	.4687909	0	1
sick	4,994	.0472567	.2122087	0	1
fruit	4,994	.2623148	.4399369	0	1
vegetables	4,994	.1055266	.3072616	0	1
alcohol	4,994	.6479776	.4776487	0	1
muchalcohol	4,994	.0756908	.2645293	0	1
smoking	4,994	.154185	.3611622	0	1
muchsmoking	4,994	1.988586	.1062341	0	1
sleep	4,994	.7747297	.4178021	0	1
exercise	4,994	.2989588	.4578476	0	1
meaningfulness	4,994	8.021826	1.130271	0	10
mood	4,994	7.920505	1.279915	0	10
Sector	4,994	4.830997	1.628369	1	9

Table 1: Descriptive statistics

Appendix B: OLS output

	Y= WAI	Y=WAI	Y=happ	Y= happ	Y= prod	Y=prod
happiness	1.382616***	-	-	-	.122736***	-
productivity	-	.5098035***	.0243233***	-	-	-
WAI	-	-	-	.0386257***	-	.0718665***
age	-.0521586***	-.06006***	-.0016132	.0007617	.0120677***	.0157852***
gender	-.5389675***	-.4987759***	.009991	.029	-.0564563	-.0175205*
education						
2	-.4251913	-.2516436	-.1468319	-.1407748	-.7704212*	-.7437455
3	.4756113	.3867896	-.102109	-.1175582	-.0970904	-.13372
4	1.569917**	1.376396	-.1680617	-.2216037	-.0607033	-.1775022
5	.9526622	.9271187	-.0927293	-.1295386	-.2035803	-.2743347
6	1.286913*	1.173446	-.1238689	-.1697563	-.1058101	-.2012602
7	2.085647***	1.995408**	-.0484427	-.1252905	.0546505	-.0963421
hourweek	-.0146743	-.005961	.0029886	.0031742	-.0099594*	.0088404
dayweek	.0484587	.0019042	-.0310756*	-.0311143*	.0113284	.0071239
functiontype						
2	1.527788***	1.521935***	.0129939	-.0455602	.0482766	-.061188
3	.3170611	.2762508	.0185661	.0085424	.1369174	.1146447
employment						
2	.8471427***	.6948026***	-.0484753	-.0744827**	.1845873**	.122675
3	.5639993	.0113149	-.297691*	-.2967556**	.3319562	.2846343
4	1.173987*	1.113372*	-.0055315	-.048021	.1115809	.0271445
5	5.075514***	4.031136***	-.6100691**	-.7638205**	.4954943	.1167159
6	1.226634**	.9568489	-.104689	-.1404316	.2746602	.1842087
irregular	-.2360101	-.2120054	-.0277822	-.0202005	-.1272788	-.1110414**
sick	-7.794557***	-7.580977***	-.2230991***	.0646434	-1.06567***	-.5113395***
Sector						
Industry	-.2340658	-.2963818	.007979	.0201404	.1525967	.1696922
Education	-1.000492	-.9964807	-.0590315	-.0213747	-.1720463	-.1016264
Research	-.1010771	-.343213	-.0456444	-.0306462	.3804502*	.3868612*
Health	-.2765243	-.3636876	-.0176958	-.0030382	.1334469	.152981
Wholesale and retail trade	-1.276232*	-1.112223	-.0947992	-.0547091	-.6062047**	-.5170543**
Industry	-.1387242	-.0193235	.0771183	.0777404	-.0362149	-.0244581
Government	-2.767386***	-3.213129***	-.1527576	-.0263669	.5098237*	.7054159***
Real estate	-.4323395	-.4519853	-.0148722	.0025771	-.0000943	.0306277
workyear	-.0268429***	-.02462***	.0009385	.0018803*	-.0020577	-.000107
fruit	.2786477**	.2005389	-.0324302	-.0398525*	.0736419	.0528982

vegetables	.1011483	.0631932	-.0270942	-.0295303	.0043602	-.0035416
alcohol	.425318***	.4575145***	.0157715	-.0020014	-.0236916	-.0539016
muchalcohol	-.5959966***	-.6896794***	-.0213957	.0058671	.1368405	.1792492**
smoking	.1798025	.118053	-.0440154	-.0485666	.007272	-.0066774
muchsmoking	-.3076887	-.5615712	-.1781867	-.1564225	.0376124	.0555693
sleep	1.707077***	1.918365***	.208191***	.1348375***	.1347499**	.0170254
exercise	-.5645822***	-.5087612***	.0009665	.0200878	-.1141988**	-.0736667
mood	.4957735***	1.241427***	.6194732***	.5726004***	.1560469***	.1350282***
_cons	27.04901***	28.45211***	3.310939***	2.242837***	6.240751***	4.378006***
White/Koenker nR2 test statistic	341.137***	276.618***	477.180***	485.034***	211.333***	258.814***

Table 1: OLS output, ***p<0.01; **p<0.05; *p<0.1

Appendix C: Correlations

	happin~s	waitotal
happiness	1.0000	
waitotal	0.4504	1.0000
waitota~ge_g	**0.0052**	**0.1529**
waitotal_g~g	-0.0027	0.0351
waito~on_2_g	0.0068	0.0138
waito~on_3_g	0.0157	0.0758
waito~on_4_g	-0.0209	0.0030
waito~on_5_g	-0.0073	0.0440
waito~on_6_g	0.0051	-0.0438
waitot~n_7_g	**-0.0060**	**-0.1338**
waitotal_h~g	0.0036	-0.0513
waitotal_d~g	-0.0010	-0.0339
waitot~t_2_g	**-0.0016**	**-0.1229**
waitot~t_3_g	0.0046	0.0804
waito~en_2_g	-0.0321	-0.1045
waito~en_3_g	-0.0047	-0.0178
waito~en_4_g	0.0045	-0.0165
waito~en_5_g	-0.1016	-0.4249
waito~en_6_g	-0.0092	-0.0598
waitotal_i~g	0.0366	0.1002
waitota~ck_g	**0.0474**	**0.1282**
waitot~r_2_g	0.0030	0.0361
waitot~r_3_g	-0.0059	-0.0191
waitot~r_4_g	-0.0115	-0.0858
waitot~r_5_g	0.0045	0.0311
waitot~r_6_g	0.0010	0.0270
waitot~r_7_g	0.0140	-0.0231
waitotal~8_g	0.0137	0.0649
waitotal~9_g	-0.0256	-0.0570
waitotal_w~g	**0.0230**	**0.1405**
waitotal_f~g	0.0050	-0.0497
waitotal_v~g	0.0001	0.0100
w~_alcohol_g	-0.0065	-0.0912
w~halcohol_g	0.0132	0.0031
w~_smoking_g	0.0392	0.0115
w~hsmoking_g	-0.0086	-0.0057
waitotal~p_g	-0.0261	-0.1036
waitotal_e~g	-0.0104	-0.0242
waitotal~d_g	**-0.0892**	**-0.1587**

Table 1: correlations happiness & WAI with instruments

	productivity	waitotal
productivity	1.0000	
waitotal	0.2858	1.0000
waitota~ge_g	**0.0455**	**0.1529**
waitotal_g~g	-0.0007	0.0351
waito~on_2_g	0.0009	0.0138
waito~on_3_g	0.0235	0.0758
waito~on_4_g	-0.0169	0.0030
waito~on_5_g	0.0219	0.0440
waito~on_6_g	-0.0201	-0.0438
waitot~n_7_g	**-0.0231**	**-0.1338**
waitotal_h~g	0.0063	-0.0513
waitotal_d~g	0.0282	-0.0339
waitot~t_2_g	-0.0135	-0.1229
waitot~t_3_g	0.0086	0.0804
waito~en_2_g	-0.0116	-0.1045
waito~en_3_g	-0.0319	-0.0178
waito~en_4_g	0.0086	-0.0165
waito~en_5_g	-0.0867	-0.4249
waito~en_6_g	-0.0186	-0.0598
waitotal_i~g	0.0309	0.1002
waitota~ck_g	**0.0509**	**0.1282**
waitot~r_2_g	0.0151	0.0361
waitot~r_3_g	0.0029	-0.0191
waitot~r_4_g	-0.0223	-0.0858
waitot~r_5_g	-0.0236	0.0311
waitot~r_6_g	0.0183	0.0270
waitot~r_7_g	0.0338	-0.0231
waitotal~8_g	0.0298	0.0649
waitotal~9_g	-0.0353	-0.0570
waitotal_w~g	**0.0243**	**0.1405**
waitotal_f~g	0.0143	-0.0497
waitotal_v~g	-0.0054	0.0100
w~_alcohol_g	-0.0475	-0.0912
w~halcohol_g	0.0143	0.0031
w~_smoking_g	0.0093	0.0115
w~hsmoking_g	0.0014	-0.0057
waitotal~p_g	-0.0123	-0.1036
waitotal_e~g	0.0054	-0.0242
waitotal~d_g	**-0.0615**	**-0.1587**

