# Quality in work and aggregate productivity♣

By Vicente Royuela[1] and Jordi Suriñach[2]

[1]AQR Research Group - IREA. Department of Econometrics, University of Barcelona. Avda. Diagonal, 690. 08034 Barcelona, Spain. Email: vroyuela@ub.edu.

[2]AQR Research Group - IREA. Department of Econometrics, University of Barcelona. Avda. Diagonal, 690. 08034 Barcelona, Spain. Email: jsurinach@ub.edu.

**Abstract:** We explore the relationship between quality in work and aggregate productivity in regions and sectors. Using recent Spanish aggregate data for the period 2001-2006, we find that quality in work may be an important factor to explain productivity levels in sectors and regions. We use two alternatives definitions of quality in work: one from survey data and the other from a social indicators approach. We also use two different measurements of labour productivity to test the robustness of our results. The estimates are run using a simultaneous equation model for our panel of data, and find important differences between high tech and low tech sectors: a positive relationship between quality in work and productivity in the former case, and a negative relationship in the latter. Consequently, on the one hand we see that quality in work is not only an objective *per se*, but may also be a production factor able to increase the wealth of regions; on the other hand, at the aggregate level, we may also find that high productivity levels coincide with lower quality in work conditions.

.

**Key words:** Productivity, Quality in Work, Simultaneous Equation Models.

**JEL codes:** J28, J24, O4, C33.

♣ The authors acknowledge the support of the European Commission 7th Framework Programme, « Intangible Assets and Regional Economic Growth » ECSC - ECSC RTD Programme. FP7-SSH-2007-1 (216813). We also acknowledge the comments received in the 6th Annual North American Meetings of the Regional Science Association International, held in New York in November 2008.

# Quality in work and aggregate productivity

## 1. INTRODUCTION

In Lisbon 2000, the European Union (EU) resolved to become the world's most competitive knowledge-based economy by 2010. A related strategy, the European Employment Strategy (EES), was launched in Luxembourg in 1997 and was renewed in 2006. Underlying both strategies is a growing consensus in Europe that job quality and productivity at work go hand in hand; consequently, more and better jobs are essential to attaining the continent's main objectives. More recently, under the German EU presidency in 2007, quality in work and employment returned to the top of the European employment and social policy agenda. An agreement was reached on a set of policy principles covering 'good work' – a new addition to EU terminology, following on from the more established EU concern for 'more and better jobs'. Finally, under the Portuguese presidency in December 2007, the European Commission launched the not so new concept of *flexicurity*,[1] a neologism formed from the words flexibility and security. Several studies (OECD, 2006, ILO, 2005, European Commission, 2006, Cazes and Nesprova, 2006) have indicated that flexicurity policies have helped to raise employment rates and reduce relative poverty rates.[2] Together with the positive reports by the European Commission, academic work (particularly at the firm level) has shown that well-motivated workers generate higher labour productivity. Nevertheless, other studies have argued that job satisfaction is not linked with productivity and contend even that productivity increases can be obtained by substituting good jobs with bad jobs. This latter aspect may be particularly true at the aggregate level.

In this article we explore these issues further via a case study focusing on Spain. Spain has negative results in a list of 'good jobs' indicators: a persistently high share of fixed-term contracts, covering about 34% of total employment; one of Europe's highest fatal work-related accident rates; and persistently high levels of unemployment. But Spain is also an example of economic convergence with other European nations, both in

[1] In the late 1990s two related concepts were on the agenda: flexi-security and labour market adaptability.

[2] Several examples of flexicurity were included in the 2007 communication of the European Commission: the Austrian severance pay system, the Danish 'Golden Triangle' (Denmark has always been seen as the most adaptable labour market in Europe), temporary work in the Netherlands, the Social Partner agreement in Ireland, and the fixed-term contract reduction in Spain.

economic terms and in terms of labour market performance: the unemployment rate was above 20% in 1994, but had fallen to single figures by 2007.

Here we pose a question: is this convergence partly a result of having an extremely flexible labour market (fixed-term contracts, high fatal accident rates, etc.)? Or, in contrast, as these problems have been solved, has Spain's process of convergence accelerated even more? As we will see later on, there are reasonable arguments on both sides. The aim of this paper is precisely to establish whether there is a relationship between quality in work and productivity and, if so, its sign.

We begin our study by looking at our key variables: quality in work and productivity. Sections 2 and 3 present and discuss the factors that condition and determine our key variables, together with their specific measurements. In section 4 we look at the relationship between quality in work and productivity and consider the possibility of reverse causality. So first we explore the mutual influences between quality in work and productivity. Second, we discuss the fact that theoretical contributions have not established the sign of the relations: some of the aspects that constitute quality in work can influence productivity positively, while other aspects may have a negative effect. Section 5 presents the model and the estimation results for our case study of Spanish regions and sectors in the period 2001-2006. Finally section 6 concludes by presenting our most important findings.

## 2. QUALITY IN WORK

### 2.1. DEFINITION AND MEASUREMENT OF QUALITY IN WORK

One of the key aspects in our study is the theoretical and empirical definition of quality in work. We will examine two definitions of the concept: one objective and one subjective.

The objective definition of quality in work is based on the institutional definition given by the European Commission in the Communication entitled *Employment and social policies: a framework for investing in quality* (COM-2001 313 final): 'Quality (…) is a key element in promoting employment in a competitive and inclusive knowledge economy. Quality reflects the desire, not just to defend minimum standards, but to

promote rising standards and ensure a more equitable sharing of progress. It delivers results – embracing the economy, the workplace, the home, society at large. It links the dual goals of competitiveness and cohesion in a sustainable way, with clear economic benefits flowing from investing in people and strong, supportive, social systems.' This definition reflects the multidimensional nature of the concept and takes into account a variety of aspects: the objective characteristics of employment; the specific characteristics of the job; and the subjective evaluation of these characteristics by the individual worker. In Royuela et al (2008) the concept of quality in work life is analysed. Based on the European Commission definition and structure, that study proposes an index structure based on a multidimensional format that could be applied to the Spanish case through the development of specific indicators. The structure includes 75 measurements, both objective and subjective, included in 30 concepts which are in turn classified under 10 different dimensions (table 1). The basic results of the index can be found in Royuela et al (2009) and in Artís et al (2008). These authors applied the structure to the Spanish case in 2001-2006 and presented results for regions, sectors, professional categories and sizes of firms.

The second approach to quality in work is based on listening to people rather than to politicians. As Di Tella and MacCulloch (2006, p. 25) argue, "Economists are trained to infer preferences from observed choices; that is, economists typically watch what people do, rather than listening to what people say". As hundreds of thousands of individuals have been asked if they are happy, in many countries and over many years, many researchers have begun to use these data to evaluate the effects of public policies on social welfare (Gruber and Mullainathan, 2002, Frey and Stutzer, 2000), to determine welfare costs of inflation and employment (Wolfers, 2003, Di Tella et al, 2001), to investigate determinants of political economy (Di Tella and MacCulloch, 2005, Alesina et al, 2004), and so on. Like them, we think that using subjective perceptions is a useful tool for our exercise.

Table 1. Dimensions and concepts of Quality in Work

| **DIMENSION: 1. Intrinsic job quality** | **DIMENSION: 6. Inclusion and access to the labour market** |
|---|---|
| Concept 1: job satisfaction among workers, taking account of job characteristics, contract type, hours worked and the level of qualification relative to job requirements | Concept 1: Effective transition of young people to active life |
| Concept 2: proportion of workers advancing to higher paid employment over time | Concept 2: employment and long-term unemployment rates by age, educational level, region |
| Concept 3: low wage earners, working poor, and the distribution of income | Concept 3: labour market bottlenecks and mobility between sectors and occupations |
| **DIMENSION: 2. Skills, life-long learning and career development** | **DIMENSION: 7. Work organisation and work-life balance** |
| Concept 1: proportion of workers with medium and high levels of education | Concept 1: proportion of workers with flexible working arrangements |
| Concept 2: proportion of workers undertaking training or other forms of life-long learning | Concept 2: opportunities for maternity and paternity leave, and take-up rates; scale of child-care facilities for pre-school and primary school age groups |
| Concept 3: proportion of workers with basic or higher levels of digital literacy | |
| **DIMENSION: 3. Gender equality** | **DIMENSION: 8. Social dialogue and worker involvement** |
| Concept 1: gender pay gap, appropriately adjusted for such factors as sector, occupation and age | Concept 1: coverage of collective agreements |
| Concept 2: gender segregation – extent to which women and men are over or under-represented in different professions and sectors | Concept 2: proportion of workers with a financial interest/participation in the firms where they are employed |
| Concept 3: proportion of women and men with different levels of responsibility within professions and sectors, taking account of factors such as age and education | Concept 3: working days lost in industrial disputes |
| **DIMENSION: 4. Health and safety at work** | **DIMENSION: 9. Diversity and non-discrimination** |
| Concept 1: composite indicators of accidents at work – fatal and serious – including costs; total and mean number of days lost due to accidents at work, by sex; occupational diseases, by sex; rates of occupational disease, including new risks e.g. repetitive strain injury | Concept 1: employment rates and pay gaps of older workers compared with average |
| Concept 2: stress levels and other difficulties concerning working relationships | Concept 2: employment rates and pay gaps of persons with disabilities, and persons from ethnic minorities – compared with average |
| | Concept 3: information on the existence of labour market complaints procedures, and of successful outcomes |
| **DIMENSION: 5. Flexibility and security** | **DIMENSION: 10. Overall work performance** |
| Concept 1: the effective coverage of social protection systems – in terms of breadth of eligibility and level of support – for those in work, or seeking work | Concept 1: average hourly productivity per worker |
| Concept 2: proportion of workers with flexible working arrangements – as seen by employers and workers | Concept 2: average annual output per worker |
| Concept 3: job losses – proportion of workers losing their job through redundancies; proportion of those finding alternative employment in a given period | Concept 3: average annual living standards per head of population – taking account of the rate of employment and the dependency ratio |
| Concept 4: proportion of workers changing the geographical location of their work | |

Source: Royuela et al (2008)

There is a line of work that questions the validity of the use of subjective perceptions of workers as an indicator of job satisfaction. The argument is that these subjective answers are not usually related to reasonable constituents of quality in work, and if they are related, the correlation is low. Spector (1997) finds that the subjective opinions and

the objective conditions at work often display major inconsistencies. Working with Spanish data, Muñoz de Bustillo et al (2005) finds at the micro level that traditional variables (gender, age, education etc.) reproduce a very low proportion of the job satisfaction of Spanish workers. Despite this partial result, we follow Di Tella and MacCulloch's (2006) strategy of listening to people. In any case, we are aware of the criticisms and so will also use the subjective perception of quality in work together with the social indicators measurement.

The data concerning individuals' subjective perceptions come from the Survey on Quality of Life in Work (*Encuesta de Calidad de Vida en el Trabajo*), compiled by the Spanish Ministry of Employment and Social Affairs. This survey provides data on workers' subjective perceptions of their satisfaction, both in overall terms and in relation to several key dimensions.

We collected information on the following question: "*and now, concerning overall satisfaction in work, please mark on a scale of 1 to 10 (1 very unsatisfied and 10 very satisfied) how you feel about your work?*" The individual results were used to compute an aggregate measurement which was computed again for regions, sectors, professional categories and firm sizes. We computed the proportion of scores of 7 or higher. We used the level of satisfaction derived from each individual's evaluation of his/her perceptions. This reflects people's aspirations and expectations and personal and societal values.

In Royuela et al (2009) the composite measurement of quality in work was compared with individuals' subjective perception. Using a list of tests the results confirmed a positive, significant relationship between the two quality in work measurements. Consequently, both measurements are clearly linked and present complementary visions of the concept of quality in work.

As new evidence has been collected for 2006, we have recomputed the final indices. Some caveats are in order. The survey was not collected in 2005, and the 2006 survey experienced several changes. Exactly the same happened with several key variables concerning key indicators of the composite measurement, particularly the effect of immigrants in the labour market. Finally, as the index structure defined by the European

Commission and adapted in Royuela et al (2008) considers a dimension that explicitly embraces productivity (dimension 10, Overall work performance) in this study our final composite measure of quality in work will only take dimensions 1 to 9 into account.

Table 2. Quality in Work and Job Satisfaction. Regions. Spain. 2001-2006.

