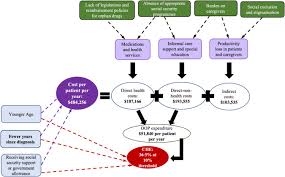
MARGINAL WORKERS:

***Those workers who had not worked for the major part of the reference period (i.e. less than 6 months) are termed as Marginal Workers. Work is defined as participation in any economically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature.***



**SOCIOECONOMIC ANALYSIS**

***A broad definition of socio-economic assessment is the analysis of “social, cultural, economic and political conditions of individuals, groups, communities and organisations”***



**Marginal socio-economic effects of an employer’s efforts to improve the work environment:**

## Background:

Satisfied and productive employees are necessary to create a successful company, while dissatisfied and unproductive workers jeopardize the company’s image, sustainability, competitiveness, and survival [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1)]. The well-being and productivity of the workforce is conditional on a well-functioning work environment with minimum risk factors for illness [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1),[2](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR2),[3](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR3),[4](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR4),[5](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR5),[6](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR6)]. Many disorders in a company are related not only to the physical environment at the workplace [[2](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR2),[3](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR3),[4](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR4),[5](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR5),[6](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR6),[7](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR7)], but also to the work conditions along a series of psychosocial and ergonomic factors that characterize the work culture in the company [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1),[2](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR2),[3](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR3),[4](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR4),[5](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR5),[6](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR6), [8](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR8),[9](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR9),[10](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR10),[11](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR11),[12](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR12),[13](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR13)]. Efforts to create a pleasant and productive work environment can be made by employers, employees, and even society’s health policy makers. The term *workplace health promotion* (WHP) is thus defined by the European Network for Workplace Health Promotion (ENWHP) in the Luxemburg Declaration 2007 as the ‘combined efforts’ of employers, employees, and society to improve the mental and physical health and well-being of people at work (<http://www.enwhp.org/fileadmin/rs-dokumente/dateien/Luxembourg_Declaration.pdf>). However, management plays a crucial role in these combined efforts when it can lend its full support for effective WHP programmes to be processed, integrated into company health policy, and allocated sufficient financial and physical resources [[14](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR14)]. Everything from optimization of the physical environment at the workplace for different work functions up to the improvement of ergonomic and psychosocial working conditions can increase workers’ health and well-being and thereby the company’s sustainability and future benefits. WHP intervention programmes have been shown to result in reduced stress and physical strain [[14](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR14)], less sick leave, improved psychosocial well-being and work satisfaction [[15](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR15)], better social support from supervisors and colleagues [[16](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR16)], and also reduced cost for work-related disorders [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1), [17](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR17)]. Thus, there are many factors motivating employers to implement and integrate WHP programmes. These include factors relating to the economic costs saved by reducing sickness absenteeism and presenteeism, and thus production loss; but also, those relating to the economic benefits of increasing workers’ potential productivity [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1)]. There are also external motivating factors such as improved corporate image and customer loyalty, and increased governmental and insurance support [[14](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR14)].

The social costs of work-related disorders, the socio-economic impacts of work environmental risk factors, and even the economic value of the information to be produced during proposed work environmental studies have recently been assessed using appropriate economic theories and methodologies [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1), [2](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR2), [17](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR17)]. However, the employer’s efforts and their socio-economic consequences have not yet been assessed in the same manner. Employers’ multifactorial efforts consist of ‘rewards’ as compensation for workers’ efforts. These rewards are mostly represented by money, self-esteem, career opportunity, and job security [[18](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR18)]; but also by improved organizational support [[19](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR19)] and optimized physical and ergonomic environmental factors [[7](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR7), [10](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR10)]. The literature referenced above advise employers to create and promote a healthy, well-functioning and productive environment for a safe workplace. The literature argue for:

* Optimizing physical factors such as lighting and noise [[7](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR7), [20](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR20)];
* Improving ergonomic working conditions [[8](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR8),[9](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR9),[10](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR10)];
* Balancing of job demands and job control [[21](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR21), [22](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR22)];
* Rotation of tasks to break the boring monotony [[23](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR23),[24](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR24),[25](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR25)];
* Career opportunity as an important psychosocial reward [[18](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR18), [26](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR26)];
* Appreciating and rewarding employees’ challenging work [[18](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR18), [21](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR21), [27](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR27), [28](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR28)];
* Perceived organizational and supervisor support [[19](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR19)];
* Adequate earnings and job security [[29](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR29)].
* The objective of this article is to assess the socio-economic consequences of an employer’s efforts to improve the above-mentioned environmental factors at the workplace. This includes the addressing of several issues: the marginal effects of the multifactorial efforts on labour efficiency, work impairments, and lost working hours; the marginal cost of labour inefficiency; and the economic benefits of the employer’s efforts.

## Methods:

### Data collection and basic concepts

All data used in this study were collected from a work environmental survey in the main plant of the Swedish company Sandvik Materials Technology (SMT) during May 2015. The collected dataset included data about work capacity, work performance, and work quality in addition to data on lost working hours due to sickness absenteeism and presenteeism. The employer’s efforts to improve the work environment are described in Table [1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#Tab1) in terms of psychosocial, ergonomic, and physical factors.

A total of 49 workers participated anonymously in the study. Most of them were involved with manufacturing and were sufficient qualified for and experienced in their tasks. Some of the collected data have been used previously in other studies [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1), [2](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR2), [17](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR17)]. The questionnaire, which was distributed to the workers by the SMT safety unit during April 2015, was based on the Harvard questionnaire (<http://www.hcp.med.harvard.edu/hpq/ftpdir/absenteeism%20presenteeism%20scoring%20050107.pdf>), (<http://www.hcp.med.harvard.edu/hpq/ftpdir/survey_clinical_7day.pdf>), knowledge of Swedish workplaces and the Swedish labour market, and findings from the literature. As the employer’s multifactorial *efforts* to improve the work environment (EE) was difficult to assess directly, workers’ *satisfaction* with the employer’s efforts was used as an *indicator* of the level of these efforts in SMT. In the survey, the workers were asked to evaluate their physical, ergonomic, and psychological work environment. The workers were also asked to answer how they perceived their employer’s multifactorial efforts to improve the work environment. The answers would be in percent. To avoid missing and confusing answers, the participants answered the questions while the supervisor was in attendance. Then, the employer’s efforts were identical to the workers’ satisfaction with these efforts. For instance, if the workers were 70% satisfied with their employer’s efforts to improve the ergonomic work conditions, the efforts were assessed to be 70% of their potential level.

The other basic concepts were:

*Overall labour effectiveness* (OLE) defined as a product of the workforce *availability*, *work performance*, and *work quality*, measured in percentage units according to the following formula:

OLE=(actual working hoursscheduled working hours.actual outputstandard output⋅accepted outputtotal output)⋅100OLE=(actual working hoursscheduled working hours.actual outputstandard output⋅accepted outputtotal output)⋅100

To assess the workforce availability, the workers were asked about their actual working hours compared to the scheduled working hours; to assess the work performance (i.e. the actual output divided to the standard output), the workers were asked about the achieved *quantitative requirements* of work in percent; and to assess the work quality (i.e. the accepted output divide to the total output), the workers were asked about the achieved *qualitative requirements* of work in percent. Both the company’s standard and the workers’ own judgements were considered in the assessments of the performance and the quality of work.

Indirect costs of sickness absenteeism and presenteeism in terms of *lost working hours* and *decreased labour productivity*. The costs were assessed in the basis of the registered illness-related lost working hours, the workers’ judgements about their working hours they worked at reduced work ability due to the environmental failures at the workplace, the national median wages, the rate of work interdependence, and the rate of unemployment and monopsony power [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1)].

*Informal work impairments*, which have previously been shown to be the largest source of the cost of work-related disorders in SMT [[1](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR1), [17](https://aoemj.biomedcentral.com/articles/10.1186/s40557-018-0212-5#ref-CR17)]. The company had registered data on the workers worked with reduced work ability in terms of part-time working, but not about the hours workers had been at work even though they, according to their health state, should had stayed at home. The non-registered work impairments were considered as informal. The informal work impairments also contained the time workers worked at reduced work *interest* and *motivation* due to the failures in the entire work environment.