Table 2: correlations productivity & WAI with instruments

	waitotal	prod
waitotal	1.0000	
prod	0.2858	1.0000
prod_age_g	0.0272	-0.0810
prod_gende~g	0.0057	0.0420
prod_~on_2_g	-0.0062	0.0572
prod_~on_3_g	0.0195	-0.0206
prod_~on_4_g	-0.0086	0.0014
prod_~on_5_g	0.0046	-0.0012
prod_~on_6_g	-0.0067	0.0201
prod__Ie~7_g	-0.0010	-0.0392
prod_hourw~g	0.0127	0.0199
prod_daywe~g	0.0326	0.0240
prod__If~2_g	0.0094	-0.0270
prod__If~3_g	-0.0072	0.0317
prod_~en_2_g	-0.0133	-0.0302
prod_~en_3_g	-0.0243	-0.0121
prod_~en_4_g	0.0036	-0.0424
prod_~en_5_g	-0.0111	-0.0101
prod_~en_6_g	-0.0074	0.0097
prod_irreg~g	0.0044	0.0797
prod_sick_g	**0.0582**	**0.1798**
prod__IS~2_g	-0.0054	0.0348
prod__IS~3_g	0.0141	0.0108
prod__IS~4_g	**-0.0160**	**-0.1059**
prod__IS~5_g	-0.0339	-0.0368
prod__IS~6_g	-0.0019	0.0623
prod__IS~7_g	0.0233	0.0469
prod__IS~8_g	0.0624	0.0198
prod__IS~9_g	0.0168	0.0198
prod_worky~g	0.0054	-0.0053
prod_fruit_g	0.0029	-0.0101
prod_veget~g	0.0001	-0.0064
prod_alcoh~g	-0.0512	-0.0181
prod_mucha~g	-0.0009	-0.0461
prod_smoki~g	0.0011	0.0540
prod_muchs~g	-0.0062	0.0092
prod_sleep_g	**-0.0102**	**-0.1070**
prod_exerc~g	-0.0028	0.0843
prod_mood_g	**-0.0711**	**-0.2657**

Table 3: correlations WAI & productivity with instruments

	produc~y	happin~s
productivity	1.0000	
happiness	0.2079	1.0000
happine~ge_g	0.0374	-0.0461
happine~er_g	0.0144	0.0491
happi~on_2_g	0.0329	0.0416
happi~on_3_g	0.0226	0.0241
happi~on_4_g	-0.0165	0.0239
happi~on_5_g	-0.0091	-0.0052
happi~on_6_g	-0.0024	-0.0124
happin~n_7_g	-0.0159	-0.0455
happ~rweek_g	-0.0152	-0.0454
happ~yweek_g	0.0012	-0.0238
happin~t_2_g	-0.0188	-0.0491
happin~t_3_g	0.0051	0.0061
happi~en_2_g	0.0036	0.0181
happi~en_3_g	-0.0212	0.0022
happi~en_4_g	0.0201	-0.0309
happi~en_5_g	-0.0139	0.0076
happi~en_6_g	-0.0033	-0.0107
happin~lar_g	0.0112	0.0403
happine~ck_g	**0.0355**	**0.1121**
happin~r_2_g	-0.0059	-0.0125
happin~r_3_g	-0.0103	-0.0112
happin~r_4_g	-0.0140	-0.0658
happin~r_5_g	0.0181	0.0479
happin~r_6_g	0.0182	0.0375
happin~r_7_g	-0.0097	-0.0523
happines~8_g	0.0338	0.0428
happines~9_g	-0.0358	0.0045
happin~ear_g	0.0306	-0.0283
happines~t_g	0.0208	0.0335
happines~s_g	0.0120	0.0818
h~_alcohol_g	-0.0056	-0.0777
h~halcohol_g	-0.0009	-0.0062
h~_smoking_g	0.0207	0.0851
h~hsmoking_g	-0.0197	-0.0315
happines~p_g	**-0.0016**	**-0.1167**
happine~se_g	-0.0315	-0.0127
happines~d_g	**0.0086**	**-0.1369**

Table 4: correlations productivity & happiness with instruments

	happin~s	prod
happiness	1.0000	
prod	0.2079	1.0000
prod_age_g	0.0136	-0.0810
prod_gende~g	0.0155	0.0420
prod_~on_2_g	-0.0016	0.0572
prod_~on_3_g	0.0197	-0.0206
prod_~on_4_g	-0.0065	0.0014
prod_~on_5_g	-0.0223	-0.0012
prod_~on_6_g	0.0157	0.0201
prod__Ie~7_g	-0.0042	-0.0392
prod_hourw~g	0.0131	0.0199
prod_daywe~g	0.0086	0.0240
prod__If~2_g	0.0188	-0.0270
prod__If~3_g	-0.0102	0.0317
prod_~en_2_g	-0.0108	-0.0302
prod_~en_3_g	-0.0088	-0.0121
prod_~en_4_g	-0.0035	-0.0424
prod_~en_5_g	-0.0284	-0.0101
prod_~en_6_g	0.0041	0.0097
prod_irreg~g	-0.0109	0.0797
prod_sick_g	**0.0671**	**0.1798**
prod__IS~2_g	-0.0128	0.0348
prod__IS~3_g	0.0101	0.0108
prod__IS~4_g	**0.0035**	**-0.1059**
prod__IS~5_g	-0.0154	-0.0368
prod__IS~6_g	0.0005	0.0623
prod__IS~7_g	0.0055	0.0469
prod__IS~8_g	0.0401	0.0198
prod__IS~9_g	0.0061	0.0198
prod_worky~g	0.0231	-0.0053
prod_fruit_g	0.0191	-0.0101
prod_veget~g	-0.0100	-0.0064
prod_alcoh~g	-0.0012	-0.0181
prod_mucha~g	-0.0086	-0.0461
prod_smoki~g	0.0140	0.0540
prod_muchs~g	-0.0119	0.0092
prod_sleep_g	**0.0044**	**-0.1070**
prod_exerc~g	-0.0139	0.0843
prod_mood_g	**-0.0286**	**-0.2657**

Table 5: correlations happiness & productivity with instruments

Appendix D: Lewbel output

Regressions of workability and productivity

productivity.	Coef.
waitotal	.0663709***
age	.0154885***
gender	-.0204168
_Ieducation_2	-.7473441*
_Ieducation_3	-.1319023
_Ieducation_4	-.1701665
_Ieducation_5	-.2698436
_Ieducation_6	-.1951514
_Ieducation_7	-.0852392
hourweek	-.0089001
dayweek	.0071554
_Ifunctiont_2	-.0526838
_Ifunctiont_3	.116554
_Iemploymen_2	.1269954
_Iemploymen_3	.2855266
_Iemploymen_4	.0335748
_Iemploymen_5	.1400516
_Iemploymen_6	.1902029
irregular	-.1125738**
sick	-.5560735***
_ISector_2	.168495
_ISector_3	-.1076065
_ISector_4	.3860283*
_ISector_5	.1513511
_ISector_6	-.5249029**
_ISector_7	-.0246395
_ISector_8	.6891376***
_ISector_9	.0281384
workyear	-.0002485
fruit	.0541961
vegetables	-.0031914
alcohol	-.0514484
muchalcohol	.1758361**
smoking	-.0060234
muchsmoking	.0525273
sleep	.0280186
exercise	-.0767832
mood	.1425028***
_cons	4.553048***

Table 1: Regression WAI on productivity

Waitotal	Coef.
prod	.5932498***
age	-.0610514***
gender	-.4941533***
_Ieducation_2	-.1856539
_Ieducation_3	.3959646
_Ieducation_4	1.383203
_Ieducation_5	.9451101
_Ieducation_6	1.183574
_Ieducation_7	1.991332**
hourweek	-.005158
dayweek	.0012752
_Ifunctiont_2	1.517761***
_Ifunctiont_3	.2646007
_Iemploymen_2	.6798513***
_Iemploymen_3	-.0134105
_Iemploymen_4	1.10409
_Iemploymen_5	3.995932***
_Iemploymen_6	.9349363
irregular	-.2010672
sick	-7.489492***
_ISector_2	-.3092355
_ISector_3	-.9814747
_ISector_4	-.3745864
_ISector_5	-.3746748
_ISector_6	-1.060512
_ISector_7	-.0170847
_ISector_8	-3.25423***
_ISector_9	-.4518246
workyear	-.024455***
fruit	.1947085
vegetables	.0631066
alcohol	.4593354***
muchalcohol	-.7009127***
smoking	.1178966
muchsmoking	-.5628888
sleep	1.904948***
exercise	-.4992132***
mood	1.222003***
_cons	27.89577***