| | | Composite Index of Quality in Work | | | | | Job Satisfaction | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2001 | 2002 | 2003 | 2004 | 2006 | 2001 | 2002 | 2003 | 2004 | 2006 |
| R01 | Andalusia | 86.5 (17º) | 85.3 (17º) | 89.4 (16º) | 91.4 (16º) | 98.1 (15º) | 61.3 (14º) | 63.5 (12º) | 65.7 (12º) | 67.4 (9º) | 71.6 (10º) |
| R02 | Aragón | 103.4 (6º) | 104.1 (5º) | 106.5 (6º) | 116.5 (4º) | 115.9 (5º) | 68.8 (6º) | 68.9 (7º) | 68.9 (8º) | 79.3 (3º) | 75.5 (6º) |
| R03 | Asturias | 92.1 (13º) | 100.4 (8º) | 103.7 (7º) | 97.4 (12º) | 97.6 (16º) | 60.9 (14º) | 72.6 (2º) | 77 (1º) | 65.9 (12º) | 66.5 (13º) |
| R04 | The Balearic Islands | 114.3 (1º) | 115.3 (1º) | 114.8 (2º) | 121.9 (1º) | 132.4 (1º) | 74.8 (1º) | 71 (3º) | 68.7 (7º) | 76.2 (4º) | 73.8 (6º) |
| R05 | The Canary Islands | 101.6 (9º) | 101.5 (7º) | 101.5 (9º) | 107 (8º) | 114.5 (8º) | 65.4 (10º) | 71.8 (2º) | 64.6 (11º) | 67.3 (8º) | 78.2 (2º) |
| R06 | Cantabria | 94 (12º) | 94.6 (13º) | 91 (15º) | 110.7 (7º) | 104.8 (13º) | 63.3 (10º) | 60.2 (12º) | 67.1 (7º) | 76.7 (3º) | 68.4 (8º) |
| R07 | Castilla La Mancha | 90.8 (15º) | 90.4 (15º) | 91.6 (14º) | 93.5 (14º) | 96.3 (17º) | 68.4 (7º) | 64.6 (6º) | 69.7 (5º) | 72.8 (4º) | 73.8 (5º) |
| R08 | Castilla León | 86.9 (16º) | 88 (16º) | 88.2 (17º) | 95.2 (13º) | 104.9 (12º) | 59.3 (11º) | 58 (11º) | 63.5 (9º) | 65.9 (7º) | 68.2 (7º) |
| R09 | Catalonia | 110.1 (2º) | 102.9 (6º) | 107 (5º) | 112.9 (5º) | 120.3 (3º) | 72.6 (1º) | 63.6 (7º) | 66.2 (7º) | 69.7 (4º) | 76.3 (4º) |
| R10 | Valencian Community | 101.2 (10º) | 97.7 (11º) | 100 (10º) | 103.6 (10º) | 109.4 (9º) | 68.6 (6º) | 61.2 (10º) | 62.9 (9º) | 64.3 (7º) | 66.3 (8º) |
| R11 | Extremadura | 91.1 (14º) | 93.6 (14º) | 95.6 (13º) | 85.5 (17º) | 107.5 (10º) | 68.7 (5º) | 73.8 (2º) | 72.6 (3º) | 62.7 (8º) | 77.8 (3º) |
| R12 | Galicia | 94.5 (11º) | 98.2 (10º) | 97.5 (12º) | 92.7 (15º) | 104 (14º) | 60.8 (9º) | 70.2 (3º) | 65 (8º) | 55.4 (10º) | 66.8 (7º) |
| R13 | Madrid | 107.5 (3º) | 112.4 (2º) | 117.3 (1º) | 118.5 (2º) | 115.5 (6º) | 63.1 (9º) | 63.9 (6º) | 69.2 (6º) | 67.3 (7º) | 65.9 (8º) |
| R14 | Murcia | 104.3 (5º) | 106.1 (4º) | 109.8 (4º) | 105.3 (9º) | 119.5 (4º) | 69.8 (5º) | 66.3 (4º) | 70.2 (5º) | 73.8 (4º) | 72.9 (5º) |
| R15 | Navarra | 107.5 (4º) | 106.6 (3º) | 112.2 (3º) | 118.3 (3º) | 115.1 (7º) | 71.7 (3º) | 71 (3º) | 71.4 (3º) | 81.7 (2º) | 76.3 (3º) |
| R16 | The Basque Country | 101.9 (8º) | 99.1 (9º) | 98.5 (11º) | 102.2 (11º) | 105 (11º) | 66.7 (5º) | 62.3 (8º) | 53.4 (10º) | 63.4 (8º) | 64.5 (9º) |
| R17 | La Rioja | 102.2 (7º) | 97 (12º) | 102.5 (8º) | 111.4 (6º) | 121.3 (2º) | 72.2 (2º) | 62.1 (8º) | 74.3 (2º) | 79.5 (2º) | 79.5 (2º) |
| | Total | 100.00 | 99.35 | 101.98 | 104.92 | 110.25 | 66.5 | 65.5 | 66.9 | 68.7 | 72.2 |

Tables 2 and 3 display the results of the composite index of quality of life and the measurement of job satisfaction for regions and sectors respectively. In 2006, the best results on the composite index were found in the Balearic Islands (R04), La Rioja (R17) and Catalonia (R09). The highest values were found in the service sectors, particularly in Financial services and public administration. The rankings for job satisfaction display a slightly different picture. By regions, we see that La Rioja (R17), Extremadura (R11), and Aragón (R02) were ranked first according to subjective perceptions. Thus, we see that several regions with poor composite index results experience a relatively high job satisfaction, especially Extremadura (R11) and Castilla León (R08). In contrast, the Balearic Islands (R04), Madrid (R13), Murcia (R14) and Castilla León (R08) display high values on the composite index and lower values on job satisfaction. In industrial sectors, the subjective perception was worse than the composite index, while the opposite was the case in Other public services (S10).

Table 3. Quality in Work and Job Satisfaction. Sectors. Spain. 2001-2006.

| | | Composite Index of Quality in Work | | | | | Job Satisfaction | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2001 | 2002 | 2003 | 2004 | 2006 | 2001 | 2002 | 2003 | 2004 | 2006 |
| S01 | Agriculture, livestock, forests and fishing | 90.3 (8º) | 89.7 (8º) | 90.4 (8º) | 88.2 (10º) | 105.6 (7º) | 51.6 (10º) | 55.5 (10º) | 54.4 (10º) | 58.6 (10º) | 61.4 (10º) |
| S02 | Energy, chemistry, rubber and metallurgy | 106.2 (3º) | 105.9 (3º) | 108 (3º) | 111.3 (3º) | 124.7 (2º) | 68.1 (4º) | 66.2 (3º) | 70.3 (2º) | 68 (6º) | 68.9 (8º) |
| S03 | Food, textiles, wood, paper and publication | 97.1 (5º) | 96.1 (6º) | 98.6 (5º) | 100.8 (5º) | 105.9 (6º) | 65 (6º) | 62.6 (7º) | 63.2 (7º) | 61.5 (9º) | 70.6 (6º) |
| S04 | Machinery, electrical material and transport | 101.3 (4º) | 102.4 (4º) | 101.9 (4º) | 107.6 (4º) | 120.5 (3º) | 69.9 (3º) | 72.1 (2º) | 61.9 (7º) | 72.7 (2º) | 73.2 (3º) |
| S05 | Construction | 84.8 (9º) | 85.1 (9º) | 88.4 (10º) | 91.3 (8º) | 99.2 (10º) | 63.5 (7º) | 63.6 (5º) | 68.2 (2º) | 69.5 (3º) | 73 (3º) |
| S06 | Commerce, hotel and catering, repairs | 96.6 (6º) | 96.4 (5º) | 98.1 (6º) | 100.5 (6º) | 100 (9º) | 64.6 (6º) | 65.9 (2º) | 66.4 (5º) | 66.4 (5º) | 68.8 (5º) |
| S07 | Transport and telecommunications | 95.9 (7º) | 93 (7º) | 96.3 (7º) | 96.8 (7º) | 108.8 (5º) | 65 (4º) | 60.6 (5º) | 67.4 (2º) | 65.3 (5º) | 66.7 (5º) |
| S08 | Financial services, services for companies and leasing | 116.1 (1º) | 115.4 (1º) | 117.3 (1º) | 122.5 (1º) | 127.1 (1º) | 70.8 (2º) | 64.3 (3º) | 66.8 (3º) | 72.4 (2º) | 70.6 (4º) |
| S09 | Public administration, education and health | 112.8 (2º) | 111.9 (2º) | 115.5 (2º) | 120.4 (2º) | 119.5 (4º) | 73.8 (1º) | 72.9 (1º) | 74.1 (1º) | 76.5 (1º) | 79.7 (1º) |
| S10 | Other public services | 84.5 (10º) | 81.9 (10º) | 89 (9º) | 90.4 (9º) | 103.3 (8º) | 64.8 (2º) | 61.6 (2º) | 61.1 (2º) | 67.7 (2º) | 74.4 (1º) |
| | Total | 100.00 | 99.35 | 101.98 | 104.92 | 110.25 | 66.5 | 65.5 | 66.9 | 68.7 | 72.2 |

Our data do not confirm the Easterlin puzzle. In 1974 Richard Easterlin found that, although developed countries experienced an important increase in their GDP per capita, reported happiness was an untrended variable. In our data, both the composite Index and the Job Satisfaction measure experience growth rates of close to 10% in aggregate terms.

Finally we should mention the fact that the main source of information of quality in work is the Survey on Quality of Life in Work mentioned above. For our computations we used the 31,750 observations for the five years considered. This survey is statistically representative at the regional and sectoral level. Nevertheless, crossing these two categories would result in an average of 37 observations per sector, region and year, which is non-representative. In order to solve this situation we have grouped sector and regions. Finally we used an aggregation of seven regions and seven sectors, which can be seen in table 4.[3]

[3] Seven sectors, for seven regions and five years result in 245 observations in our database.

Table 4. Regional and Sectoral aggregation of information.

| **7 Regions** | **17 *Autonomous Communities*** |
|---|---|
| R01 South and The Canary Islands | R01 Andalusia |
| | R05 The Canary Islands |
| | R14 Murcia |
| R02 Centre | R07 Castilla La Mancha |
| | R08 Castilla León |
| | R11 Extremadura |
| R03 East | R04 The Balearic Islands |
| | R10 Valencian Community |
| R04 Madrid | R13 Madrid |
| R05 North-east | R02 Aragón |
| | R15 Navarra |
| | R16 The Basque Country |
| | R17 La Rioja |
| R06 North-west | R03 Asturias |
| | R06 Cantabria |
| | R12 Galicia |
| R07 Catalonia | R09 Catalonia |

| **7 Sectors** | **10 Sectors** |
|---|---|
| S01 Agriculture, livestock, forests and fishing | S01 Agriculture, livestock, forests and fishing |
| S02 Energy, chemistry, rubber and metallurgy | S02 Energy, chemistry, rubber and metallurgy |
| S03 Food, textiles, wood, paper and publication, Machinery, electrical material and transport | S03 Food, textiles, wood, paper and publication |
| | S04 Machinery, electrical material and transport |
| S04 Construction | S05 Construction |
| S05 Commerce, hotel and catering, repairs | S06 Commerce, hotel and catering, repairs |
| S06 Transport and telecommunications, Financial services, services for companies and leasing | S07 Transport and telecommunications |
| | S08 Financial services, services for companies and leasing |
| S07 Public administration, education and health, Other public services | S09 Public administration, education and health |
| | S10 Other public services |

## 2.2. CONDITIONINGS AND DETERMINANTS OF QUALITY IN WORK

Studies have found several factors that influence job satisfaction. To relate them to quality in work we have to divide them into conditioning factors and determinant factors. The former (for instance, age or gender, being a young woman), influence job satisfaction and quality in work. In contrast, the latter are part of the definition of quality in work and are therefore constituent factors. Here we briefly review both.

Conditionings:

- Age: age is related to quality in work with a U shaped form, with the minimum around 35 years. This result is usually related to worker expectations and goals achieved in the professional career (Clark, 1996, Clark and Oswald, 1996, Clark et al, 1996).
- Gender: women are usually more satisfied with their work than men. There are two possible explanations: sample self-selection drives dissatisfied women to exit the labour market, something that men do not usually do (Clark and Oswald, 1994); women have lower expectations than men (Groot and Maassen van den Brink, 1998, Souza-Posa and Souza-Posa, 2000a and Kaiser, 2002 and 2007).

- Education: more educated workers usually earn more and have better professional careers. Nevertheless, this variable is negatively related with quality in work (Clark, 1996, Clark and Oswald, 1996, Brown and McIntosh, 1998 and Sloane and Williams, 2000). Three explanations emerge: more educated workers have higher expectations; and *overeducated* workers (more educated than is required for their job, Sanromá and Ramos, 2003, Vieira, 2005) will be unhappy at work (Tsang et al, 1991, Groot and Maassen van den Brink, 1998, Locke, 1976, and Lawler, 1973, Bender and Heywood, 2006). Finally, it is possible that the more specialized the worker, the more difficult it is to change job and consequently to adjust worker preferences.
- Labour values: workers for whom money is very important are systematically dissatisfied (Clark, 1996, Clark et al 1996, Clark, 1997, Shields and Ward, 2001). Inversely, workers who value their job in itself have higher quality in work (Manglione and Quinn, 1975).
- Family: marital status or having children has a positive influence on happiness in general and in quality in work in particular (Clark, 1996, Clark et al 1996, Lydon and Chevalier, 2002 and Belfield and Harris, 2002). Consequently it is not true that having a family is a restriction to professional development, and in turn a cause of a low quality in work.
- Other personal characteristics: religion (Lévy-Garboua and Montmarquette, 2004) and health (Meng, 1990, Clark, 1996, Clark et al 1996, Büchel, 2002) are correlated with quality in work. Probably health is also related with quality in work.

Determinants:

- Hours of work: the relationship of this variable with job satisfaction is not clear. Working more hours is expected to have a negative influence on job satisfaction. However, satisfied workers are likely to spend more hours at work; the empirical results do not produce clear conclusions (Clark, 1996, 1997, Clark and Oswald, 1996, Lydon and Chevalier, 2002, Bartel, 1981, Schwochau, 1987, and Boheim and Taylor, 2004).
- Unionism: union membership tends to be negatively correlated with job satisfaction, which would mean that Unions are the right vehicle to channel workers' complaints

(Freeman, 1978, Borjas, 1979, Meng, 1990). Nevertheless, it has been argued that workers who belong to unions are usually the ones who belong to sectors with low quality in work; this, in turn, raises the possibility that this variable is endogenous (Gordon and Densini, 1995 and Bender and Sloane, 1998, Bryson et al, 2005),

- Precarious employment: job uncertainty has a negative influence on job satisfaction (Clark and Oswald, 1996), although other studies found a non-significant relationship (Clark, 1996). García Mainar (1999) found that this factor is one of the major determinants of job satisfaction in Spain, while Gamero Burón (2007) finds that the type of contract matters.
- Possibilities of promotion: the possibility of promotion influences expectations and subsequently job satisfaction. Consequently, the use of information and its interpretation within the firm is a key aspect (Souza-Poza and Souza-Poza, 2000a, 2000b).
- Seniority: although the chances of promotion rise with age, routine may also have a negative influence on job satisfaction. The empirical evidence is ambiguous and very often non-significant (Freeman, 1978, Borjas, 1979, Clark et al 1996).
- Quality and specialization of education: better students usually find better jobs and report higher job satisfaction, as they have more chance of obtaining a job more in tune with their desires (Lydon and Chevalier, 2002 and Belfield and Harris, 2002). Specialization appears to cause the opposite situation, as fewer options arise to change a position. Empirical results are non-conclusive (Lydon, 2001).
- Unemployment: short- and long-term unemployed workers always present the worst job satisfaction because their position is involuntary (Woittiez and Theeuwes, 1998, and Winkelmann and Winkelmann, 1997). However, b long-term unemployment may help workers to reassess their expectations. The empirical finding of the U shape form found in the time spent unemployed seems reasonable (Lydon and Chevalier, 2002 and Belfield and Harris, 2002).
- Other aspects: Asiedu and Folmer (2007) consider the effect of privatization of firms on job satisfaction; de Santis and Durst (1996) and Macklin et al (2006) reviewed differences between productive sectors in job satisfaction.

A key aspect that we have not included in this list of factors is salary. As our main aim is to find a relationship between quality in work/job satisfaction and productivity, we will address the subject in section 4.