### Analytical tools:

Five regression equations were used to analyse the socio-economic consequences of labour ineffectiveness and the employer’s efforts to improve the work environment in SMT from May 2014 to April 2015. The socio-economic consequences were assessed in terms of important econometric issues. First, two regression models were used to assess the economic cost of labour ineffectiveness, which is measured as 1 – OLE, and the economic benefit of the employer’s efforts to improve the work environment. Then, three regression models were employed to assess the marginal effects of the employer’s efforts on labour effectiveness, informal impairments, and illness-related lost working hours.

The economic cost of labour ineffectiveness (LIE) in terms of labour productivity loss (LPL) was assessed by:

LPL=α1+β2⋅LIE,LPL=α1+β2⋅LIE where LPL is expressed in terms of money, LIE is measured in percent, the intercept α1 is interpreted as the level of LPL independent of LIE, and β1 is the marginal cost of LIE (i.e. the cost of an additional percentage unit of LIE).

The economic benefit of the employer’s efforts to improve the work environment (EE) in terms of saving/decreasing labour productivity loss (LPL) was assessed by:

LPL=α2+β2⋅EE,LPL=α2+β2⋅EE,

where the intercept α2 is interpreted as the level of LPL independent of EE, and β2 is the marginal benefits of EE in terms of reducing LPL (i.e. the economic benefit of increasing EE by one precentage unit).

The impact of the employer’s efforts to improve the work environment (EE) on overall labour effectiveness (OLE) was assessed by:

OLE=α3+β3⋅EE,OLE=α3+β3⋅EE,

where both OLE and EE are measured in percentage units, the intercept α3 is interpreted as the level of OLE independent of EE, and β3 is the marginal effect of EE on OLE (also known as the OLE elasticity of EE).

The impact of the employer’s efforts to improve the work environment (EE) on informal work impairments (IWI); that is, reduced work capacity among workers which is not reflected in formal terms such as part-time working, was assessed by:

IWI=α4+β4⋅EE,IWI=α4+β4⋅EE,

where both IWI and EE are measured in percentage units, the intercept α4 is interpreted as the level of IWI independent of EE, and β4 is the marginal effect of EE on IWI (and known as the IWI elasticity of EE).

The impact of the employer’s efforts to improve the work environment (EE) on the working hours lost by ill workers (LWH) was assessed by:

LWH=α5+β5⋅EE,LWH=α5+β5⋅EE,

where the intercept α5 is interpreted as the amount of LWH independent on the level of EE, and β5 is the marginal effect of EE on LWH (i.e. the responsiveness of LWH to changes in EE by one percentage unit).

Ordinary least squares (OLS) regression analysis was used to assess the important marginal values.

**TAGS**

Census-2011

**GEOGRAPHIC UNIT(S)**

|  |  |  |
| --- | --- | --- |
| **Location name** | **Location code** | **Type** |
| Tamil Nadu | 33 | State |
| Thiruvallur | 602 | District |
| Chennai | 603 | District |
| Kancheepuram | 604 | District |
| Vellore | 605 | District |
| Tiruvannamalai | 606 | District |
| Viluppuram | 607 | District |
| Salem | 608 | District |
| Namakkal | 609 | District |
| Erode | 610 | District |
| The Nilgiris | 611 | District |
| Dindigul | 612 | District |
| Karur | 613 | District |
| Tiruchirappalli | 614 | District |
| Perambalur | 615 | District |
| Ariyalur | 616 | District |
| Cuddalore | 617 | District |
| Nagapattinam | 618 | District |
| Thiruvarur | 619 | District |
| Thanjavur | 620 | District |
| Pudukkottai | 621 | District |
| Sivaganga | 622 | District |
| Madurai | 623 | District |
| Theni | 624 | District |
| Virudhunagar | 625 | District |
| Ramanathapuram | 626 | District |
| Thoothukkudi | 627 | District |
| Tirunelveli | 628 | District |
| Kanniyakumari | 629 | District |
| Dharmapuri | 630 | District |
| Krishnagiri | 631 | District |
| Coimbatore | 632 | District |
| Tiruppur | 633 | District |