Table 2: Regression productivity on WAI

waitotal	Coef.
happiness	1.287462***
age	-.0522845***
gender	-.538145***
_Ieducation_2	-.4409934
_Ieducation_3	.4656407
_Ieducation_4	1.553736**
_Ieducation_5	.9433396
_Ieducation_6	1.274846*
_Ieducation_7	2.081151***
hourweek	-.0144122
dayweek	.0455191
_Ifunctiont_2	1.52914***
_Ifunctiont_3	.3191509
_Iemploymen_2	.8429447***
_Iemploymen_3	.5363583
_Iemploymen_4	1.173718
_Iemploymen_5	5.01844*
_Iemploymen_6	1.217281
irregular	-.2389571*
sick	-7.818324***
_ISector_2	-.2329501
_ISector_3	-1.006526
_ISector_4	-.1045502
_ISector_5	-.2779033
_ISector_6	-1.286687*
_ISector_7	-.1314481
_ISector_8	-2.780782***
_ISector_9	-.4337591
workyear	-.0267581***
fruit	.2757235**
vegetables	.0985725
alcohol	.4267682***
muchalcohol	-.5977209***
smoking	.1756186
muchsmoking	-.3246075
sleep	1.72726***
exercise	-.564755***
mood	.555258***
_cons	27.3795***

Table 3: Regression WAI on happiness

happiness	Coef.
waitotal	.0113175
age	-.0007126
gender	.0146082
_Ieducation_2	-.1586561
_Ieducation_3	-.1085264
_Ieducation_4	-.1851525
_Ieducation_5	-.1072222
_Ieducation_6	-.1394014
_Ieducation_7	-.0701195
hourweek	.0028775
dayweek	-.0309573*
_Ifunctiont_2	-.0033026
_Ifunctiont_3	.0180299
_Iemploymen_2	-.0530145
_Iemploymen_3	-.2923216*
_Iemploymen_4	-.0160683
_Iemploymen_5	-.6478642
_Iemploymen_6	-.1106461
irregular	-.0278148
sick	-.1576421
_ISector_2	.0141912
_ISector_3	-.0510903
_ISector_4	-.0347845
_ISector_5	-.0111368
_ISector_6	-.0937091
_ISector_7	.0768392
_ISector_8	-.1072544
_ISector_9	-.0097926
workyear	.001181
fruit	-.0334034
vegetables	-.0277901
alcohol	.0101887
muchalcohol	-.0110926
smoking	-.0453167
muchsmoking	-.1715381
sleep	.1894629***
exercise	.0046015
mood	.6097422***
_cons	3.112629***

Table 4: Regression happiness on wai

productivity	Coef.
happiness	.133163
age	.012081***
gender	-.0565464
_Ieducation_2	-.7686897*
_Ieducation_3	-.0959978
_Ieducation_4	-.0589303
_Ieducation_5	-.2025587
_Ieducation_6	-.1044878
_Ieducation_7	.0551432
hourweek	-.0099881*
dayweek	.0116506
_Ifunctiont_2	.0481285
_Ifunctiont_3	.1366884
_Iemploymen_2	.1850473**
_Iemploymen_3	.334985
_Iemploymen_4	.1116103
_Iemploymen_5	.5017485
_Iemploymen_6	.2756852
irregular	-.1269559**
sick	-1.063065***
_ISector_2	.1524744
_ISector_3	-.1713852
_ISector_4	.3808308*
_ISector_5	.133598
_ISector_6	-.6050591**
_ISector_7	-.0370122
_ISector_8	.5112916*
_ISector_9	.0000612
workyear	-.002067
fruit	.0739623
vegetables	.0046425
alcohol	-.0238506
muchalcohol	.1370295*
smoking	.0077305
muchsmoking	.0394663
sleep	.1325383**
exercise	-.1141798**
mood	.1495287**
_cons	6.204537***

Table 5: Regression happiness on productivity

happiness	Coef.
productivity	.0516455
age	-.0019385
gender	.0115046
_Ieducation_2	-.1252254
_Ieducation_3	-.0991049
_Ieducation_4	-.1658329
_Ieducation_5	-.0868385
_Ieducation_6	-.1205527
_Ieducation_7	-.0497775
hourweek	.0032514
dayweek	-.0312815*
_Ifunctiont_2	.0116272
_Ifunctiont_3	.0147515
_Iemploymen_2	-.0533707
_Iemploymen_3	-.3057867*
_Iemploymen_4	-.0085706
_Iemploymen_5	-.6215957*
_Iemploymen_6	-.1118637
irregular	-.0242008
sick	-.1931451***
_ISector_2	.0037704
_ISector_3	-.0541182
_ISector_4	-.0559168
_ISector_5	-.0212932
_ISector_6	-.0778679
_ISector_7	.0778513
_ISector_8	-.166215
_ISector_9	-.0148196
workyear	.0009917
fruit	-.0343392
vegetables	-.0271225
alcohol	.0163677
muchalcohol	-.0250737
smoking	-.0440667
muchsmoking	-.1786181
sleep	.2037981***
exercise	.0040928
mood	.6131134***
_cons	3.128781***

Table 6: Regression productivity on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	1305.821
Chi-sq(6) P-val = 0.0000	
Weak identification test (Kleibergen-Paap rk Wald F statistic):	74.453
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	19.28
10% maximal IV relative bias	11.12
20% maximal IV relative bias	6.76
30% maximal IV relative bias	5.15
10% maximal IV size	29.18
15% maximal IV size	16.23
20% maximal IV size	11.72
25% maximal IV size	9.38
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	5.298
Chi-sq(5) P-val =	0.3806

Table 7: Test output wai on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	73.529
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	52.689
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	0.536
Chi-sq(3) P-val =	0.9110

Table 8: Test output productivity on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	91.707
Chi-sq(5) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	30.548
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.37
10% maximal IV relative bias	10.83
20% maximal IV relative bias	6.77
30% maximal IV relative bias	5.25
10% maximal IV size	26.87
15% maximal IV size	15.09
20% maximal IV size	10.98
25% maximal IV size	8.84
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	6.593
Chi-sq(4) P-val =	0.1590

Table 9: Test output wai on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	83.274
Chi-sq(37) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	17.550
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	21.39
10% maximal IV relative bias	11.24
20% maximal IV relative bias	6.00
30% maximal IV relative bias	4.20
10% maximal IV size	102.88
15% maximal IV size	53.19
20% maximal IV size	36.36
25% maximal IV size	27.90
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	29.650
Chi-sq(36) P-val =	0.7635

Table 10: Test output happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic): 46.722
Chi-sq(3) P-val = 0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic): 175.092
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias 13.91
10% maximal IV relative bias 9.08
20% maximal IV relative bias 6.46
30% maximal IV relative bias 5.39
10% maximal IV size 22.30
15% maximal IV size 12.83
20% maximal IV size 9.54
25% maximal IV size 7.80
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.
Hansen J statistic (overidentification test of all instruments): 1.509
Chi-sq(2) P-val = 0.4702

Table 11: Test output happiness on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	73.529
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	52.689
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	1.210
Chi-sq(3) P-val =	0.7505

Table 12: Test output productivity on happiness

Appendix E: Robustness check 1

waitotal	coef
prod	.5207113***
happiness	1.211461***
age	-.0585843***
gender	-.5086431***
_Ieducation_2	-.0418342
_Ieducation_3	.5149299
_Ieducation_4	1.583289*
_Ieducation_5	1.048162
_Ieducation_6	1.328409*
_Ieducation_7	2.052122***
hourweek	-.009193
dayweek	.0392468
_Ifunctiont_2	1.504174***
_Ifunctiont_3	.248122
_Iemploymen_2	.7462946***
_Iemploymen_3	.3599929
_Iemploymen_4	1.115582*
_Iemploymen_5	4.753178***
_Iemploymen_6	1.073073*
irregular	-.173056
sick	-7.266437***
_ISector_2	-.3122671
_ISector_3	-.9177058
_ISector_4	-.3030962
_ISector_5	-.3475659
_ISector_6	-.9723577
_ISector_7	-.1116661
_ISector_8	-3.047955***
_ISector_9	-.4338904
workyear	-.0256759***
fruit	.2370058*
vegetables	.0959748
alcohol	.439289***
muchalcohol	-.6691944***
smoking	.1713003
muchsmoking	-.3463424
sleep	1.659658***
exercise	-.5053124***
mood	.4815608***
_cons	24.17186***

Table 1: wai as dependent

Happiness	Coef.
waitotal	.0089247
prod	.0428749
age	-.0013522
gender	.0157222
_Ieducation_2	-.1263173
_Ieducation_3	-.1030209
_Ieducation_4	-.178461
_Ieducation_5	-.0960227
_Ieducation_6	-.1315376
_Ieducation_7	-.0673796
hourweek	.003264
dayweek	-.0312667*
_Ifunctiont_2	-.0017444
_Ifunctiont_3	.0128754
_Iemploymen_2	-.0588154
_Iemploymen_3	-.304637*
_Iemploymen_4	-.0180376
_Iemploymen_5	-.6557916*
_Iemploymen_6	-.1192949
irregular	-.022862
sick	-.1301148
_ISector_2	.0070656
_ISector_3	-.045984
_ISector_4	-.0512668
_ISector_5	-.0174917
_ISector_6	-.0705573
_ISector_7	.0779106
_ISector_8	-.13546
_ISector_9	-.0107939
workyear	.0012032
fruit	-.035834
vegetables	-.0276821
alcohol	.0121924
muchalcohol	-.0183504
smoking	-.0451123
muchsmoking	-.1735396
sleep	.1873559***
exercise	.0081504
mood	.6030165***
_cons	2.902995***