## 3. PRODUCTIVITY

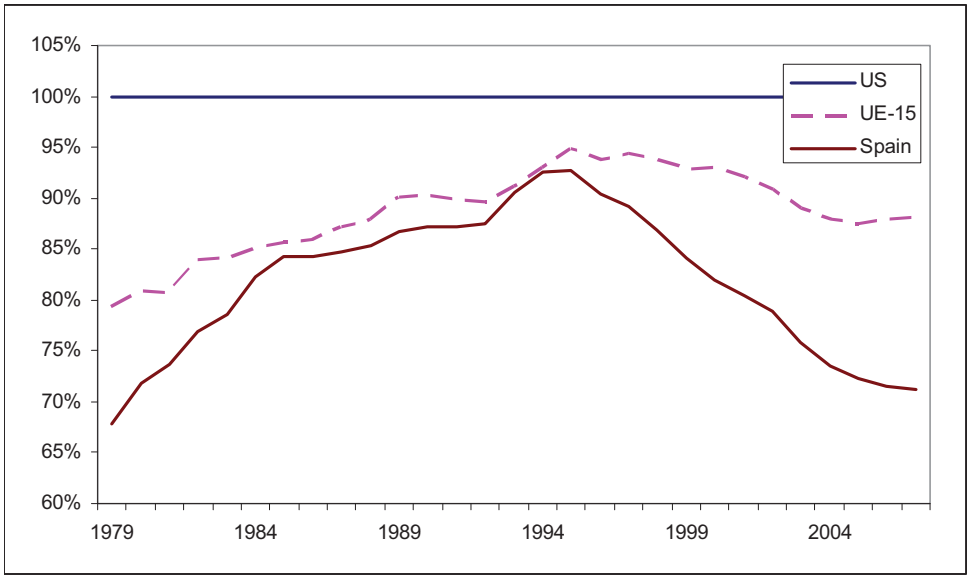
### 3.1. DEFINITION AND MEASUREMENT

In 2000 the European Union's objective of becoming the world's most competitive knowledge-based economy appeared to be a reasonable one. Nevertheless, from a position of near parity with the US in the mid 1990s, labour productivity levels in the EU have fallen in recent times. According to the Groningen Growth and Development Centre data, the labour productivity of the group of countries that we can label today as the EU-15 was twenty points below that of the US at the end of the seventies.[4] After twenty years of real convergence this gap fell significantly and reached 5% in 1997, only to rise again at the start of the new century, reaching 12% in 2007 (figure 1).

Many scholars have argued that the main advantage of the US over the EU is its more effective use of information technology (van Ark et al, 2008). The global business organization the Conference Board found that the differences between the two are found in just three industries: retail, wholesale and finance (Triplett and Bosworth, 2004, Blanchard, 2004). Besides, countries differ most strongly in the rates of efficiency improvement in the use of inputs (Inklaar et al, 2008a). Searching for a solution, several authors note the urgent need for reform in European economies (Cohen, 2007).

[4] EU-15 comprises the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.

Figure 1. Labour productivity. Gross Value Added per worked hour. US=100.




Source: Groningen Growth and Development Centre data. GDP per worked hour, in 2007 constant dollars.

Together with the sector heterogeneity, we see that there is a wide variation across European Union in productivity performance in terms of both growth rates and levels. A limited number of countries show productivity levels near those of the US or even above it whereas others are substantially behind, as it is the case of Spain. In Spain, the convergence-divergence path is even deeper than the trend we saw in the EU-15 as a whole. In 1979 Spanish labour productivity was 32% below the US figure; the gap then shrank to 7% in 1995 but rose once more to 29% in 2007.

According to Pérez García et al (2006), the halt in the convergence process in the mid-nineties is due to a strong specialization in mature activities, in which Spain also performs worse and has lower growth rates than other developed countries. The solutions are usually oriented towards increasing specialization in knowledge and innovation-based activities, and consequently, increasing the investment in human capital and in activities where more educated people are more productive. These solutions, then, are linked to human factors. Consequently it is imperative to look at the factors that condition labour productivity – for example, quality in work.

It is not easy to find a precise definition of labour productivity, and even less to measure it.[5] As our quality in work data are available for regions, sectors and several years, we looked for productivity data for the same years. We finally used the national accounts at regional level (*Contabilidad Regional de España*), from the Spanish *Instituto Nacional de Estadística* (INE, National Statistical Institute). The variables offered by this institution for regions, sectors and different time points are the following:

- Gross Value Added (GVA)
- Employee Remuneration
- Operating surplus / mixed income
- Total employment
- Salaried employment

The *Encuesta de Coyuntura Laboral* (Employment Situation Survey) offers information concerning hours worked by working day.

With these data, we build two different indicators of productivity:

- GVA per person employed = GVA /Total employment
- GVA per hour worked = GVA /Total hours worked

We accept that neither measurement is probably ideal for measuring productivity. Nonetheless, they are standard measurements of the concept, and, what is more, the use of two alternatives will allow more robust results in our estimates. Tables 5 and 6 display the results of the indicators of productivity considered for three years: 2001, 2004 and 2006, for regions and sectors, respectively.

In 2006, the highest productivity (GVA per worked hour) was found in Financial, services for companies and leasing, followed by Energy, chemistry, rubber and metallurgy. By regions, the top three are the Basque Country (R16), Madrid (R13) and Navarra (R15).

[5] Several issues arise when trying to measure labour productivity, especially total factor productivity. For a discussion, see the Spring 2008 special issue of the *International Productivity Monitor* (Diewert, 2008, and Inklaar et al, 2008b).

Table 5. Productivity measures. Regions. Spain. 2001-2006.

| | | Apparent productivity of labour = GVA /Total employment (€ per worker) | | | GVA by hour worked = Apparent productivity of labour/Hours worked (€ per worker per hour) | | |
|---|---|---|---|---|---|---|---|
| | | 2001 | 2004 | 2006 | 2001 | 2004 | 2006 |
| R01 | Andalusia | 32996 (13º) | 37638 (12º) | 40522 (12º) | 19.88 (13º) | 22.63 (12º) | 24.37 (11º) |
| R02 | Aragón | 35075 (11º) | 39526 (9º) | 42938 (6º) | 21.15 (10º) | 24.13 (9º) | 26.34 (7º) |
| R03 | Asturias | 35758 (8º) | 40193 (6º) | 42891 (7º) | 22.12 (5º) | 25.13 (6º) | 26.45 (6º) |
| R04 | The Balearic Islands | 37854 (4º) | 42446 (4º) | 44008 (5º) | 22.06 (6º) | 25.23 (5º) | 26.22 (8º) |
| R05 | The Canary Islands | 35564 (9º) | 38862 (11º) | 41166 (11º) | 20.61 (11º) | 22.96 (11º) | 24.32 (12º) |
| R06 | Cantabria | 35854 (6º) | 40028 (7º) | 42360 (10º) | 21.62 (7º) | 24.29 (8º) | 25.89 (10º) |
| R07 | Castilla La Mancha | 31353 (15º) | 35402 (15º) | 39507 (14º) | 18.7 (15º) | 21.43 (15º) | 23.81 (14º) |
| R08 | Castilla León | 35097 (10º) | 39950 (8º) | 42819 (8º) | 21.21 (9º) | 24.54 (7º) | 26.47 (5º) |
| R09 | Catalonia | 38000 (3º) | 42455 (3º) | 44709 (4º) | 22.71 (3º) | 25.81 (3º) | 27.29 (4º) |
| R10 | Valencian Community | 34209 (12º) | 37331 (13º) | 39869 (13º) | 20.45 (12º) | 22.52 (13º) | 24.2 (13º) |
| R11 | Extremadura | 29677 (17º) | 33457 (17º) | 35952 (17º) | 17.68 (17º) | 20.23 (17º) | 21.88 (17º) |
| R12 | Galicia | 31305 (16º) | 36078 (14º) | 39240 (15º) | 18.55 (16º) | 21.67 (14º) | 23.47 (15º) |
| R13 | Madrid | 41497 (1º) | 45839 (2º) | 48164 (2º) | 24.44 (2º) | 27.62 (2º) | 29.05 (2º) |
| R14 | Murcia | 31878 (14º) | 35335 (16º) | 37946 (16º) | 19.36 (14º) | 21.3 (16º) | 22.98 (16º) |
| R15 | Navarra | 37126 (5º) | 41730 (5º) | 44991 (3º) | 22.63 (4º) | 25.81 (4º) | 28.12 (3º) |
| R16 | The Basque Country | 41119 (2º) | 46340 (1º) | 49939 (1º) | 25.34 (1º) | 29.46 (1º) | 31.55 (1º) |
| R17 | La Rioja | 35814 (7º) | 39362 (10º) | 42764 (9º) | 21.41 (8º) | 23.97 (10º) | 26.02 (9º) |
| | Total | 36020.31 | 40303.84 | 42984.44 | 21.54 | 24.44 | 26.10 |

Table 6. Productivity measures. Sectors. Spain. 2001-2006.

| | | Apparent productivity of labour = GVA /Total employment (€ per worker) | | | GVA by hour worked = Apparent productivity of labour/Hours worked (€ per worker per hour) | | |
|---|---|---|---|---|---|---|---|
| | | 2001 | 2004 | 2006 | 2001 | 2004 | 2006 |
| S01 | Agriculture, livestock, forests and fishing | 23129 (9º) | 25615 (9º) | 25485 (9º) | 13.78 (9º) | 15.43 (9º) | 15.4 (9º) |
| S02 | Energy, chemistry, rubber and metallurgy | 53224 (2º) | 58887 (2º) | 66675 (2º) | 30.64 (2º) | 34.55 (2º) | 39.28 (2º) |
| S03 | Food, textiles, wood, paper and publication | 29365 (7º) | 31000 (8º) | 34481 (8º) | 16.83 (7º) | 18.08 (8º) | 20.2 (8º) |
| S04 | Machinery, electrical material and transport | 38599 (4º) | 42585 (4º) | 44887 (4º) | 22.2 (4º) | 25.04 (4º) | 26.49 (4º) |
| S05 | Construction | 27145 (8º) | 35634 (5º) | 41265 (5º) | 15.19 (8º) | 20.13 (7º) | 23.36 (5º) |
| S06 | Commerce, hotel and catering, repairs | 31017 (6º) | 33568 (7º) | 34849 (7º) | 18.94 (6º) | 20.76 (6º) | 21.6 (7º) |
| S07 | Transport and telecommunications | 47546 (3º) | 50252 (3º) | 50411 (3º) | 29.01 (3º) | 31.11 (3º) | 31.26 (3º) |
| S08 | Financial, services for companies and leasing | 70246 (1º) | 77907 (1º) | 81559 (1º) | 42.93 (1º) | 48.33 (1º) | 50.67 (1º) |
| S09 | Public administration, education and health | 31263 (5º) | 35507 (6º) | 37404 (6º) | 19.14 (5º) | 22.02 (5º) | 23.23 (6º) |
| S10 | Other public services | 15273 (10º) | 16621 (10º) | 17221 (10º) | 9.34 (10º) | 10.3 (10º) | 10.69 (10º) |
| | Total | 36020 | 40304 | 42984 | 21.54 | 24.44 | 26.10 |

### 3.2. FACTORS INFLUENCING PRODUCTIVITY

Many factors influence both economic growth and its components, productivity growth and physical and human capital accumulation. Durlauf et al (2008) lists up to seven growth theories: neoclassical theory, demography/health, macroeconomic policy, religion, geography, ethnic fractionalization, and institutions. This list is considered in an international framework and, consequently, we do not think that it can be applied fully in a regional framework where fundamentals are basically the same throughout a particular nation. Consequently we will focus our analysis on neoclassical growth theory. The economic theory of productivity measurement goes back to Solow (1957). It has since developed due to the major contributions of Mankiw et al. (1992), Jorgenson (1995), Griliches (1995) and Diewert and Nakamura (2007), who reformulated productivity measures in a production function setting and linked it to the analysis of economic growth. The usual factors conditioning economic growth are related with physical capital, human capital, and labour. In regional science other aspects are considered in the analysis of productivity (usually total factor productivity), such as agglomeration economies, congestion, and specialization economies (Ciccone and Hall, 1996, Ciccone, 2002, Broersma and Oosterhaven, 2008).

## 4. QUALITY IN WORK AND PRODUCTIVITY

Different scholars have found the correlation between quality in work and economic performance to be negative, unrelated, or positive.

Defenders of the negative correlation claim that the dehumanization of labour relationships is the price to pay for having higher economic growth. Europe in general, and particularly Spain, experienced high unemployment rates in the eighties and early nineties, followed by a subsequent recovery which, nevertheless, was a consequence of substituting *good jobs* with *bad jobs* (Clark, 2005). With globalization and an abundant labour force, together with technological progress, "in the current economic system workers are irrelevant" (Sennett, 2006).[6]

[6] This phrase was the title for the interview with the sociologist Richard Sennett, published by the Spanish newspaper La Vanguardia on 20 December 2006.

Defenders of the view that there is no correlation hold that money and job satisfaction are unconnected. Economic theory states that firms pay higher salaries to more productive workers. Other things being equal, all workers will obviously prefer higher salaries. Nevertheless, several studies have found that the satisfaction/salary relationship is not so clear. Herzberg et al (1959) showed how salary was a hygienic factor: its absence causes dissatisfaction, but its presence does not cause satisfaction. The effect of salary increases is only transitory and disappears in the long term (Groot and Maassen van den Brink, 1998). This result is consistent with international studies (Kenny, 1999 and Muñoz de Bustillo Llorente et al, 2005) together with others focused on Spain alone (Esteve, 2000), which conclude that after achieving a certain economic level (Inglehart, 1996, situated it at six thousand 1991 constant dollars) subjective satisfaction does not increase with wealth. Finally, other studies have found that what really matters is relative wealth: when the reference salary increases, job satisfaction decreases (Clark and Oswald, 1996, Watson et al 1996, Grund and Sliwca, 2001, and Clark et al, 2008, among others).

Within this second view we find the work of Rosen (1986), who shows that in an efficient labour market, good and bad jobs should be compensated with lower and higher salaries respectively. Consequently, having a higher salary should not be accompanied by higher job satisfaction, as it would be attached to a worse job position. Finally, Diener et al (2002) and Staw et al (1986) found that people's character is a major influence in job satisfaction; obviously, this result lessens the influence or consequences of economic variables.