Table 2: happiness as dependent

productivity	Coef.
happiness	.0408334
waitotal	.0640035***
age	.0154148***
gender	-.0220174
_Ieducation_2	-.7421131*
_Ieducation_3	-.1268407
_Ieducation_4	-.160063
_Ieducation_5	-.2639084
_Ieducation_6	-.1873414
_Ieducation_7	-.0785269
hourweek	-.0090383
dayweek	.0084305
_Ifunctiont_2	-.0496008
_Ifunctiont_3	.1164797
_Iemploymen_2	.1306579*
_Iemploymen_3	.2977724
_Iemploymen_4	.0364602
_Iemploymen_5	.174596
_Iemploymen_6	.196799
irregular	-.1119692**
sick	-.5651445***
_ISector_2	.1675005
_ISector_3	-.1075935
_ISector_4	.38716*
_ISector_5	.1512409
_ISector_6	-.5237973**
_ISector_7	-.02784
_ISector_8	.6878739***
_ISector_9	.0276753
workyear	-.0003455
fruit	.05601
vegetables	-.0019353
alcohol	-.0510139
muchalcohol	.1751059**
smoking	-.0039462
muchsmoking	.0584773
sleep	.0240932
exercise	-.0780516
mood	.1201962*
_cons	4.486631***

Table 3: productivity as dependent

Underidentification test (Kleibergen-Paap rk LM statistic):	115.190
Chi-sq(40) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	15.341
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	20.99
10% maximal IV relative bias	11.01
20% maximal IV relative bias	5.89
30% maximal IV relative bias	4.12
10% maximal IV size	82.05
15% maximal IV size	43.09
20% maximal IV size	30.00
25% maximal IV size	23.32
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	28.964
Chi-sq(39) P-val =	0.8799

Table 4: Test output for wai as dependent

Underidentification test (Kleibergen-Paap rk LM statistic):	57.625
Chi-sq(8) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	57.947
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.30
10% maximal IV relative bias	10.43
20% maximal IV relative bias	6.22
30% maximal IV relative bias	4.69
10% maximal IV size	27.51
15% maximal IV size	15.24
20% maximal IV size	11.03
25% maximal IV size	8.85
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	6.621
Chi-sq(7) P-val =	0.4693

Table 5: Test output for happiness as dependent

Underidentification test (Kleibergen-Paap rk LM statistic):	107.245
Chi-sq(8) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	18.552
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.30
10% maximal IV relative bias	10.43
20% maximal IV relative bias	6.22
30% maximal IV relative bias	4.69
10% maximal IV size	27.51
15% maximal IV size	15.24
20% maximal IV size	11.03
25% maximal IV size	8.85
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	7.535
Chi-sq(7) P-val =	0.3754

Table 6: Test output for productivity as dependent

Appendix F: Robustness check 2: Without mood

productivity.	Coef
waitotal	.0683719***
age	.0168293***
gender	-.0190601
_Ieducation_2	-.7470668*
_Ieducation_3	-.1856047
_Ieducation_4	-.2587833
_Ieducation_5	-.3387346
_Ieducation_6	-.2714943
_Ieducation_7	-.1543132
hourweek	-.0085727
dayweek	.0046348
_Ifunctiont_2	-.0835457
_Ifunctiont_3	.0906149
_Iemploymen_2	.11725
_Iemploymen_3	.256652
_Iemploymen_4	.0639263
_Iemploymen_5	-.0585486
_Iemploymen_6	.1885725
irregular	-.1098221**
sick	-.6484788***
_ISector_2	.2033152
_ISector_3	-.1023794
_ISector_4	.3951541*
_ISector_5	.1621496
_ISector_6	-.5136772**
_ISector_7	-.0085014
_ISector_8	.6770247***
_ISector_9	.0273538
workyear	-.0006581
fruit	.0422752
vegetables	-.0417836
alcohol	-.0569758
muchalcohol	.1418232*
smoking	-.0198322
muchsmoking	.1165593
sleep	.1097868*
exercise	-.1059156**
_cons	5.466554***

Table 1: regression of wai on productivity

productivity.	Coef
happiness	.074085
age	.0136477***
gender	-.0556327
_Ieducation_2	-.7798785*
_Ieducation_3	-.1729413
_Ieducation_4	-.1836232
_Ieducation_5	-.2980622
_Ieducation_6	-.2108503
_Ieducation_7	-.0343966
hourweek	-.0094176
dayweek	.0064784
_Ifunctiont_2	.0119305
_Ifunctiont_3	.104312
_Iemploymen_2	.1715396**
_Iemploymen_3	.2797402
_Iemploymen_4	.1550538
_Iemploymen_5	.2127255
_Iemploymen_6	.2706142
irregular	-.1258593**
sick	-1.222812***
_ISector_2	.1990339
_ISector_3	-.171063
_ISector_4	.3904432*
_ISector_5	.1463546
_ISector_6	-.6003877**
_ISector_7	-.0110555
_ISector_8	.4789104*
_ISector_9	-.0030759
workyear	-.0026291
fruit	.0568754
vegetables	-.0482664
alcohol	-.0291319
muchalcohol	.0889299
smoking	-.0129697
muchsmoking	.1128998
sleep	.2594825**
exercise	-.1546618***
_cons	7.713305***

Table 2: regression of happiness on productivity

waitotal	Coef.
happiness	1.774039 ***
age	-.0494261 ***
gender	-.541808 ***
_Ieducation_2	-.3620446
_Ieducation_3	.4213518
_Ieducation_4	1.482097 *
_Ieducation_5	.8702032
_Ieducation_6	1.203418
_Ieducation_7	1.987332 **
hourweek	-.0152034
dayweek	.0560436
_Ifunctiont_2	1.472352 ***
_Ifunctiont_3	.2631204
_Iemploymen_2	.8497317 ***
_Iemploymen_3	.6264188
_Iemploymen_4	1.233817 *
_Iemploymen_5	4.968819 ***
_Iemploymen_6	1.266104 **
irregular	-.2199471
sick	-7.892034***
_ISector_2	-.1768927
_ISector_3	-.970196
_ISector_4	-.0709429
_ISector_5	-.2525206
_ISector_6	-1.218195 *
_ISector_7	-.1397851
_ISector_8	-2.744687 ***
_ISector_9	-.4295374
workyear	-.0280195***
fruit	.2701123 **
vegetables	.0426516
alcohol	.4110283 ***
muchalcohol	-.6522313 ***
smoking	.172637
muchsmoking	-.125065
sleep	1.778122***
exercise	-.6182384 ***
_cons	27.44493 ***

Table 3: regression of happiness on wai

waitotal	Coef.
prod	.6343068***
Age	-.0508475***
gender	-.4892582***
_Ieducation_2	-.1621457
_Ieducation_3	-.0595883
_Ieducation_4	.6410677
_Ieducation_5	.3705941
_Ieducation_6	.5456612
_Ieducation_7	1.425253
hourweek	-.0021115
dayweek	-.0207982
_Ifunctiont_2	1.274873***
_Ifunctiont_3	.039906
_Iemploymen_2	.6016097***
_Iemploymen_3	-.273212
_Iemploymen_4	1.383097*
_Iemploymen_5	2.329676
_Iemploymen_6	.9289438
irregular	-.1766576
sick	-8.387275***
_ISector_2	-.0173143
_ISector_3	-.947639
_ISector_4	-.3134972
_ISector_5	-.2915637
_ISector_6	-.9624869
_ISector_7	.1234241
_ISector_8	-3.430929***
_ISector_9	-.4664132
workyear	-.0283726***
fruit	.0925382
vegetables	-.2705736
alcohol	.4200351***
muchalcohol	-1.012243***
smoking	.0001092
muchsmoking	-.0177382
sleep	2.642314***
exercise	-.7570486***
_cons	36.09851***

Table 4: regression of productivity on wai

happiness	Coef.
prod	.0257558
age	.00383*
gender	.0114087
_Ieducation_2	-.1502744
_Ieducation_3	-.3368864*
_Ieducation_4	-.548629***
_Ieducation_5	-.3903195**
_Ieducation_6	-.4519924**
_Ieducation_7	-.3365588*
hourweek	.0043563
dayweek	-.0422003
_Ifunctiont_2	-.1100604*
_Ifunctiont_3	-.0934479
_Iemploymen_2	-.0849299
_Iemploymen_3	-.4245718*
_Iemploymen_4	.139117
_Iemploymen_5	-1.452708
_Iemploymen_6	-.1026197
irregular	-.0178777
sick	-.7029699***
_ISector_2	.1600584
_ISector_3	-.0452659
_ISector_4	-.007105
_ISector_5	.0273171
_ISector_6	-.0568469
_ISector_7	.1483455
_ISector_8	-.2333686
_ISector_9	-.0223596
workyear	-.0011001
fruit	-.083239**
vegetables	-.1974689***
alcohol	-.0047236
muchalcohol	-.1777481***
smoking	-.1041273**
muchsmoking	.1005049
sleep	.5878702***
exercise	-.1329331***
_cons	7.629928***

Table 5: regression of productivity on happiness

happiness	Coef.
waitotal	.0283251 *
age	.005379***
gender	.0248395
_Ieducation_2	-.1518546
_Ieducation_3	-.336743*
_Ieducation_4	-.5685375***
_Ieducation_5	-.4033683**
_Ieducation_6	-.4693551**
_Ieducation_7	-.3773923**
hourweek	.0043452
dayweek	-.041585
_Ifunctiont_2	-.1461419**
_Ifunctiont_3	-.0938183
_Iemploymen_2	-.100681*
_Iemploymen_3	-.4148954*
_Iemploymen_4	.1012311
_Iemploymen_5	-1.517876*
_Iemploymen_6	-.1268796
irregular	-.0138664
sick	-.4753486***
_ISector_2	.1621946
_ISector_3	-.0197851
_ISector_4	.0048177
_ISector_5	.0367336
_ISector_6	-.0343026
_ISector_7	.144849
_ISector_8	-.1325847
_ISector_9	-.0091853
workyear	-.0003176
fruit	-.0854644**
vegetables	-.1902957 ***
alcohol	-.0168512
muchalcohol	-.148485***
smoking	-.1042919**
muchsmoking	.1019465
sleep	.5153912
exercise	-.1127735
_cons	6.672039

Table 6: regression of wai on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	1171.703
Chi-sq(6) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	51.746
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	19.28
10% maximal IV relative bias	11.12
20% maximal IV relative bias	6.76
30% maximal IV relative bias	5.15
10% maximal IV size	29.18
15% maximal IV size	16.23
20% maximal IV size	11.72
25% maximal IV size	9.38
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	5.173
Chi-sq(5) P-val =	0.3951

Table 7: Test output for wai on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	26.462
Chi-sq(3) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	17.104
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	2.319
Chi-sq(2) P-val =	0.3136

Table 8: Test output for happiness on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	57.714
Chi-sq(36) P-val =	0.0123
Weak identification test (Kleibergen-Paap rk Wald F statistic):	7.881
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	21.39
10% maximal IV relative bias	11.25
20% maximal IV relative bias	6.01
30% maximal IV relative bias	4.22
10% maximal IV size	100.50
15% maximal IV size	51.99
20% maximal IV size	35.55
25% maximal IV size	27.29
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	30.769
Chi-sq(35) P-val =	0.6726

Table 9: Test output for productivity on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	62.934
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	57.143
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	2.632
Chi-sq(3) P-val =	0.4518

Table 10: Test output for productivity on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	61.360
Chi-sq(3) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	54.074
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	0.783
Chi-sq(2) P-val =	0.6762

Table 11: Test output for happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	87.499
Chi-sq(5) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	30.546
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.37
10% maximal IV relative bias	10.83
20% maximal IV relative bias	6.77
30% maximal IV relative bias	5.25
10% maximal IV size	26.87
15% maximal IV size	15.09
20% maximal IV size	10.98
25% maximal IV size	8.84
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	7.323
Chi-sq(4) P-val =	0.1198

Table 12: Test output for wai on happiness

Appendix G: Robustness check 3: No health habits

productivity	Coef.
waitotal	.0656005***
age	.0153692***
gender	-.0380384
_Ieducation_2	-.7272228*
_Ieducation_3	-.1133044
_Ieducation_4	-.1513006
_Ieducation_5	-.2562393
_Ieducation_6	-.1860746
_Ieducation_7	-.0757265
hourweek	-.0091193*
dayweek	.008327
_Ifunctiont_2	-.0589501
_Ifunctiont_3	.108132
_Iemploymen_2	.1327638*
_Iemploymen_3	.266672
_Iemploymen_4	.0486985
_Iemploymen_5	.1581998
_Iemploymen_6	.1996867
irregular	-.1156593**
sick	-.5637735***
_ISector_2	.1518899
_ISector_3	-.1194665
_ISector_4	.362069*
_ISector_5	.1468766
_ISector_6	-.527996**
_ISector_7	-.0429949
_ISector_8	.6851099***
_ISector_9	.0203795
workyear	-.0000583
mood	.1459587***
_cons	4.673337***

Table 1: regression of wai on productivity

productivity	Coef.
happiness	.0757741
age	.0141222***
gender	-.0692992
_Ieducation_2	-.7846608*
_Ieducation_3	-.1441735
_Ieducation_4	-.1485382
_Ieducation_5	-.2679495
_Ieducation_6	-.1785262
_Ieducation_7	-.0054564
hourweek	-.0105626*
dayweek	.0107331
_Ifunctiont_2	.0049599
_Ifunctiont_3	.0945493
_Iemploymen_2	.1783136**
_Iemploymen_3	.2709636
_Iemploymen_4	.1827385
_Iemploymen_5	.1354692
_Iemploymen_6	.3233116
irregular	-.1379313**
sick	-1.239471***
_ISector_2	.1751892
_ISector_3	-.1718472
_ISector_4	.3576112
_ISector_5	.1464046
_ISector_6	-.6117918**
_ISector_7	-.0089815
_ISector_8	.4667378
_ISector_9	-.0266144
workyear	-.0021541
_cons	8.061572***

Table 2: regression of productivity on happiness

waitotal	Coef.
happiness	1.373156***
age	-.0517066 ***
gender	-.63091 ***
_Ieducation_2	-.5713285
_Ieducation_3	.6832345
_Ieducation_4	1.814332**
_Ieducation_5	1.176816
_Ieducation_6	1.535462*
_Ieducation_7	2.249008***
hourweek	-.0202997
dayweek	.0861051
_Ifunctiont_2	1.572691***
_Ifunctiont_3	.3422603
_Iemploymen_2	.9120685***
_Iemploymen_3	.570451
_Iemploymen_4	1.226984*
_Iemploymen_5	4.474949***
_Iemploymen_6	1.430971***
irregular	-.2913958*
sick	-7.834347***
_ISector_2	-.3364537
_ISector_3	-.9818912
_ISector_4	-.2147081
_ISector_5	-.2737728
_ISector_6	-1.288072
_ISector_7	-.0119474
_ISector_8	-2.707195***
_ISector_9	-.4772158
workyear	-.0246246***
mood	.640042***
_cons	26.6603***

Table 3: regression of happiness on wai

waitotal	Coef.
prod	.5933533***
age	-.0599177***
gender	-.571859***
_Ieducation_2	-.3601702
_Ieducation_3	.5899174
_Ieducation_4	1.622834*
_Ieducation_5	1.167198
_Ieducation_6	1.439885*
_Ieducation_7	2.163633**
hourweek	-.0112107
dayweek	.0396383
_Ifunctiont_2	1.571851***
_Ifunctiont_3	.2926985
_Iemploymen_2	.7398698***
_Iemploymen_3	.0202858
_Iemploymen_4	1.162635
_Iemploymen_5	3.349059***
_Iemploymen_6	1.157108*
irregular	-.2636542*
sick	-7.521355***
_ISector_2	-.39632
_ISector_3	-.9365424
_ISector_4	-.4638703
_ISector_5	-.3592282
_ISector_6	-1.078348
_ISector_7	.1490513
_ISector_8	-3.193036***
_ISector_9	-.4993274
workyear	-.0221084***
mood	1.375505***
_cons	26.95034***

Table 4: regression of productivity on wai

happiness	Coef.
prod	.0525795
age	-.0014626
gender	.013168
_Ieducation_2	-.1427355
_Ieducation_3	-.0974199
_Ieducation_4	-.1571666
_Ieducation_5	-.0779564
_Ieducation_6	-.1057842
_Ieducation_7	-.036028
hourweek	.0027275
dayweek	-.0295242
_Ifunctiont_2	.0168286
_Ifunctiont_3	.0141906
_Iemploymen_2	-.0538083
_Iemploymen_3	-.2948229*
_Iemploymen_4	.0024873
_Iemploymen_5	-.6706959
_Iemploymen_6	-.090609
irregular	-.0323013
sick	-.1895442***
_ISector_2	.0061169
_ISector_3	-.038414
_ISector_4	-.0504877
_ISector_5	-.0135372
_ISector_6	-.0837103
_ISector_7	.1041297
_ISector_8	-.1659809
_ISector_9	-.0209903
workyear	.0012367
mood	.6288733***
_cons	2.754843***