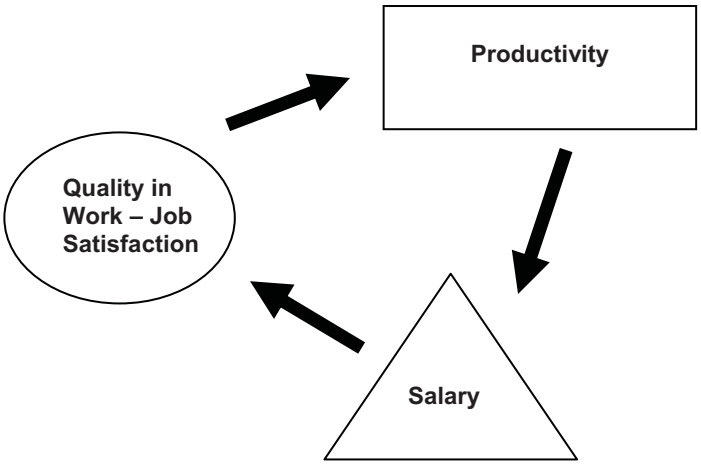
And finally, the third point of view in the quality in work-productivity relation states that higher worker satisfaction will result in higher productivity. A wide range of literature has studied the factors that determine job satisfaction, and some recent publications have also looked at the influence of quality in work on firms' results. Clark (2002) and Lalive (2002) found that workers systematically prefer a higher salary, even after controlling for the usual determinants of job satisfaction. Nevertheless, the estimated effect is relatively low. Other studies of firms' performance and worker motivations are Cully et al (1999), Lazear (2000), Boselie and Van der Wiele (2002), and Petrescu and Simmons (2008).

As regards the influence of quality in work on productivity, seminal results (Vroom, 1964, and Iaffaldano and Muchinsky, 1985, who found a correlation coefficient of 0.17), found a very low relationship between these two variables. This result rather dampened the interest in the topic. Several studies by Chinchilla et al (2003,2004,2005a, 2005b) canvassed a list of Spanish firms in order to determine their position on 'family responsible' policies. Although most firms acknowledged their importance, very few finally applied specific action to promote conciliation between family and work.

Nevertheless, additional studies have found new evidence: Lowe and Schellenberg (2001) reported that having good relationships at work was a key issue to define a good job and increases productivity; West and Patterson (1998): "*a happy workforce is a more productive workforce. It is a simple message to bosses, but is backed up with hard evidence*"; in a 2004 *American Psychological Society Journal* report, Diener and Seligman (2004) confirmed that having dissatisfied workers implied enormous costs for firms in terms of productivity. Other works that come to similar conclusions are Spector (1997), George (1995), Miner (2001), Judge et al (2001).

To summarize, we display the potential relationship between quality in work and productivity that arises from the third point of view, the positive correlation, and we draw a virtuous circle (see figure 2): more productive workers receive higher salaries, which in turn will produce more satisfied and more productive workers. As can be seen, the two variables are reciprocal; this creates a situation of endogeneity that we will have to consider later on.

Figure 2. Relationship between Quality in Work, Productivity and Salary

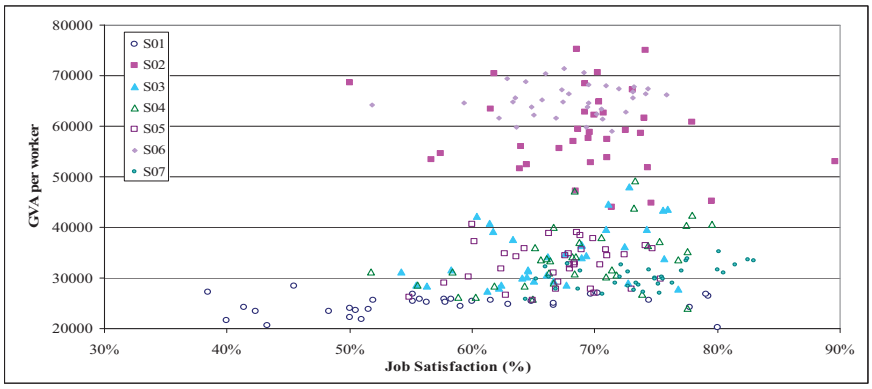



Finally, in order to have a draft idea of the relationship between quality in work and productivity, we compute the correlations between the selected variables. Several alternatives arise. Firstly, figures 3 and 4 show the scatter plot of GVA per worker against job satisfaction and the composite index of quality in work respectively, distinguishing per sector. In this picture, each spot is one sector in one region in one year. Table 7 also displays the correlations between our four basic measures: two measures of quality in work, and two of productivity. Finally in appendix 1 we show the correlations between the indicators for a specific set of years.

These results show that job satisfaction is only slightly correlated with productivity. However, figure 3 displays an interesting result. As we have differentiated each sector in the picture, we see different behaviours: a positive relationship between job satisfaction and GVA per worker in the lower part of the picture, but a negative relationship is in the upper part. Figure 4 does not display this heterogeneous behaviour, and in most sectors the relationship is positive. In order to control for heterogeneity, we divided our dataset in two different groups of sectors. Sectors S01, S04 and S05 are the ones with the lowest proportions of individuals with higher education, and are labelled low-HK sectors. The other sectors are considered high-HK sectors. We compute the correlations between quality in work and productivity measures, which are displayed in the lower part of table 7. The picture differs markedly depending on which measure of quality in work is considered, but in both cases heterogeneity is present. When Job Satisfaction is considered, the relationship with productivity is negative in high-HK

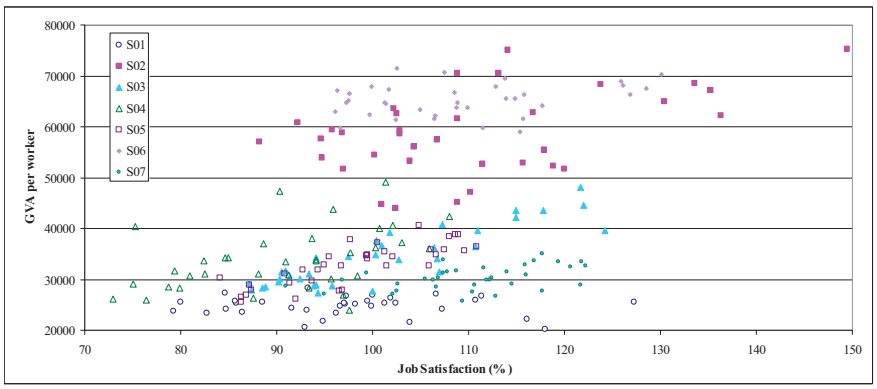
sectors but positive in low-HK sectors. In contrast, the composite index of quality in work displays a higher and positive relationship with productivity in high-HK sectors, while in low-HK sectors it is very close to zero. These results reveal the presence of heterogeneity in the data set; it will have to be taken into account in future computations of our model.

Figure 3. Scatter plot, job satisfaction and GVA per worker.




Note: sectors S01 (Agriculture), S04 (Construction) and S05 (Commerce, hotel and catering, repairs), represented in non solid dots, are the ones with the lowest proportions of workers with university degrees.

Figure 4. Scatter plot Composite Index of QiW and GVA per worker.




Note: sectors S01 (Agriculture), S04 (Construction) and S05 (Commerce, hotel and catering, repairs), represented in non solid dots, are the ones with the lowest proportions of workers with university degrees.

Table 7. Correlation between quality in work and productivity measures. Sectoral, regional and temporal observations.

| | Composite Index of QiW | Job Satisfaction | GVA per worker | GVA per hour worked |
|---|---|---|---|---|
| *All Sectors* | | | | |
| **Composite Index of QiW** | 1 | | | |
| **Job Satisfaction** | 0.378*** | 1 | | |
| **GVA per worker** | 0.442*** | 0.161** | 1 | |
| **GVA per hour worked** | 0.454*** | 0.164*** | 0.995*** | 1 |
| *Low-HK Sectors* | | | | |
| **Composite Index of QiW** | 1 | | | |
| **Job Satisfaction** | 0.375*** | 1 | | |
| **GVA per worker** | 0.096 | 0.382*** | 1 | |
| **GVA per hour worked** | 0.176** | 0.375*** | 0.995*** | 1 |
| *High -HK Sectors* | | | | |
| **Composite Index of QiW** | 1 | | | |
| **Job Satisfaction** | 0.238** | 1 | | |
| **GVA per worker** | 0.306*** | -0.132 | 1 | |
| **GVA per hour worked** | 0.307*** | -0.116 | 0.994*** | 1 |

Note: the number of observations in *All sectors* is 245 (7 regions times 7 sectors for 5 years); in *High-HK Sectors* there are 140 observations (4 sectors); and in *Low-HK Sectors* there are 105 observations; *** denotes significant at p<0.01; ** denotes significant at 5%; and * denotes significant at 10%.

## 5. THE MODEL

### 5.1. ESTIMATION STRATEGY

After detailing the theories and our data, in this chapter we propose a list of models to analyse the relationship between productivity and quality in work. Thus, we supersede the use of simple correlations and apply use models that allow for controlling factors that influence both quality in work and productivity. Besides, we consider the possibility of endogeneity in the relationship may arise.

The aim of our strategy is to see whether there is a significant influence, and, if so, its sign. We believe that the use of alternative measures for both quality in work and productivity is the correct procedure.

Our empirical model is a simultaneous equation model in which quality in work in sector *i*, region *j* and time *t*, depends on the productivity of the same observation, and *vice versa*. Of course, a list of controls will arise in every equation of the system.

$$Quality\ in\ Work_{ijt} = \alpha_1 Productivity_{ijt} + \delta_1\ control\ variables - eq.1_{ijt} \quad \text{(eq. 1)}$$
$$Productivity_{ijt} = \alpha_2\ Quality\ in\ Work_{ijt} + \delta_2\ control\ variables - eq.2_{ijt}$$

This estimation can be developed with two measures of quality in work and two measures of productivity. Consequently, four different models can be estimated, as shown in table 8. Besides, as we have also detected potential differences in behaviour of sectors depending on their level of human capital, we will estimate additional differentiated models.

Table 8. Alternative models considering different measures of productivity and quality in work

| | Job Satisfaction | Composite Index of QiW |
|---|---|---|
| GVA per hour worked | Model 1 | Model 3 |
| GVA per worker | Model 2 | Model 4 |

## 5.2. CONTROL VARIABLES

The models we have developed are intentionally simple. Basically, we have considered a short list of control variables.

With regard to quality in work, we have considered variables that condition quality in work but do not define it. We consider the rate of female employees vis-à-vis the total; the proportion of workers with children; the proportion of people who are married or live with a partner; the proportion of college-educated workers; the proportion of workers who completed non-compulsory secondary school; and the total years studied. All these variables are extracted from the micro data of the Survey on Quality of Life in Work.

The productivity equation is basically a production function. Therefore, we consider the traditional factors together with quality in work: the capital to worker ratio; the share of labour revenues with regard to total GVA, and the educational level of workers, computed as an average between the standardized average number of years studied and

the proportion of college-educated workers; the total number of the active population related to the sector; and finally the proportion of salaried workers to total workers. Appendix 1 shows the definition and basic statistics of all variables.

Additionally in both equations we consider a trend, and also fixed effects for both regions and sectors, and so we include thirteen additional parameters.

## 6. ESTIMATION RESULTS

The empirical model was estimated in EViews, an econometrics program, for the complete panel, 2001-06. In order to correct for the autocorrelation between the disturbances of the two equations, we estimated the system using three stages least squares. We estimated many alternative models, but for simplicity we display only the models depending on the specification of the quality in work equations. Thus, in Case 1 all variables are considered. Case 2 uses only workers' family variables, Case 3 considers education variables, and finally Case 4 uses only one family variable (WOMEN) and one education variable (UNIV). All cases were computed for all four indicators (two of quality in work and two of productivity). This means: four cases times four models (see table 8), a total of 16 different models. Besides, as we found important differences between high-HK and low-HK sectors, we also performed the estimates of all 16 models for both sets of sectors. Presenting the results of 48 different models is difficult; the detailed results are displayed in appendix 2, ands the basic results in tables 9 to 11.

Table 9 displays the estimates of the endogenous variables in each equation. We show the coefficient estimate, the t-statistic, and finally an adjustment evaluation of each equation.[7] Looking at the results, we see in the quality in work equation that when we use Job Satisfaction as the measurement of quality in work, there is no significant effect of the measures of productivity. In contrast, when we consider the composite index of QiW, the parameters are significant and positive in five of the eight estimations (all four cases of models 3 and 4). In the productivity equation we have the estimates of the

[7] We computed the pseudo adjusted $R^2$ using the simple correlation between the data and the result of the model derived by the estimation of the system of equations, using the static solution of EViews.

influence of quality in work. The results always display negative parameters, although the parameters are significant in only seven of the sixteen estimates. In other words: higher productivity does not help higher subjective job satisfaction, but does help to improve more objective aspects of quality in work. And concerning productivity, we see that improving quality in work does not help productivity, and may even worsen it.

We should remember of course that these results are one part of the story: good jobs are being substituted with bad jobs. Nevertheless, two more aspects are relevant here. First, other studies explain the opposite story, and second, we have also seen that there is probably a differentiated pattern for different sectors. Tables 10 and 11 show the results for high-HK and low-HK sectors respectively. Now the results offer no doubt: in high-HK sectors quality in work positively influences productivity. In all estimates the parameters are positive, and are non-significant in only three estimates of the total of sixteen. Besides, as happened before, higher productivity does not mean higher subjective job satisfaction, but does help to improve more objective aspects of quality in work.

In low-HK sectors we find the reverse picture: a negative influence between the two variables which tells us that, in order to gain productivity, there has to be a loss in quality in work. Surprisingly, in cases 2, 3 and 4 the estimates suggest that improving sector productivity will worsen quality in work. Our explanation is addressed in three ways. Firstly, during the period considered, 2001-2006, Spain experienced a large-scale real estate boom, which led to a high increase in GVA, particularly in the construction sector. Nevertheless, this boom was not accompanied simultaneously by the same increase in quality in work aspects. Secondly, we find a substantial increase in job satisfaction in the Agriculture sector, which was not accompanied by an increase in productivity terms. Other arguments that are not controlled in our equation may be behind this part of the story. And finally, the third explanation has to do with the lack of connection between productivity and salaries. In part four of the paper we presented a diagram displaying a virtuous circle in which productivity, salaries and quality in work influenced each other. In our model we have basically used measures of productivity and quality of work. Thus, we have assumed that the higher the productivity, the higher the salary. In low HK sectors with high levels of labour supply increases in productivity may well not result in salary increases. If this happens, then the expected virtuous circle

may not appear, as we find here. Consequently, for whatever reason, quality in work and productivity were linked negatively in these sectors during the period considered.