Table 5: regression of productivity on happiness

happiness	Coef.
waitotal	.0111918
age	-.0002452
gender	.0159568
_Ieducation_2	-.1745947
_Ieducation_3	-.1075882
_Ieducation_4	-.1774725
_Ieducation_5	-.0996076
_Ieducation_6	-.1262784
_Ieducation_7	-.0570783
hourweek	.0023819
dayweek	-.0294455
_Ifunctiont_2	.0013477
_Ifunctiont_3	.0170012
_Iemploymen_2	-.0534228
_Iemploymen_3	-.2822396*
_Iemploymen_4	-.0045513
_Iemploymen_5	-.6901147*
_Iemploymen_6	-.090386
irregular	-.0357057
sick	-.1558987
_ISector_2	.01657
_ISector_3	-.0365794
_ISector_4	-.029444
_ISector_5	-.0036226
_ISector_6	-.1002608
_ISector_7	.1008738
_ISector_8	-.1075094
_ISector_9	-.0159935
workyear	.001412
mood	.6247687***
_cons	2.761108***

Table 6: regression of happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	1291.551
Chi-sq(6) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	69.348
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	19.28
10% maximal IV relative bias	11.12
20% maximal IV relative bias	6.76
30% maximal IV relative bias	5.15
10% maximal IV size	29.18
15% maximal IV size	16.23
20% maximal IV size	11.72
25% maximal IV size	9.38
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	5.112
Chi-sq(5) P-val =	0.4023

Table 7: test output wai on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	23.353
Chi-sq(3) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	14.274
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	2.555
Chi-sq(2) P-val =	0.2787

Table 8: test output happiness on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	72.218
Chi-sq(29) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	18.228
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	21.42
10% maximal IV relative bias	11.33
20% maximal IV relative bias	6.11
30% maximal IV relative bias	4.31
10% maximal IV size	83.79
15% maximal IV size	43.57
20% maximal IV size	29.92
25% maximal IV size	23.04
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	23.530
Chi-sq(28) P-val =	0.7061

Table 9: test output happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	72.775
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	52.723
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	0.411
Chi-sq(3) P-val =	0.9379

Table 10: test output productivity on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	72.775
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	52.723
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	1.090
Chi-sq(3) P-val =	0.7796

Table 11: test output productivity on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	92.948
Chi-sq(5) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	30.681
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.37
10% maximal IV relative bias	10.83
20% maximal IV relative bias	6.77
30% maximal IV relative bias	5.25
10% maximal IV size	26.87
15% maximal IV size	15.09
20% maximal IV size	10.98
25% maximal IV size	8.84
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	6.459
Chi-sq(4) P-val =	0.1674

Table 12: test output wai on happiness

Appendix H: Robustness check 4: Without sick

productivity	Coef.
happiness	.1675241
age	.011303***
gender	-.0547955
_Ieducation_2	-.8592351**
_Ieducation_3	-.1640745
_Ieducation_4	-.0739675
_Ieducation_5	-.2547661
_Ieducation_6	-.1466127
_Ieducation_7	.016073
hourweek	-.0091994
dayweek	.0044667
_Ifunctiont_2	.0320434
_Ifunctiont_3	.1243411
_Iemploymen_2	.1964578**
_Iemploymen_3	.3495731
_Iemploymen_4	.1361891
_Iemploymen_5	.6337905
_Iemploymen_6	.277378
irregular	-.1302394**
_ISector_2	.100534
_ISector_3	-.2199689
_ISector_4	.3403192
_ISector_5	.090817
_ISector_6	-.6442103**
_ISector_7	-.0784552
_ISector_8	.4265768
_ISector_9	-.0371343
workyear	-.0022353
fruit	.0875476*
vegetables	.029765
alcohol	.0085022
muchalcohol	.1538357*
smoking	-.0085273
muchsmoking	.0751727
sleep	.1236908*
exercise	-.1112418**
mood	.1522922**
_cons	5.910735***

Table 1: regression of productivity on happiness

productivity	Coef.
waitotal	.0695279***
age	.0165021***
gender	-.0171607
_Ieducation_2	-.80569*
_Ieducation_3	-.2352023
_Ieducation_4	-.2814008
_Ieducation_5	-.3803352
_Ieducation_6	-.3084919
_Ieducation_7	-.1879275
hourweek	-.0079868
dayweek	-.00069
_Ifunctiont_2	-.0975943
_Ifunctiont_3	.0806606
_Iemploymen_2	.1216542
_Iemploymen_3	.256573
_Iemploymen_4	.0807764
_Iemploymen_5	-.0129954
_Iemploymen_6	.1863265
irregular	-.1119679**
_ISector_2	.1751113
_ISector_3	-.1320946
_ISector_4	.3704489*
_ISector_5	.1368122
_ISector_6	-.5376649**
_ISector_7	-.0308337
_ISector_8	.6235696**
_ISector_9	.0044913
workyear	-.0007574
fruit	.0486248
vegetables	-.0306333
alcohol	-.0376861
muchalcohol	.1491391*
smoking	-.0322105
muchsmoking	.1414419
sleep	.1147114*
exercise	-.1063816**
_cons	5.41568***

Table 2: regression of wai on productivity

waitotal	Coef.
happiness	1.657246***
age	-.057832***
gender	-.5263368***
_Ieducation_2	-1.084799
_Ieducation_3	-.0207748
_Ieducation_4	1.463632*
_Ieducation_5	.5723912
_Ieducation_6	.9811739
_Ieducation_7	1.800469**
hourweek	-.0089584
dayweek	-.0034692
_Ifunctiont_2	1.409611***
_Ifunctiont_3	.2260924
_Iemploymen_2	.9317541***
_Iemploymen_3	.6775273
_Iemploymen_4	1.354135**
_Iemploymen_5	6.056677***
_Iemploymen_6	1.241286**
irregular	-.2593596
_ISector_2	-.6148898
_ISector_3	-1.355004**
_ISector_4	-.3970616
_ISector_5	-.5896392
_ISector_6	-1.560571**
_ISector_7	-.4441168
_ISector_8	-3.384853***
_ISector_9	-.7045219
workyear	-.0280965 ***
fruit	.3788866 ***
vegetables	.2858347
alcohol	.662011***
muchalcohol	-.4724469**
smoking	.0616912
muchsmoking	-.0420096
sleep	1.637402***
exercise	-.5430139***
mood	.5017224 ***
_cons	24.81695***

Table 3: regression of happiness on wai

happiness	Coef.
waitotal	.0116337
age	-.0008167
gender	.0150759
_Ieducation_2	-.1726036
_Ieducation_3	-.1191716
_Ieducation_4	-.1886451
_Ieducation_5	-.1156531
_Ieducation_6	-.1465884
_Ieducation_7	-.0767425
hourweek	.0030109
dayweek	-.0321717*
_Ifunctiont_2	-.0060854
_Ifunctiont_3	.0162153
_Iemploymen_2	-.051808
_Iemploymen_3	-.2916955*
_Iemploymen_4	-.012838
_Iemploymen_5	-.6328199**
_Iemploymen_6	-.1112387
irregular	-.028366
_ISector_2	.0066812
_ISector_3	-.0582112
_ISector_4	-.0408785
_ISector_5	-.0174075
_ISector_6	-.0995702
_ISector_7	.0711415
_ISector_8	-.1194872
_ISector_9	-.0151946
workyear	.0011688
fruit	-.0316356
vegetables	-.0242526
alcohol	.0148823
muchalcohol	-.0085164
smoking	-.0479673
muchsmoking	-.1670107
sleep	.1886012***
exercise	.0052037
mood	.6128774***
_cons	3.076903***

Table 4: regression of productivity on wai

Happiness	Coef.
prod	.0567702
age	-.002146*
gender	.0121526
_Ieducation_2	-.1382899
_Ieducation_3	-.1112883
_Ieducation_4	-.1691281
_Ieducation_5	-.0956167
_Ieducation_6	-.128197
_Ieducation_7	-.0572647
hourweek	.0034578
dayweek	-.0327865
_Ifunctiont_2	.0085972
_Ifunctiont_3	.0119745
_Iemploymen_2	-.0525293
_Iemploymen_3	-.3064859*
_Iemploymen_4	-.0047869
_Iemploymen_5	-.6039409*
_Iemploymen_6	-.113509
irregular	-.0243023
_ISector_2	-.0061843
_ISector_3	-.0622241
_ISector_4	-.065271
_ISector_5	-.0296646
_ISector_6	-.0823262
_ISector_7	.071086
_ISector_8	-.1846648
_ISector_9	-.0215157
workyear	.0009772
fruit	-.0324691
vegetables	-.0228255
alcohol	.0223262
muchalcohol	-.0228856
smoking	-.0472362
muchsmoking	-.1734356
sleep	.2026968***
exercise	.0051906
mood	.6162319***
_cons	3.063589***

Table 5: regression of productivity on happiness

waitotal	Coef.
prod	.7904569***
age	-.0690824***
gender	-.4691036***
_Ieducation_2	-.6935972
_Ieducation_3	-.0767449
_Ieducation_4	1.255269
_Ieducation_5	.6043087
_Ieducation_6	.8868966
_Ieducation_7	1.701012**
hourweek	.0028326
dayweek	-.0570833
_Ifunctiont_2	1.400317***
_Ifunctiont_3	.1571073
_Iemploymen_2	.7127652***
_Iemploymen_3	-.0400686
_Iemploymen_4	1.251016**
_Iemploymen_5	4.681337***
_Iemploymen_6	.8715287
Irregular	-.2052059
_ISector_2	-.6950919
_ISector_3	-1.296145**
_ISector_4	-.7368093
_ISector_5	-.6991568
_ISector_6	-1.23439*
_ISector_7	-.2795236
_ISector_8	-3.969048***
_ISector_9	-.7115369
workyear	-.0250206***
fuit	.2673503*
vegetables	.2297689
alcohol	.6904038***
muchalcohol	-.6158344***
smoking	-.0050322
muchsmoking	-.3618587
sleep	1.862485***
exercise	-.4568135***
mood	1.34332***
_cons	25.37764***

Table 6: regression of happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	46.427
Chi-sq(3) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	178.402
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
Hansen J statistic (overidentification test of all instruments):	0.935
Chi-sq(2) P-val =	0.6265

Table 7: test output happiness on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	1160.630
Chi-sq(6) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	30.820
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	19.28
10% maximal IV relative bias	11.12
20% maximal IV relative bias	6.76
30% maximal IV relative bias	5.15
10% maximal IV size	29.18
15% maximal IV size	16.23
20% maximal IV size	11.72
25% maximal IV size	9.38
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	4.892
Chi-sq(5) P-val = 0	.4291

Table 8: test output wai on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	77.596
Chi-sq(36) P-val =	0.0001
Weak identification test (Kleibergen-Paap rk Wald F statistic):	16.850
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	21.39
10% maximal IV relative bias	11.25
20% maximal IV relative bias	6.01
30% maximal IV relative bias	4.22
10% maximal IV size	100.50
15% maximal IV size	51.99
20% maximal IV size	35.55
25% maximal IV size	27.29
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	31.345
Chi-sq(35) P-val =	0.6453

Table 9: test output happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	69.568
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	50.529
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	1.438
Chi-sq(3) P-val =	0.6966

Table 10: test output productivity on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	69.568
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	50.529
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	1.187
Chi-sq(3) P-val =	0.7561

Table 11: test output productivity on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	84.491
Chi-sq(5) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	20.051
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.37
10% maximal IV relative bias	10.83
20% maximal IV relative bias	6.77
30% maximal IV relative bias	5.25
10% maximal IV size	26.87
15% maximal IV size	15.09
20% maximal IV size	10.98
25% maximal IV size	8.84
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	6.629
Chi-sq(4) P-val =	0.1569

Table 12: test output wai on happiness

Appendix I: Robustness check 5: General controls

productivity.	Coef
waitotal	.0694267***
age	.0157978***
gender	.0454112
_Ieducation_2	-.7707859*
_Ieducation_3	-.234064
_Ieducation_4	-.265842
_Ieducation_5	-.3536107
_Ieducation_6	-.3311808
_Ieducation_7	-.2079227
_cons	5.558603***

Table 1: regression of wai on productivity

productivity	Coef.
happiness	.1108187
age	.0110211***
gender	-.0106246
_Ieducation_2	-.8394381**
_Ieducation_3	-.2013081
_Ieducation_4	-.107717
_Ieducation_5	-.2662805
_Ieducation_6	-.1995239
_Ieducation_7	.0114019
_cons	7.656181***

Table 2: regression of productivity on happiness

waitotal	Coef.
happiness	1.488577**
age	-.0682257***
gender	-.8033083***
_Ieducation_2	-1.020499
_Ieducation_3	.4257064
_Ieducation_4	2.210794**
_Ieducation_5	1.205034
_Ieducation_6	1.839215**
_Ieducation_7	3.113621***
_cons	31.09962***

Table 3: regression of happiness on wai

waitotal	Coef. Std.
prod	.8720158***
age	-.0703756***
gender	-.7447327***
_Ieducation_2	-.6979014
_Ieducation_3	.005025
_Ieducation_4	1.4409
_Ieducation_5	.7537941
_Ieducation_6	1.274301
_Ieducation_7	2.515699***
_cons	35.89249***

Table 4: regression of productivity on wai

happiness	Coef.
prod	.0484242
age	.0047974***
gender	.0357503
_Ieducation_2	-.251898
_Ieducation_3	-.4162942**
_Ieducation_4	-.6120441 ***
_Ieducation_5	-.4754693**
_Ieducation_6	-.5183321***
_Ieducation_7	-.4207024 **
_cons	7.824736***

Table 5: regression of productivity on happiness

happiness	Coef.
waitotal	.028403*
age	.007071***
gender	.0567445*
_Ieducation_2	-.2527046 .
_Ieducation_3	-.422322**
_Ieducation_4	-.6571451***
_Ieducation_5	-.5044657 ***
_Ieducation_6	-.5606377***
_Ieducation_7	-.4929935***
_cons	7.007999***

Table 6: regression of happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	926.680
Chi-sq(6) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	26.405
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	19.28
10% maximal IV relative bias	11.12
20% maximal IV relative bias	6.76
30% maximal IV relative bias	5.15
10% maximal IV size	29.18
15% maximal IV size	16.23
20% maximal IV size	11.72
25% maximal IV size	9.38
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	5.004
Chi-sq(5) P-val =	0.4154

Table 7: test output wai on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	20.182
Chi-sq(3) P-val =	0.0002
Weak identification test (Kleibergen-Paap rk Wald F statistic):	10.782
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	2.124
Chi-sq(2) P-val =	0.3457

Table 8: test output happiness on productivity

Underidentification test (Kleibergen-Paap rk LM statistic):	20.182
Chi-sq(3) P-val =	0.0002
Weak identification test (Kleibergen-Paap rk Wald F statistic):	10.782
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	4.581
Chi-sq(2) P-val =	0.1012

Table 9: test output happiness on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	55.164
Chi-sq(4) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	47.240
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	16.85
10% maximal IV relative bias	10.27
20% maximal IV relative bias	6.71
30% maximal IV relative bias	5.34
10% maximal IV size	24.58
15% maximal IV size	13.96
20% maximal IV size	10.26
25% maximal IV size	8.31
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	1.300
Chi-sq(3) P-val =	0.7292

Table 10: test output productivity on wai

Underidentification test (Kleibergen-Paap rk LM statistic):	55.164
Chi-sq(3) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	52.273
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	1.435
Chi-sq(2) P-val =	0.4880

Table 11: test output productivity on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	80.794
Chi-sq(5) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	19.842
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.37
10% maximal IV relative bias	10.83
20% maximal IV relative bias	6.77
30% maximal IV relative bias	5.25
10% maximal IV size	26.87
15% maximal IV size	15.09
20% maximal IV size	10.98
25% maximal IV size	8.84
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	4.744
Chi-sq(4) P-val =	0.3146

Table 12: test output wai on happiness

Appendix J: Mediation

productivity	Coef.
happiness	.122736***
age	.0120677***
gender	-.0564563
_Ieducation_2	-.7704212
_Ieducation_3	-.0970904
_Ieducation_4	-.0607033
_Ieducation_5	-.2035803
_Ieducation_6	-.1058101
_Ieducation_7	.0546505
hourweek	-.0099594*
dayweek	.0113284
_Ifunctiont_2	.0482766
_Ifunctiont_3	.1369174
_Iemploymen_2	.1845873**
_Iemploymen_3	.3319562
_Iemploymen_4	.1115809
_Iemploymen_5	.4954943
_Iemploymen_6	.2746602
irregular	-.1272788**
sick	-1.06567***
_ISector_2	.1525967
_ISector_3	-.1720463
_ISector_4	.3804502
_ISector_5	.1334469
_ISector_6	-.6062047**
_ISector_7	-.0362149
_ISector_8	.5098237*
_ISector_9	-.0000943
workyear	-.0020577
fruit	.0736419
vegetables	.0043602
alcohol	-.0236916
muchalcohol	.1368405
smoking	.007272
muchsmoking	.0376124
sleep	.1347499**
exercise	-.1141988**
mood	.1560469***
_cons	6.240751***