Finally, the adjustment of all models is relatively high: the only exceptions are the job satisfaction equations, particularly in the low-HK sectors.

In order to save space, here we describe only the main findings related to the control variables of the models, equation by equation.[8]

Quality in work equation:

- The variable related to gender is the rate of female employees with regard to the total. This variable always has a negative and significant parameter in the job satisfaction estimates (models 1 and 2), while in almost all the models with the composite index of quality in work, the variable was non-significant. This result contrasts with the findings of previous research, which found that women usually have higher job satisfaction than men. In any case, our results suggest that women are employed in regions and sectors characterized by lower job satisfaction.

- The variables related to the family status of workers (the proportion of workers with children and the proportion of people who are married or live with a partner) are only significant in the composite index of quality in work estimations (models 3 and 4), and not in all the cases estimated.

- And the variables related to human capital are significant and positive; the variable percentage of college-educated workers is the one with highest significance. This means that more educated people are employed in sectors and regions with higher quality in work.

[8] The working paper displays the detailed results of the models. It is available at http://riscd2.eco.ub.es/~vroyuela/

Productivity equation:

- The variables related to technology, such as the capital per worker ratio, display a significant and clearly positive influence on productivity, while the share of labour revenues over total GVA is negative. Another technical variable, the proportion of salaried workers to total workers, shows a negative influence on productivity.

- Human capital is proxied by workers' educational level. This variable shows a positive parameter particularly in the models with all sectors. In contrast, the variable is sometimes non-significant when we look at particular estimates, such as low-HK sectors. Therefore this variable is particularly important in reproducing differences between high and low HK sectors.

- The variable related to scale – the total number of active population related to the sector – displays a positive, significant parameter in the model with all sectors. We interpret this in terms of agglomeration economies and competition between workers. This variable is also significant and positive in low-HK sectors. In contrast, the variable is negative and significant in the high-HK sector estimates. Our interpretation has to do, firstly, with the construction of the productivity measurement, GVA to total workers, which displays the denominator of the ratio in the right hand side of the equation. And secondly, we hypothesize that in high-HK sectors workers are probably less predisposed to find a job in a different sector or region, a situation that eventually leads to lower competition.

Table 9. 3SLS estimates. All sectors.

| All sectors | Case 1 | | | Case 2 | | | Case 3 | | | Case 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 |
| | Model 1 (Job Satisfaction, GVA per worked hour) | | | | | | | | | | | |
| QiW equation | 0.0000111 | 0.003 | 0.391 | -0.001346 | -0.404 | 0.379 | 0.00161 | 0.460 | 0.277 | -0.001736 | -0.545 | 0.376 |
| Productivity equation | -2.9256 | -0.933 | 0.972 | -3.2091 | -1.024 | 0.972 | -5.5165 * | -1.758 | 0.972 | -3.2678 | -1.043 | 0.972 |
| | Model 2 (Job Satisfaction, GVA per worker) | | | | | | | | | | | |
| QiW equation | 3.29E-08 | 0.015 | 0.391 | -1.02E-06 | -0.501 | 0.378 | 8.85E-07 | 0.410 | 0.277 | -1.23E-06 | -0.628 | 0.376 |
| Productivity equation | -5936.03 | -1.106 | 0.972 | -6725.381 | -1.253 | 0.969 | -15167.58 *** | -2.801 | 0.969 | -6804.73 *** | -1.267 | 0.969 |
| | Model 3 (Composite Index of QiW, GVA per worked hour) | | | | | | | | | | | |
| QiW equation | 0.634924 ** | 2.023 | 0.778 | 0.646921 ** | 2.145 | 0.766 | 0.358739 | 1.245 | 0.774 | 0.72466 ** | 2.483 | 0.768 |
| Productivity equation | -0.060484 | -1.245 | 0.972 | -0.100748 ** | -2.006 | 0.972 | -0.07472 | -1.520 | 0.971 | -0.065955 | -1.352 | 0.972 |
| | Model 4 (Composite Index of QiW, GVA per worker) | | | | | | | | | | | |
| QiW equation | 3.94E-04 ** | 2.034 | 0.778 | 3.64E-04 ** | 1.977 | 0.766 | 2.32E-04 | 1.304 | 0.774 | 2.74E-04 | 1.571 | 0.768 |
| Productivity equation | -112.1079 | -1.340 | 0.969 | -210.262 ** | -2.396 | 0.969 | -139.7166 * | -1.649 | 0.969 | -192.3916 ** | -2.230 | 0.969 |

Note: the number of observations in *All sectors* is 245 (7 regions times 7 sectors for 5 years); *** denotes significant at p<0.01; ** denotes significant at 5%; and * denotes significant at 10%. Pseudo Adj R2 has been computed using the static solution of the model coming from the system estimation. Case 1 includes all control variables in the QiW equation; Case 2 uses only worker family variables in the QiW equation; Case 3 considers only education variables in the QiW equation, and finally Case 4 uses only one family variable (WOMEN) and one education variable (UNIV).

Table 10. 3SLS estimates. High HK sectors.

| Higk HK sectors | Case 1 | | | Case 2 | | | Case 3 | | | Case 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 |
| | Model 1 (Job Satisfaction, GVA per worked hour) | | | | | | | | | | | |
| QiW equation | 2.28E-04 | 0.077 | 0.277 | 1.94E-04 | 0.072 | 0.272 | 2.20E-03 | 0.773 | 0.201 | 2.57E-04 | 0.097 | 0.275 |
| Productivity equation | 5.9558 | 1.576 | 0.984 | 6.0877 | 1.611 | 0.984 | 9.8330 *** | 2.626 | 0.985 | 6.0720 | 1.606 | 0.984 |
| | Model 2 (Job Satisfaction, GVA per worker) | | | | | | | | | | | |
| QiW equation | 1.60E-07 | 0.090 | 0.276 | 1.65E-07 | 0.104 | 0.272 | 1.32E-06 | 0.769 | 0.198 | 1.61E-07 | 0.102 | 0.275 |
| Productivity equation | 10904.86 * | 1.688 | 0.983 | 11161.39 * | 1.728 | 0.983 | 18290.17 *** | 2.865 | 0.983 | 11104.65 * | 1.718 | 0.983 |
| | Model 3 (Composite Index of QiW, GVA per worked hour) | | | | | | | | | | | |
| QiW equation | 0.798176 *** | 3.207 | 0.821 | 1.170852 *** | 5.017 | 0.793 | 0.783976 *** | 3.387 | 0.820 | 0.95388 *** | 4.185 | 0.808 |
| Productivity equation | 0.1188 *** | 3.107 | 0.985 | 0.171673 *** | 4.625 | 0.984 | 0.122514 *** | 3.217 | 0.985 | 0.143204 *** | 3.800 | 0.984 |
| | Model 4 (Composite Index of QiW, GVA per worker) | | | | | | | | | | | |
| QiW equation | 0.000479 *** | 3.212 | 0.820 | 0.000729 *** | 5.313 | 0.790 | 0.000477 *** | 3.423 | 0.819 | 0.000609 *** | 4.517 | 0.806 |
| Productivity equation | 232.3995 *** | 3.596 | 0.984 | 337.164 *** | 5.407 | 0.982 | 240.1765 *** | 3.739 | 0.984 | 286.9253 *** | 4.518 | 0.983 |

Note: the number of observations in *Higk HK sectors* is 140 (7 regions times 4 sectors for 5 years?; *** denotes significant at p<0.01; ** denotes significant at 5%; and * denotes significant at 10%. Pseudo Adj R2 has been computed using the static solution of the model coming from the system estimation. Case 1 includes all control variables in the QiW equation; Case 2 uses only worker family variables in the QiW equation; Case 3 considers only education variables in the QiW equation, and finally Case 4 uses only one family variable (WOMEN) and one education variable (UNIV).

Table 11. 3SLS estimates. Low-HK sectors.

| Low HK sectors | Case 1 | | | Case 2 | | | Case 3 | | | Case 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 | Coeff | t-stat | Pseudo Adj R2 |
| | Model 1 (Job Satisfaction, GVA per worked hour) | | | | | | | | | | | |
| Productivity | -0.025081 | -0.644 | 0.426 | -0.047666 *** | -4.845 | 0.092 | -0.029775 ** | -2.552 | 0.388 | -0.022243 ** | -2.282 | 0.405 |
| QiW | -7.6958 ** | -2.036 | 0.804 | -11.3947 *** | -3.593 | 0.712 | -7.6997 ** | -2.073 | 0.799 | -11.5781 *** | -3.430 | 0.810 |
| | Model 2 (Job Satisfaction, GVA per worker) | | | | | | | | | | | |
| Productivity | -2.66E-05 | -0.900 | 0.215 | -2.77E-05 *** | -4.534 | 0.092 | -1.82E-05 ** | -2.519 | 0.368 | -1.29E-05 ** | -2.203 | 0.400 |
| QiW | -12294.13 * | -1.913 | 0.771 | -18782.05 *** | -3.367 | 0.715 | -12406.26 * | -1.920 | 0.794 | -19503.77 *** | -3.317 | 0.806 |
| | Model 3 (Composite Index of QiW, GVA per worked hour) | | | | | | | | | | | |
| Productivity | 0.335923 | 0.093 | 0.639 | -2.184939 *** | -4.061 | 0.104 | -1.575452 *** | -3.146 | 0.401 | -1.521442 *** | -4.332 | 0.459 |
| QiW | -0.162463 ** | -2.496 | 0.820 | -0.347207 *** | -6.866 | 0.420 | -0.509265 *** | -9.109 | 0.603 | -0.530466 *** | -18.602 | 0.656 |
| | Model 4 (Composite Index of QiW, GVA per worker) | | | | | | | | | | | |
| Productivity | 0.000874 | 0.333 | 0.629 | -0.001241 *** | -3.823 | 0.121 | -0.000743 ** | -2.535 | 0.478 | -0.000735 *** | -3.475 | 0.512 |
| QiW | -270.5229 ** | -2.398 | 0.823 | -597.0438 *** | -6.723 | 0.444 | -1041.208 *** | -10.248 | 0.636 | -1024.234 *** | -18.427 | 0.692 |

Note: the number of observations in *Low-HK Sectors* is 105 (7 regions times 3 sectors for 5 years);; *** denotes significant at p<0.01; ** denotes significant at 5%; and * denotes significant at 10%. Pseudo Adj R2 has been computed using the static solution of the model coming from the system estimation. Case 1 includes all control variables in the QiW equation; Case 2 uses only worker family variables in the QiW equation; Case 3 considers only education variables in the QiW equation, and finally Case 4 uses only one family variable (WOMEN) and one education variable (UNIV).

## 7. CONCLUSIONS

In 2000 the EU drafted its 'Lisbon strategy' in an attempt to establish itself as the world's top knowledge-based economy by the decade's end. This was followed by the introduction of a common currency, the Euro, less than a year later. An assessment of the Lisbon strategy in 2004 concluded that its progress was disappointingly slow and that its targets were unlikely to be met. The EU enlargement, the new Constitution and the recent recession have left Europe in a situation quite different from that of only ten years ago. Besides, as the world becomes increasingly complex there is a common feeling of 'European decline'.[9]

In this scenario, the EU is trying to turn its specificities into productive assets. This is particularly true for preserving what has been labelled as 'good work'. In this regard, there is a growing consensus in Europe that job quality and productivity at work go hand in hand. Nevertheless, both theoretical and empirical analyses have produced arguments in all possible directions regarding the correlation between the two variables: negative, unrelated, and positive.

We have focused our attention on Spain, a country with a persistently high share of fixed-term contracts, one of the highest rates of fatal work-related accidents, and a still high rate of unemployment. But Spain is also an example of economic convergence with other European nations, both in economic terms and in terms of labour market performance. So we can ask a more specific question: is economic convergence partly the result of an extremely flexible labour market (fixed-term contracts, fatal accidents, and so on)? Or, in contrast, as these problems have been solved, has Spain gained achieved convergence at an unusually fast pace?

In order to answer these questions, we produced a simultaneous equation model in which quality in work and productivity measurements are mutually caused. To measure quality in work we used both subjective and social indicator computations. We have used two alternative definitions of productivity: GVA per person employed and GVA per hour worked. The final model considered seven sectors, for seven regions, inside a five-year panel. We have also considered two data sets, dividing human capital sectors

[9] For a wider perspective of Europe, see two ESPON Projects: ESPON 3.2 'Spatial Scenarios and Orientations in relation to the ESPD and Cohesion Policy' and ESPON 3.4.1. 'Europe in the World'

into high and low. In the estimation procedure we calculate the simultaneous model through three stage least squares.

Our results suggest different pictures for the two kinds of sector. In high-HK sectors, quality in work has a positive influence on productivity. Besides, as happened before, higher productivity does not lead to higher subjective job satisfaction, but does help to improve the more objective aspects of quality in work. Conversely, in low-HK sectors there is a negative influence between quality in work and productivity which shows that in order to gain productivity, there has to be a loss in quality in work. We should remember that between 2001 and 2006 Spain experienced a real estate boom which was not accompanied by an increase in aspects of quality in work. For its part, the agriculture sector has also experienced a substantial increase in job satisfaction, without any productivity increase. Finally, in these sectors productivity is probably not linked with salaries.

In our view, these results support the possible relationships between quality in work and productivity. On the one hand we have seen that when HK matters, quality in work is a key issue in explaining productivity. This result bears out the European consensus that job quality and productivity at work go hand in hand. On the other, we have also seen that in low HK sectors higher productivity must be achieved at the expense of low levels of quality in work. This and other issues such as the substitution of workers by machinery are probably amplified by the effect of globalization. In this regard, we see that the EU economy cannot afford to renounce these gains in productivity. We already mentioned that the productivity gap between US and the EU was found in just three sectors: retail, wholesale and finance. Substitution of good jobs with bad jobs is probably the reason for some productivity gains, most probably using new immigrants as cheap labour.

At this point we should recall the topic of *flexicurity*. The use of two combined aspects such as flexibility and security provides an advantage for workers. Firstly, because they will be able to change a good job for another good job when the former is occupied by a lower HK worker, and secondly because the worker will be supported by the social security system. In this situation, we see that everybody will have a chance to play in a win-and-win game.