Table 1: dv regressed on iv (path c)

waitotal	Coef.
happiness	1.382616***
age	-.0521586***
gender	-.5389675***
_Ieducation_2	-.4251913
_Ieducation_3	.4756113
_Ieducation_4	1.569917**
_Ieducation_5	.9526622
_Ieducation_6	1.286913*
_Ieducation_7	2.085647***
hourweek	-.0146743
dayweek	.0484587
_Ifunctiont_2	1.527788***
_Ifunctiont_3	.3170611
_Iemploymen_2	.8471427***
_Iemploymen_3	.5639993
_Iemploymen_4	1.173987
_Iemploymen_5	5.075514*
_Iemploymen_6	1.226634
irregular	-.2360101*
sick	-7.794557***
_ISector_2	-.2340658
_ISector_3	-1.000492
_ISector_4	-.1010771
_ISector_5	-.2765243
_ISector_6	-1.276232*
_ISector_7	-.1387242
_ISector_8	-2.767386***
_ISector_9	-.4323395
workyear	-.0268429***
fruit	.2786477**
vegetables	.1011483
alcohol	.425318***
muchalcohol	-.5959966***
smoking	.1798025
muchsmoking	-.3076887
sleep	1.707077***
exercise	-.5645822***
mood	.4957735***
_cons	27.04901***

Table 2: mediator regressed on iv (path a)

productivity	Coef.
waitotal	.0709128***
happiness	.0246908
age	.0157664***
gender	-.0182366
_Ieducation_2	-.7402697**
_Ieducation_3	-.1308173
_Ieducation_4	-.1720306
_Ieducation_5	-.2711363
_Ieducation_6	-.1970688
_Ieducation_7	-.0932486
hourweek	-.0089188
dayweek	.0078921
_Ifunctiont_2	-.0600631
_Ifunctiont_3	.1144337
_Iemploymen_2	.124514
_Iemploymen_3	.2919614
_Iemploymen_4	.0283301
_Iemploymen_5	.1355753
_Iemploymen_6	.1876761
irregular	-.1105426**
sick	-.5129356***
_ISector_2	.1691949
_ISector_3	-.1010986
_ISector_4	.3876178
_ISector_5	.153056
_ISector_6	-.5157035*
_ISector_7	-.0263776
_ISector_8	.7060669**
_ISector_9	.0305641
workyear	-.0001542
fruit	.0538822
vegetables	-.0028125
alcohol	-.0538521
muchalcohol	.1791043**
smoking	-.0054783
muchsmoking	.0594315
sleep	.0136962
exercise	-.0741627
mood	.1208902***
_cons	4.322629***

Table 3: dv regressed on mediator and iv (paths b and c')

Source	SS	df	MS	Number of obs =	4,994
				F(38, 4955)=	13.65
Model	1257.00643	38	33.0791167	Prob > F =	0.0000
Residual	12009.2797	4,955	2.42366896	R-squared =	0.0948
Total	13266.2861	4,993	2.656977	Root MSE =	1.5568

Table 4: test output for model with dv regressed on iv (path c)

Source	SS	df	MS	Number of obs =	4,994
				F(38, 4955)=	92.56
Model	57417.1578	38	1510.97784	Prob > F =	0.0000
Residual	80882.7797	4,955	16.3234672	R-squared =	0.4152
Total	138299.938	4,993	27.6987658	Root MSE =	4.0402

Table 5: test output for model with mediator regressed on iv (path a)

Source	SS	df	MS	Number of obs =	4,994
				F(39, 4954)=	18.21
Model	1663.73584	39	42.6598934	Prob > F =	0.0000
Residual	11602.5503	4,954	2.34205698	R-squared =	0.1254
Total	13266.2861	4,993	2.656977	Root MSE =	1.5304

Table 6: test output for model with dv regressed on mediator and iv (paths b and c')

	Coef	Std Err	Z	P>Z
Sobel	.09804523	.00947315	10.35	0
Goodman-1 (Aroian)	.09804523	.0094836	10.34	0
Goodman-2	.09804523	.00946269	10.36	0
a coefficient =	1.38262	.082694	16.7197	0
b coefficient =	.070913	.005381	13.1781	0
Indirect effect =	.098045	.009473	10.3498	0
Direct effect =	.024691	.032195	.766922	.443128
Total effect =	.122736	.031864	3.85184	.000117
Proportion of total effect that is mediated:				.79883018
Ratio of indirect to direct effect:				3.9709246
Ratio of total to direct effect:				4.9709246

Table 7: Sobel Goodman output

Appendix K: Moderation

productivity	Coef.
happiness	.5179389***
age	.0099292**
gender	-.0479104
_Ieducation_2	-.9661126**
_Ieducation_3	-.1219364
_Ieducation_4	-.1281991
_Ieducation_5	-.2623622
_Ieducation_6	-.1264215
_Ieducation_7	.074294
hourweek	-.0145333**
dayweek	.0279445
_Ifunctiont_2	.1299787
_Ifunctiont_3	.0992726
_Iemploymen_2	.10565
_Iemploymen_3	.3560249
_Iemploymen_4	-.4434234
_Iemploymen_5	.6949417
_Iemploymen_6	.9882301***
irregular	-.0471375
sick	-.8712723***
_ISector_2	.1214965
_ISector_3	-.2651913
_ISector_4	.2503985
_ISector_5	.0247719
_ISector_6	-.6648545**
_ISector_7	-.1076759
_ISector_8	.2060915
_ISector_9	-.0874691
workyear	-.0034204
fruit	.1462185**
vegetables	-.0525028
alcohol	-.0403848
muchalcohol	.1868872*
smoking	-.018118
muchsmoking	.1257322
sleep	-.0404453
exercise	-.0845434
mood	-.0989574
_cons	5.334918***

Table 1: regression of happiness on productivity

happiness	Coef.
prod	.1882615***
age	-.0020989
gender	.0148765
_Ieducation_2	.0264572
_Ieducation_3	-.070717
_Ieducation_4	-.1023692
_Ieducation_5	-.0276831
_Ieducation_6	-.0714177
_Ieducation_7	-.0347156
hourweek	.0026799
dayweek	-.0121883
_Ifunctiont_2	-.0314397
_Ifunctiont_3	-.0184284
_Iemploymen_2	-.0267118
_Iemploymen_3	-.3016995
_Iemploymen_4	.2116172*
_Iemploymen_5	-.5894971
_Iemploymen_6	-.1644369
irregular	-.0194002
sick	-.0113287
_ISector_2	-.0562732
_ISector_3	-.0177712
_ISector_4	-.12988
_ISector_5	-.0851777
_ISector_6	.0769658
_ISector_7	.0910691
_ISector_8	-.1634211
_ISector_9	-.0480134
workyear	.0023028*
fruit	-.048764
vegetables	-.0443556
alcohol	.020707
muchalcohol	-.0293531
smoking	-.013515
muchsmoking	-.1086616
sleep	.1911015***
exercise	-.0074306
mood	.6132733***
_cons	1.719068***

Table 2: regression of productivity on happiness

happiness	Coef.
waitotal	.0307339 ***
age	.0029303
gender	.0063178
_Ieducation_2	-.1534203
_Ieducation_3	-.1135519
_Ieducation_4	-.1730657
_Ieducation_5	-.1037589
_Ieducation_6	-.1345496
_Ieducation_7	-.0928167
hourweek	.0001371
dayweek	-.0087251
_Ifunctiont_2	-.059265
_Ifunctiont_3	-.00975
_Iemploymen_2	-.0426866
_Iemploymen_3	-.2587015*
_Iemploymen_4	.1222079
_Iemploymen_5	-.6437699**
_Iemploymen_6	-.0819835
irregular	-.0227113
sick	.0510499
_ISector_2	-.0108845
_ISector_3	-.0322464
_ISector_4	-.0811601
_ISector_5	-.060995
_ISector_6	.0107567
_ISector_7	.082788
_ISector_8	-.0262069
_ISector_9	-.0284984
workyear	.0023409**
fruit	-.0361935
vegetables	-.0587265
alcohol	-.0001021
muchalcohol	.023458
smoking	-.0267109
muchsmoking	-.0712926
sleep	.1432779***
exercise	-.0013724
mood	.6140218***
_cons	1.973735***

Table 3: regression of wai on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	24.969
Chi-sq(3) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	77.663
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	3.224
Chi-sq(2) P-val =	0.1995

Table 4: test output happiness on

Underidentification test (Kleibergen-Paap rk LM statistic):	30.307
Chi-sq(2) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	32.941
Stock-Yogo weak ID test critical values: 10% maximal IV size	19.93
15% maximal IV size	11.59
20% maximal IV size	8.75
25% maximal IV size	7.25
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	1.796
Chi-sq(1) P-val =	0.1802

Table 5: test output productivity on happiness

Underidentification test (Kleibergen-Paap rk LM statistic):	446.618
Chi-sq(5) P-val =	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic):	802.052
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	18.37
10% maximal IV relative bias	10.83
20% maximal IV relative bias	6.77
30% maximal IV relative bias	5.25
10% maximal IV size	26.87
15% maximal IV size	15.09
20% maximal IV size	10.98
25% maximal IV size	8.84
Source: Stock-Yogo (2005). Reproduced by permission.	
NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.	
Hansen J statistic (overidentification test of all instruments):	5.712
Chi-sq(4) P-val =	0.2217

Table 6: test output wai on happiness