At the European level the current policies are backed up by our results. However, most policies need to be developed at national and regional levels, by establishing national objectives for adaptation and change, by promoting national and regional dialogues with representatives of employers, workers, governments and other parties, and by reformulating a series of policy approaches, such as life long learning and modern social security systems.

## References


1. Alesina, A., Di Tella, R. and Mac Culloch, R. (2004) "Inequality and happiness: are Europeans and Americans different?", *Quarterly Journal of Economics*, August, 102, pp. 651-78.
2. Artís, M., López-Tamayo, J. and Suriñach, J. (2008) *Estudio Manpower Professional de Calidad Laboral*. Manpower Professional. Barcelona. Avaliable at http://129.35.74.13/Img/5FB7198B2B8D48E2A607BCFC4C1EB8BA.pdf
3. Asiedu, K.F., Folmer, H. (2007) "Does privatization improve job satisfaction? The case of Ghana", *World Development*, 35(10), pp. 1779-1795
4. Bartel, A.P. (1981): Race differences in job satisfaction: A reappraisal, *Journal of Human Resources*, *16*, 295-303.
5. Belfield, C.R. y Harris, R.D.F. (2002): How well do theories of job matching explain variations in job satisfaction across education levels? Evidence for UK graduates, *Applied Economics*, *34*, 535-548.
6. Bender, K.A. y Sloane, P.J. (1998): Job satisfaction, trade unions, and exit-voice revisited, *Industrial and Labor Relations Review*, *51*, 222-240.
7. Bender K.A., Heywood, J.S. (2006) "Job satisfaction of the highly educated: The role of gender, academic tenure, and earnings", *Scottish Journal of Political Economy*, 53(2), pp. 253-279.
8. Blanchard, O.J. (2004). 'The Economic Future of Europe' *Journal of Economic Perspectives*, 18(4), 3–26.
9. Boheim, R., Taylor, M.P. (2004) "Actual and preferred working hours", *British Journal of Industrial Relations*, 42(1), pp. 149-166.
10. Borjas, G.J. (1979): Job satisfaction, wages and unions, *Journal of Human Resources*, *14*, 21-40.
11. Broersma, L. and Oosterhaven, J. (2008) Regional Labour Productivity in The Netherlands. Diversification and Agglomeration Economies. *Journal of Regional Science* (forthcoming).
12. Brown, D. y McIntosh, S. (1998): If you're happy and you know it... Job satisfaction in the low wage service sector, *Centre for Economic Performance, Working Paper*, 405, London School of Economics.
13. Bryson, A., Cappellari, L., Lucifora, C. (2004) "Does union membership really reduce job satisfaction?", *British Journal of Industrial Relations*, 42(3), pp. 439-459.

14. Büchel, F. (2002): The effects of overeducation on productivity in Germany - The firms' viewpoint, *Economics of Education Review*, *21*, 263-275.
15. Cazes, S. and Nesporova, A. (2007) "Flexicurity: A relevant approach in Central and Eastern Europe", ILO.
16. Chinchilla, N. y Polemans, S. (2005a). *La conciliación de la vida laboral, familiar y personal* Barcelona: Pla Estratègic Metropolità de Barcelona, col. Prospectiva, 1.
17. Chinchilla, N. y Polemans, S. (2005b). *Empresa y familia ¿son re-conciliables?*. Centro Internacional del Trabajo y la Familia- IESE Bussinees School.
18. Chinchilla, N., Polemans, S.y León C. (2004). *Empresas Familiarmente Responsables.* Centro Internacional del Trabajo y la Familia- IESE Bussinees School.
19. Chinchilla, N., Polemans, S.y León C. (2003). *Políticas de Conciliación trabajo-familia en 150 empresas españolas*. IESE-Businees School.
20. Ciccone, A. (2002) Agglomeration effects in Europe. *European Economic Review*, 46, PP. 213–227.
21. Ciccone, A. and Hall, R. E. (1996) "Productivity and density of economic activity." *American Economic Review*, 86: 54–70.
22. Clark, A.E. (1996): Job satisfaction in Britain, *British Journal of Industrial Relations*, *34*, 189- 217.
23. Clark, A.E. (1997): Job satisfaction and gender: Why are women so happy at work?, *Labour Economics*, *4*, 341-372.
24. Clark, A.E. (2002): Looking for labour market rents with subjective data, *DELTA Working Papers*.
25. Clark, A.E. (2005) "Your Money or Your Life: Changing Job Quality in OECD Countries", *British Journal of Industrial Relations*, 43(3), 377–400.
26. Clark, A.E., Frijters, P., Shields, M.A. (2008) "Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles", *Journal of Economic Literature*, 46(1), pp. 95-144.
27. Clark, A.E. y Oswald, A.J. (1994): Unhappiness and unemployment, *Economic Journal*, *104*, 648-659.
28. Clark, A.E. y Oswald, A.J. (1996): Satisfaction and comparison income, *Journal of Public Economics*, *61*, 359-381.
29. Clark, A.E., Oswald, A.J. y Warr, P.B. (1996): Is job satisfaction U-shaped in age?, *Journal of Occupational and Organizational Psychology*, *69*, 57-81.
30. Cohen, D. (2007) "The future of Europe: Reform or decline", *Economic Journal,*: 117(524), pp. F642-F648.
31. de Santis, V.S. y Durst, S.L. (1996) "Comparing job satisfaction among public and private sector employees", *American Review of Public Administration*, 26, 327-343.
32. Diener, E., Nickerson, C., Lucas, R.E. y Sandvik, E. (2002) "Dispositional affect and job outcomes", *Social Indicators Research*, 59, 229–259.
33. Diener, E. y Seligman, M.E.P. (2004) "Beyond Money. Towards an economy of well-being". American Psychological Society Journal, 5(1), 1-31.
34. Diewert, E. W. and Nakamura, A. O. (2007) "A Survey of empirical methods of productivity measurement and analysis". In J. J. Heckman and E. E. Leamer (eds) *Handbook of Econometrics. Vol. 6,* Chapter 67, Amsterdam: Elsevier.
35. Diewert, R. (2008) "What Is To Be Done for Better Productivity Measurement" *International Productivity Monitor*, 16, pp. 40-52.
36. Di Tella. R., MacCulloch, R. and Oswald, J. (2001) "Preferences over inflation and unemployment: Evidence from Surveys of Happiness", *American Economic* Review, 91(1), pp 335-41.

37. Di Tella, R., and MacCulloch, R. (2005) "The consequences of labour market flexibility: Panel evidence based on surbey data", *European Economic Review*, 49, pp. 1225-1259.
38. Di Tella, R., MacCulloch, R. (2006) "Some uses of happiness data in Economics", *Journal of Economic Perspectives*, 20(1), pp. 25-46.
39. Durlauf, S.N., Kourtellos, A. and Ming Tan, C. (2008) "Are any growth theories robust?", *The Economic Journal*, 118, 329–346.
40. Easterlin, R. (1974) "Does economic growth improbé human lot? Some empirical evidence", in *Nations and Households in Economic Growth: Essays in honour of Moses Abramovitz*. P. David and M. Reder, eds. New York and London: Academic Press, pp. 98-125.
41. Esteve, F. (2000) "Bienestar y crisis del estado de bienestar. Elementos para una economía de la felicidad", en Muñoz de Bustillo, R. (Ed.) *El estado del bienestar en el cambio de siglo*, Alianza Ed. Madrid, pp. 351-401.
42. European Commission (2006) "Boosting Jobs and Incomes, Policy Lessons from Reassessing the OECD Jobs Strategy", European Commission, DG EMPL, Employment in Europe-2006.
43. Freeman, R.B. (1978): Job satisfaction as an economic variable, *American Economic Association, Papers and Proceedings*, *68*, 135-141.
44. Frey, B., and Stutzer, A. (2000) "Happiness, economy and institutions", *Economic Journal*, 110:446, pp. 918-38.
45. Gamero Buron, C. (2007) "Type of contract and work satisfaction in Spain", *Investigaciones Economicas*, 31(3), pp. 415-444.
46. García Mainar, I. (1999) "La satisfacción con el trabajo en España", *Documentación Laboral*, 59(II), 115-129.
47. George, J.M. (1995) "Leader positive mood and group performance: The case of customer service", *Journal of Applied Social Psychology*, 25, 778–794.
48. Gordon, M. y Denisi, A. (1995): A re-examination of the relationship between union membership and job satisfaction, *Industrial and Labor Relations Review*, *48*, 222-236.
49. Griliches, Z. (1995) "R&D and productivity: econometric results and measurement issues". In P. Stoneman (ed.) *Handbook of the Economics of Innovation and Technological Change,* pp. 52–89. Malden, MA: Blackwell.
50. Groot, W. y Maassen van den Brink, H. (1998): Job satisfaction, wages and allocation of men and women, *TSER/STT Working Papers*, WP-10-98.
51. Gruber, J., and Mullainathan, S. (2002) "Do cigarettes taxes make smokers happier?", NBER Working Paper No 8872.
52. Grund, C. y Sliwka, D. (2001): The impact of wage increases on job satisfaction – Empirical evidence and theoretical implications, *IZA Discussion Papers*, 387, November.
53. Herzberg, F., Mausner, B. y Snyderman, B. (1959) *The Motivation to Work*, New York, Ed. Wiley.
54. Iaffaldano, M., & Muchinsky, P. (1985) "Job satisfaction and performance: A meta-analysis", *Journal of Applied Psychology*, 97, 251–273.
55. ILO (2005) Seventh European Regional Meeting, 14-18 February 2005: official conclusions no. 18; Changing Patterns of Work, Report of the Director-General, June 2006: page 33-35.
56. Inglehart, R, (1996) "The diminishing utility of economic growth: from maximizing security towards maximizing subjective well-being", *Critical Review*, 10(4), 509-531.

57. Inklaar, R., Timmer, M.P., van Ark, B. (2008a) Market Services Productivity across Europe and the US, *Economic Policy*, 53 pp. 139-194.
58. Inklaar, R., Timmer, M.P. van Ark, B. (2008b) "Data for Productivity Measurement in Market Services: An International Comparison" *International Productivity Monitor*.
59. Jorgenson, D. W. (1995) *Productivity Volume 1 and 2*. Cambridge MA: MIT Press.
60. Judge, T.A., Thoreson, C.J., Bono, J.E., y Patton, G.K. (2001) "The job satisfaction-job performance relationship: A qualitative and quantitative review", *Psychological Bulletin*, 127, 376–407.
61. Kaiser, L.C. (2002): Job satisfaction: A comparison of standard, non-standard, and selfemployment patterns across Europe with a special note to the gender/job satisfaction paradox, *EPAG Working Papers*, *27*, Colchester: University of Essex.
62. Kaiser, L.C. (2007) "Gender-job satisfaction differences across Europe - An indicator for labour market modernization", *International Journal of Manpower*, 28(1), pp. 75-94.
63. Kenny, C. (1999) "Does happiness Cause Growth?", *Kyklos*, 52(1), 3-26.
64. Lalive, R. (2002): Do wages compensate for workplace amenities?, *mimeo, University of Zurich*.
65. Lawler, E.E. (1973) *Motivation in Work Organizations*, Brooks/Cole, Monterrey.
*66.* Lévy-Garboua, L.L. y C. Montmarquette (2004) "Reported Job Satisfaction : What Does It Mean?" *Journal of Socio-Economics*¨, 33(2), 135-151.
*67.* Locke, E.A. (1976) "The nature and causes of job satisfaction", en Dunette, M.D. (Ed.), *Handbook of Industrial and Organizational Psychology*, Rand-McNally, Chicago.
68. Lowe, G. y Schellenberg, G. (2001) "What's a good job? The importance of employment relationships", Canadian Policy Research Networks Inc.
69. Lydon, R. (2001): Subject choice at third level and job satisfaction, *mimeo*, Departament of Economics, University of Warwick.
70. Lydon, R. y Chevalier, R. (2002): Estimates of the effect of wages on job satisfaction, *CEPLSE Discussion Papers*, 0531.
71. Macklin DS, Smith LA, Dollard MF (2006) "Public and private sector work stress: Workers compensation, levels of distress and job satisfaction, and the demand-control-support model", *Australian Journal of Psychology*, 58(3), 130-143.
72. Manglione, T.W. y Quinn, R.P. (1975) "Job satisfaction, counter-productive behaviour and drug use at work", *Journal of Applied Psychology*, 60, 114-116.
73. Mankiw, N.G., Romer, D. and Weil, D. (1992). "A contribution to the empirics of economic growth", *Quarterly Journal of Economics*,. 107(2), pp. 407–37.
74. Meng, R. (1990): The relationship between unions and job satisfaction, *Applied Economics*, *22*, 1635-1648.
75. Miner, A.G. (2001) "Experience sampling events, moods, behaviors, and performance at work" Unpublished doctoral dissertation, University of Illinois, Urbana-Champaign.
76. Muñoz de Bustillo Llorente, R. y Fernández Macías, E. (2005) "Job satisfaction as an indicador of the quality of work"*, The Journal of Socio-Economics*, 34, 656-673.
77. OECD (2006), Boosting Jobs and Incomes, Policy Lessons from Reassessing the OECD Jobs Strategy.
78. Pérez García, F. Maudos Villarroya, J., Pastor Monsálvez, J.M. y Serrano Martínez, L. (2006) *Productividad e internacionalización: el crecimiento español ante los nuevos cambios estructurales*, Ed. Fundación BBVA. Bilbao.

79. Rosen, S. (1986): The theory of equalizing differences, en Ashenfelter, O. y Layard, R. (eds.), *Handbook of Labor Economics*, *1*, Elsevier Science Publishers, 641-692.
80. Royuela, V., López-Tamayo, J., and Suriñach, J. (2008a) "The Institutional vs. the Academic Definition of the Quality of Work Life. What is the Focus of the European Commission?" *Social Indicators Research*, 86(3), pp. 401-415
81. Royuela, V., López-Tamayo, J., and Suriñach, J. (2008b) "Results of a Quality of Work Life Index in Spain. A Comparison of Survey Results and Aggregate Social Indicators", *Social Indicators Research*, forthcoming.
82. Sanromá, E. y Ramos, R. (2003), "Sobreeducación y mercados de trabajo locales en España" en San Segundo, M. J. y Zorrilla, R. (eds.), "Economía de la Educación. Actas de las XII Jornadas de la AEDE, 18- 19/9/2003", DL M-39456-2003, Universidad Carlos III de Madrid, Madrid, pp. 220-239.
83. Schwochau, S. (1987): Union effects on job attitudes, *Industrial and Labor Relations Review*, *40*, 209-224.
84. Sennet, R. (2006) *La nueva cultura del capitalismo*, Ed. Anagrama.
85. Sloane, P.J. y Williams, H. (2000): Job satisfaction, comparison earnings and gender, *Labour*, *14*, 473-501.
86. Shields, M.A. y Ward, M.E. (2001): Improving nurse retention in the British National Health Service: The impact of job satisfaction on intentions to quit, *Journal of Health Economics*, *20*, 677-801.
87. Sousa-Poza, A. y Sousa-Poza, A.A. (2000a): Taking another look at the gender/job satisfaction paradox, *Kyklos*, *53*, 135-152.
88. Sousa-Poza, A. y Sousa-Poza, A.A. (2000b): Well-being at work: A cross-national analysis of the levels and determinants of job satisfaction, *Journal of Socio-Economics*, *29*, 517-538.
89. Spector, P.E. (1997) *Job satisfaction: Application, assessment, cause, and consequences.* Thousand Oaks, CA: Sage.
90. Staw, B.M., Bell, N.E., y Clausen, J.A. (1986) "The dispositional approach to job attitudes: A lifetime longitudinal test", *Administrative Science Quarterly*, 31, 56–77.
91. Triplett, J.E. and B.P. Bosworth (2004). *Productivity in the US Services Sector; New Sources of Economic Growth*, Washington DC: Brookings Institution.
92. Tsang, M.C., R.W. Rumberger and H.M. Levin (1991), "The impact of surplus schooling on worker productivity", *Industrial Relations*, 30 (2), 209-228.
93. van Ark, B., O'Mahony, M., Timmer, M.P. (2008) "The productivity gap between Europe and the United States: Trends and causes", *Journal of Economic Perspectives*, 22(1), pp. 25-44.
94. Vieira, J.A.C. (2005) "Skill mismatches and job satisfaction", *Economics Letters* 89(1), pp. 39-47.
95. Vroom, V.H. (1964). *Work and motivation*. New York: Wiley.
96. Watson, R., Storey, D., Wynarczyk, P., Keasey, K. y Short, H. (1996): The relationship between job satisfaction and managerial remuneration in small and medium-sized categories: An empirical test of comparison income and Equity Theory hipotheses, *Applied Economics*, *28*, 567-576.
97. West, M. y Patterson, M. (1998) "People Power", London School of Economics Journal Centre Piece.
98. Winkelmann, L. y Winkelmann, R. (1997) "Why are unemployed so unhappy? Evidence from panel data", *Economica*, 65, 1-16.
99. Woittiez, Y. y Theeuwes, J. (1998) "Well being and labor market status", en Jenkins, P., Kapteyn, A. y van Praag, B.M.S. *The distribution of welfare and household production. International perspectives*, Cambridge University Press.

100. Wolfers, J. (2003) "Is business cycle volatility costly? Eidence from surveys of subjective well-being", *International Finance*, 6(1), pp. 1-31.

## Appendix 1. Definition of variables and descriptive statistics

Table A1. Definition and sources of all variables.

| Label | Definition | Comments | Source |
|---|---|---|---|
| JS | Job Satisfaction | Proportion of workers with a job satisfaction over 6; computed using micro data from the SQLW | Survey on Quality of Life in Work |
| IT19 | Composite Index of QiW | We used up to the 9th component of the index | Royuela et al 2008a,b |
| WOMEN | rate of women employees over total employees | Computed using micro data from the SQLW | Survey on Quality of Life in Work |
| SONS | the proportion of workers with children | Computed using micro data from the SQLW | Survey on Quality of Life in Work |
| PART | the proportion of people who are married or live with a partner | Computed using micro data from the SQLW | Survey on Quality of Life in Work |
| UNIV | the proportion of college-educated workers | Computed using micro data from the SQLW | Survey on Quality of Life in Work |
| SECOND | the proportion of workers with non compulsory secondary school | Computed using micro data from the SQLW | Survey on Quality of Life in Work |
| S_YEARS | the years studied by workers | Computed using micro data from the SQLW. We used the same years for each category as in the Spanish 2001 Census | Survey on Quality of Life in Work |
| GVAw | Gross Value Added per worker | | Contabilidad Regional de España (INE) |
| GVAh | Gross Value Added per worked hour | | Contabilidad Regional de España (INE) |
| K/L | the capital over workers | We computed the ratio in a 2000 basis. To account for growth of the K variable, we used the perpetual inventory method, with the national depreciated investment until 2006. | BDMores, Encuesta de Población Activa (INE) |
| LR/Y | the share of labour revenues over total GVA | | Contabilidad Regional de España (INE) |
| STUDIES | and the education level of workers | computed as an average between the standardized average studied years and the proportion of college-educated workers | Encuesta de Población Activa ( INE) |
| ACTIVE | the total number of active population related to the sector | | Encuesta de Población Activa ( INE) |
| SALARIED | the proportion of salaried workers over total workers | | Contabilidad Regional de España (INE) |
| YEAR | Trend | Computed from 2001 to 2006 | self made |

Table A2. Basic statistics of all variables. Unidimensinal statistics.

| | All sectors (N=245) | | | | | High HK sectors (N=140) | | | | | Low HK sectors (N=105) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Median | Max | Min | S.D. | Mean | Median | Max | Min | S.D. | Mean | Median | Max | Min | S.D. |
| JS | 0.674918 | 0.685714 | 0.9 | 0.384615 | 0.083811 | 0.693935 | 0.694915 | 0.896552 | 0.5 | 0.063106 | 0.649561 | 0.666667 | 0.9 | 0.384615 | 0.100107 |
| IT19 | 102.4738 | 101.5127 | 149.5027 | 72.89494 | 12.52937 | 107.6337 | 107.1128 | 149.5027 | 87.14106 | 11.47289 | 95.59388 | 96.25323 | 127.3079 | 72.89494 | 10.42863 |
| WOMEN | 0.312228 | 0.327434 | 0.697802 | 0 | 0.187958 | 0.362778 | 0.352003 | 0.697802 | 0.018182 | 0.166682 | 0.244828 | 0.186047 | 0.6 | 0 | 0.194232 |
| SONS | 0.553591 | 0.585366 | 0.916667 | 0.111111 | 0.132276 | 0.548739 | 0.586408 | 0.743243 | 0.207921 | 0.12697 | 0.56006 | 0.581227 | 0.916667 | 0.111111 | 0.139389 |
| PART | 0.772143 | 0.77551 | 1 | 0.5 | 0.083954 | 0.769554 | 0.77475 | 0.978723 | 0.548387 | 0.082046 | 0.775595 | 0.776786 | 1 | 0.5 | 0.086708 |
| UNIV | 0.175314 | 0.122642 | 0.548736 | 0 | 0.139621 | 0.243544 | 0.221731 | 0.548736 | 0.031915 | 0.141997 | 0.084341 | 0.081081 | 0.4 | 0 | 0.064536 |
| SECOND | 0.211729 | 0.214953 | 0.666667 | 0 | 0.083471 | 0.239181 | 0.23367 | 0.37037 | 0.101449 | 0.057757 | 0.175126 | 0.173469 | 0.666667 | 0 | 0.097575 |
| S_YEARS | 5.125961 | 5.041667 | 7.1875 | 2.5 | 0.920645 | 5.614401 | 5.552098 | 7.1875 | 4.214953 | 0.768015 | 4.474707 | 4.578378 | 6.333333 | 2.5 | 0.671454 |
| GVAw | 39996.09 | 33775.49 | 75259.24 | 18768.52 | 15185.6 | 47157.35 | 44695.7 | 75259.24 | 25737.91 | 16030.62 | 30447.74 | 29249.6 | 49123.8 | 18768.52 | 6039.937 |
| GVAh | 23.91956 | 20.13933 | 45.3244 | 11.31161 | 9.292361 | 28.32027 | 25.9382 | 45.3244 | 15.37105 | 9.832827 | 18.05194 | 17.3227 | 28.36381 | 11.31161 | 3.540217 |
| K/L | 96553.47 | 58847.83 | 453941.4 | 4232.938 | 102941.9 | 152113 | 114326 | 453941.4 | 39256.18 | 104795.6 | 22474.16 | 10125.25 | 97952 | 4232.938 | 22098.77 |
| LR/Y | 0.50811 | 0.503282 | 0.7948 | 0.136573 | 0.176835 | 0.568107 | 0.578292 | 0.7948 | 0.337306 | 0.153547 | 0.428113 | 0.487934 | 0.682935 | 0.136573 | 0.174779 |
| STUDIES | -0.071269 | -0.151163 | 2.825192 | -1.722986 | 0.825759 | 0.163427 | -0.097653 | 2.825192 | -1.034522 | 0.777852 | -0.384197 | -0.443896 | 1.525114 | -1.722986 | 0.786193 |
| ACTIVE | 355171.8 | 302391.6 | 1200967 | 17175 | 226037.5 | 372895.5 | 300335.5 | 1200967 | 109309.7 | 221543.6 | 331540.2 | 309150 | 1170550 | 17175 | 230837.2 |
| SALARIED | 0.813808 | 0.850802 | 0.971711 | 0.322241 | 0.168596 | 0.909707 | 0.936 | 0.971711 | 0.787178 | 0.059405 | 0.685943 | 0.761923 | 0.870791 | 0.322241 | 0.181895 |

Note: the number of observations in *All sectors* is 245 (7 regions times 7 sectors for 5 years); in *High-HK Sectors* there are 140 observations (4 sectors); and in *Low-HK Sectors* there are 105 observations.

Table A3. Basic statistics of all variables. Correlations.

| | All sectors (N=245) | | | | High HK sectors (N=140) | | | | Low HK sectors (N=105) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JS | IT19 | GVAw | GVAh | JS | IT19 | GVAw | GVAh | JS | IT19 | GVAw | GVAh |
| WOMEN | 0.089 | 0.325*** | -0.1 | -0.033 | 0.2** | 0.177** | -0.516 | -0.447 | -0.131 | 0.259*** | 0.028 | 0.212** |
| SONS | -0.149 | -0.332 | -0.156 | -0.164 | -0.032 | -0.389 | -0.117 | -0.125 | -0.233 | -0.312 | -0.362 | -0.4 |
| PART | -0.031 | -0.361 | -0.029 | -0.063 | -0.116 | -0.434 | 0.08 | 0.04 | 0.052 | -0.333 | -0.325 | -0.399 |
| UNIV | 0.337*** | 0.55*** | 0.235*** | 0.281*** | 0.27*** | 0.405*** | -0.153 | -0.086 | 0.3*** | 0.401*** | 0.252*** | 0.309*** |
| SECOND | 0.168*** | 0.383*** | 0.401*** | 0.414*** | -0.169 | 0.367*** | 0.282*** | 0.275*** | 0.199** | 0.167* | 0.383*** | 0.478*** |
| S_YEARS | 0.361*** | 0.582*** | 0.347*** | 0.388*** | 0.218** | 0.492*** | -0.08 | -0.018 | 0.328*** | 0.29*** | 0.426*** | 0.513*** |
| K/L | 0.11* | 0.371*** | 0.802*** | 0.836*** | -0.022 | 0.113 | 0.787*** | 0.835*** | -0.406 | 0.178* | -0.566 | -0.538 |
| LR/Y | 0.372*** | 0.085 | -0.173 | -0.185 | 0.232*** | -0.045 | -0.933 | -0.923 | 0.362*** | -0.232 | 0.599*** | 0.521*** |
| STUDIES | 0.194*** | 0.631*** | 0.4*** | 0.42*** | -0.087 | 0.665*** | 0.258*** | 0.268*** | 0.295*** | 0.435*** | 0.46*** | 0.566*** |
| ACTIVE | 0.21*** | 0.139** | -0.066 | -0.03 | 0.24*** | 0.236*** | -0.315 | -0.264 | 0.163 | -0.067 | 0.407*** | 0.461*** |
| SALARIED | 0.405*** | 0.261*** | 0.345*** | 0.319*** | 0.156* | 0.108 | -0.656 | -0.698 | 0.379*** | -0.189 | 0.683*** | 0.607*** |

Note: the number of observations in *All sectors* is 245 (7 regions times 7 sectors for 5 years); in *High-HK Sectors* there are 140 observations (4 sectors); and in *Low-HK Sectors* there are 105 observations; *** denotes significant at p<0.01; ** denotes significant at 5%; and * denotes significant at 10%.

## Appendix 2. Detailed results of the models.

Results for All sectors (N=245 observations)

| **Model 1 (Job Satisfaction, GVA per worker)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -18.903 | -1.72 | -25.562 | -2.51 | -12.952 | -1.58 | -21.439 | -2.78 |
| Productivity | 0.000 | 0.015 | -0.000 | -0.501 | 0.000 | 0.410 | -0.000 | -0.628 |
| %women | -0.351 | -5.25 | -0.306 | -4.76 | | | -0.370 | -6.22 |
| %children | -0.065 | -1.10 | -0.040 | -0.73 | | | | |
| % partner | 0.134 | 1.56 | 0.153 | 1.78 | | | | |
| % college educated | 0.119 | 0.61 | | | -0.110 | -0.57 | 0.146 | 1.68 |
| % non comp secondary | -0.121 | -0.82 | | | -0.152 | -1.12 | | |
| average years of education | -0.003 | -0.10 | | | 0.029 | 0.93 | | |
| Trend | 0.010 | 1.79 | 0.013 | 2.59 | 0.007 | 1.65 | 0.011 | 2.88 |
| pseudo - adj R2 | | 0.391 | | 0.378 | | 0.277 | | 0.376 |
| simple r (model) | | 0.666 | | 0.657 | | 0.582 | | 0.655 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,365,484 | -4.99 | -1,392,117 | -5.08 | -1,607,507 | -5.67 | -1,390,887 | -5.07 |
| QiW | -5,936 | -1.11 | -6,725 | -1.25 | -15,168 | -2.80 | -6,805 | -1.27 |
| K/L | 6.4E-02 | 8.52 | 6.4E-02 | 8.44 | 6.1E-02 | 7.86 | 6.3E-02 | 8.38 |
| Actives | 9.1E-03 | 3.45 | 8.9E-03 | 3.36 | 6.8E-03 | 2.48 | 9.0E-03 | 3.40 |
| Education | 2,379 | 2.72 | 2,305 | 2.63 | 1,963 | 2.15 | 2,332 | 2.66 |
| %Salaried workers | 12,984 | 3.15 | 12,831 | 3.11 | 12,512 | 2.90 | 12,952 | 3.13 |
| LR/Y | -66,461 | -11.48 | -66,613 | -11.49 | -67,154 | -11.13 | -67,066 | -11.57 |
| Trend | 712.3 | 5.15 | 726.1 | 5.24 | 838.2 | 5.85 | 725.7 | 5.24 |
| pseudo - adj R2 | | 0.972 | | 0.969 | | 0.969 | | 0.969 |
| simple r (model) | | 0.987 | | 0.986 | | 0.986 | | 0.986 |

| **Model 2 (Job Satisfaction, GVA per worked hour)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -19.212 | -1.70 | -24.578 | -2.26 | -11.742 | -1.38 | -20.696 | -2.58 |
| Productivity | 1.1E-05 | 0.003 | -1.3E-03 | -0.404 | 1.6E-03 | 0.460 | -1.7E-03 | -0.545 |
| %women | -0.352 | -5.26 | -0.308 | -4.78 | | | -0.372 | -6.24 |
| %children | -0.0638 | -1.07 | -0.0441 | -0.78 | | | | |
| % partner | 0.1367 | 1.58 | 0.1553 | 1.80 | | | | |
| % college educated | 0.1257 | 0.64 | | | -0.0891 | -0.45 | 0.1433 | 1.64 |
| % non comp secondary | -0.1101 | -0.75 | | | -0.1228 | -0.87 | | |
| average years of education | -0.0050 | -0.16 | | | 0.0237 | 0.74 | | |
| Trend | 0.010 | 1.77 | 0.013 | 2.33 | 0.006 | 1.44 | 0.011 | 2.68 |
| pseudo - adj R2 | | 0.391 | | 0.379 | | 0.277 | | 0.376 |
| simple r (model) | | 0.666 | | 0.657 | | 0.582 | | 0.656 |

| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
|---|---|---|---|---|---|---|---|---|
| Constant | -966.7 | -6.05 | -962.0 | -5.92 | -1,020.6 | -6.23 | -962.6 | -5.92 |
| QiW | -2.926 | -0.93 | -3.209 | -1.02 | -5.517 | -1.76 | -3.268 | -1.04 |
| K/L | 4.1E-05 | 9.22 | 4.1E-05 | 9.18 | 4.0E-05 | 8.98 | 4.0E-05 | 9.14 |
| Actives | 5.1E-06 | 3.28 | 5.0E-06 | 3.23 | 4.4E-06 | 2.84 | 5.0E-06 | 3.25 |
| Education | 1.495 | 2.93 | 1.471 | 2.88 | 1.380 | 2.68 | 1.479 | 2.89 |
| %Salaried workers | 7.873 | 3.27 | 7.869 | 3.26 | 7.787 | 3.20 | 7.910 | 3.28 |
| LR/Y | -37.128 | -10.98 | -37.235 | -11.01 | -37.386 | -10.96 | -37.424 | -11.06 |
| Trend | 0.500 | 6.19 | 0.498 | 6.06 | 0.528 | 6.38 | 0.498 | 6.06 |
| pseudo - adj R2 | | 0.972 | | 0.972 | | 0.972 | | 0.972 |
| simple r (model) | | 0.987 | | 0.987 | | 0.987 | | 0.987 |

| **Model 3 (Composite Index of QiW, GVA per worker)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,919.981 | -1.97 | -2,392.264 | -2.64 | -3,448.934 | -5.12 | -3,486.073 | -5.06 |
| Productivity | 0.000 | 2.034 | 0.000 | 1.977 | 0.000 | 1.304 | 0.000 | 1.571 |
| %women | -2.425 | -0.42 | 3.175 | 0.58 | | | -0.402 | -0.08 |
| %children | -9.617 | -1.85 | -9.580 | -2.02 | | | | |
| % partner | -1.715 | -0.23 | -0.043 | -0.01 | | | | |
| % college educated | 47.664 | 2.79 | | | 54.634 | 3.41 | 23.785 | 3.20 |
| % non comp secondary | 9.878 | 0.77 | | | 20.125 | 1.79 | | |
| average years of education | -4.265 | -1.54 | | | -5.607 | -2.19 | | |
| Trend | 1.018 | 2.09 | 1.249 | 2.76 | 1.781 | 5.26 | 1.790 | 5.17 |
| pseudo - adj R2 | | 0.778 | | 0.766 | | 0.774 | | 0.768 |
| simple r (model) | | 0.893 | | 0.887 | | 0.891 | | 0.888 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,686,856 | -3.88 | -2,122,460 | -4.60 | -1,819,934 | -4.13 | -2,049,451 | -4.52 |
| QiW | -112 | -1.34 | -210 | -2.40 | -140 | -1.65 | -192 | -2.23 |
| K/L | 6.8E-02 | 8.47 | 7.1E-02 | 8.12 | 6.7E-02 | 8.19 | 6.9E-02 | 8.06 |
| Actives | 1.1E-02 | 4.34 | 1.1E-02 | 3.94 | 1.1E-02 | 4.24 | 1.0E-02 | 3.97 |
| Education | 3,363 | 3.50 | 3,681 | 3.51 | 3,552 | 3.63 | 3,779 | 3.69 |
| %Salaried workers | 11,714 | 2.59 | 9,237 | 1.88 | 11,600 | 2.51 | 10,699 | 2.21 |
| LR/Y | -66,461 | -10.76 | -66,610 | -9.86 | -67,160 | -10.68 | -67,567 | -10.26 |
| Trend | 876.7 | 3.96 | 1,101.0 | 4.68 | 945.1 | 4.20 | 1,063.3 | 4.60 |
| pseudo - adj R2 | | 0.969 | | 0.969 | | 0.969 | | 0.969 |
| simple r (model) | | 0.986 | | 0.986 | | 0.986 | | 0.986 |

| **Model 4 (Composite Index of QiW, GVA per worked hour)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,828 | -1.82 | -1,915 | -1.96 | -3,379 | -4.81 | -1,379 | -1.43 |
| Productivity | 0.635 | 2.023 | 0.647 | 2.145 | 0.359 | 1.245 | 0.725 | 2.483 |
| %women | -2.293 | -0.39 | 3.427 | 0.61 | | | 0.000 | 0.00 |
| %children | -9.918 | -1.90 | -11.354 | -2.29 | | | -12.658 | -2.93 |
| % partner | -1.701 | -0.22 | -0.378 | -0.05 | | | 0.000 | 0.00 |
| % college educated | 47.599 | 2.76 | | | 55.707 | 3.45 | 25.752 | 3.38 |
| % non comp secondary | 10.585 | 0.82 | | | 21.617 | 1.91 | 0.000 | 0.00 |
| average years of education | -4.310 | -1.55 | | | -5.801 | -2.24 | 0.000 | 0.00 |
| Trend | 0.973 | 1.93 | | | 1.747 | 4.94 | 0.739 | 1.53 |
| pseudo - adj R2 | | 0.778 | | 0.766 | | 0.774 | | 0.768 |
| simple r (model) | | 0.893 | | 0.887 | | 0.891 | | 0.888 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,147 | -4.55 | -1,310 | -4.96 | -1,202 | -4.68 | -1,157 | -4.54 |
| QiW | -0.060 | -1.25 | -0.101 | -2.01 | -0.075 | -1.52 | -0.066 | -1.35 |
| K/L | 4.3E-05 | 9.12 | 4.4E-05 | 8.88 | 4.2E-05 | 8.83 | 4.3E-05 | 9.14 |
| Actives | 5.8E-06 | 4.09 | 5.8E-06 | 3.84 | 5.8E-06 | 4.01 | 5.8E-06 | 4.03 |
| Education | 2.008 | 3.60 | 2.129 | 3.61 | 2.106 | 3.72 | 2.024 | 3.60 |
| %Salaried workers | 7.183 | 2.74 | 6.164 | 2.23 | 7.185 | 2.69 | 7.084 | 2.68 |
| LR/Y | -37.162 | -10.37 | -37.343 | -9.83 | -37.657 | -10.34 | -37.243 | -10.33 |
| Trend | 0.592 | 4.61 | 0.676 | 5.02 | 0.621 | 4.74 | 0.597 | 4.60 |
| pseudo - adj R2 | | 0.972 | | 0.972 | | 0.971 | | 0.972 |
| simple r (model) | | 0.987 | | 0.987 | | 0.987 | | 0.987 |

## Results for High-HK sectors

| **Model 1 (Job Satisfaction, GVA per worker)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -15.532 | -1.41 | -15.648 | -1.54 | -5.686 | -0.75 | -12.502 | -1.71 |
| Productivity | 0.000 | 0.090 | 0.000 | 0.104 | 0.000 | 0.769 | 0.000 | 0.102 |
| %women | -0.305 | -3.48 | -0.285 | -3.39 | | | -0.315 | -3.71 |
| %children | 0.003 | 0.05 | -0.000 | -0.00 | | | | |
| % partner | 0.048 | 0.43 | 0.052 | 0.46 | | | | |
| % college educated | 0.101 | 0.39 | | | -0.021 | -0.09 | 0.069 | 0.68 |
| % non comp secondary | -0.020 | -0.11 | | | 0.005 | 0.03 | | |
| average years of education | -0.007 | -0.15 | | | -0.003 | -0.07 | | |
| Trend | 0.008 | 1.49 | 0.008 | 1.63 | 0.003 | 0.84 | 0.007 | 1.83 |
| pseudo - adj R2 | | 0.276 | | 0.282 | | 0.226 | | 0.300 |
| simple r (model) | | 0.574 | | 0.571 | | 0.504 | | 0.570 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,898,632 | -7.15 | -1,894,360 | -7.13 | -1,777,980 | -6.54 | -1,895,493 | -7.13 |
| QiW | 10,905 | 1.69 | 11,161 | 1.73 | 18,290 | 2.87 | 11,105 | 1.72 |
| K/L | 3.8E-02 | 4.31 | 3.8E-02 | 4.30 | 3.8E-02 | 4.17 | 3.8E-02 | 4.31 |
| Actives | -5.8E-03 | -2.03 | -5.7E-03 | -2.02 | -4.4E-03 | -1.53 | -5.8E-03 | -2.03 |
| Education | 1,686 | 1.99 | 1,714 | 2.02 | 1,903 | 2.18 | 1,693 | 2.00 |
| %Salaried workers | 119,191 | 8.45 | 119,269 | 8.46 | 122,952 | 8.48 | 119,049 | 8.44 |
| LR/Y | -68,480 | -6.52 | -68,514 | -6.52 | -68,676 | -6.35 | -68,463 | -6.52 |
| Trend | 928.0 | 6.97 | 925.7 | 6.95 | 862.7 | 6.34 | 926.4 | 6.96 |
| pseudo - adj R2 | | 0.983 | | 0.983 | | 0.983 | | 0.983 |
| simple r (model) | | 0.992 | | 0.992 | | 0.992 | | 0.992 |

| **Model 2 (Job Satisfaction, GVA per worked hour)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -15.804 | -1.37 | -16.141 | -1.51 | -5.527 | -0.69 | -12.481 | -1.62 |
| Productivity | 2.3E-04 | 0.077 | 1.9E-04 | 0.072 | 2.2E-03 | 0.773 | 2.6E-04 | 0.097 |
| %women | -0.306 | -3.49 | -0.285 | -3.40 | | | -0.316 | -3.73 |
| %children | 0.0030 | 0.04 | 0.0007 | 0.01 | | | | |
| % partner | 0.0515 | 0.45 | 0.0571 | 0.51 | | | | |
| % college educated | 0.0949 | 0.36 | | | -0.0453 | -0.19 | 0.0702 | 0.69 |
| % non comp secondary | -0.0311 | -0.18 | | | -0.0302 | -0.19 | | |
| average years of education | -0.0057 | -0.12 | | | 0.0013 | 0.03 | | |
| Trend | 0.008 | 1.45 | 0.009 | 1.59 | 0.003 | 0.78 | 0.007 | 1.73 |
| pseudo - adj R2 | | 0.277 | | 0.282 | | 0.228 | | 0.300 |
| simple r (model) | | 0.575 | | 0.571 | | 0.506 | | 0.570 |
| | | | | | | | | |
| **Productivity equation** | | | | | | | | |
| Constant | -1,368.7 | -8.81 | -1,366.5 | -8.80 | -1,305.4 | -8.25 | -1,367.0 | -8.80 |
| QiW | 5.956 | 1.58 | 6.088 | 1.61 | 9.833 | 2.63 | 6.072 | 1.61 |
| K/L | 2.6E-05 | 4.98 | 2.6E-05 | 4.97 | 2.6E-05 | 4.85 | 2.6E-05 | 4.98 |
| Actives | -4.3E-06 | -2.59 | -4.3E-06 | -2.57 | -3.6E-06 | -2.13 | -4.3E-06 | -2.58 |
| Education | 0.932 | 1.88 | 0.947 | 1.91 | 1.044 | 2.06 | 0.937 | 1.89 |
| %Salaried workers | 70.626 | 8.56 | 70.651 | 8.57 | 72.602 | 8.61 | 70.532 | 8.55 |
| LR/Y | -36.209 | -5.90 | -36.227 | -5.90 | -36.328 | -5.78 | -36.200 | -5.89 |
| Trend | 0.671 | 8.61 | 0.669 | 8.60 | 0.636 | 8.03 | 0.670 | 8.60 |
| pseudo - adj R2 | | 0.984 | | 0.984 | | 0.985 | | 0.985 |
| simple r (model) | | 0.993 | | 0.993 | | 0.993 | | 0.993 |

| **Model 3 (Composite Index of QiW, GVA per worker)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -3,306.706 | -3.63 | -2,331.340 | -2.87 | -3,447.955 | -5.59 | -3,279.880 | -5.28 |
| Productivity | 0.000 | 3.212 | 0.001 | 5.313 | 0.000 | 3.423 | 0.001 | 4.517 |
| %women | -7.214 | -1.01 | -0.627 | -0.10 | | | -4.033 | -0.61 |
| %children | 2.257 | 0.39 | -1.922 | -0.41 | | | | |
| % partner | -8.263 | -0.91 | -8.825 | -1.12 | | | | |
| % college educated | 31.269 | 1.48 | 0.000 | 0.00 | 30.927 | 1.60 | 22.010 | 2.76 |
| % non comp secondary | 22.919 | 1.62 | 0.000 | 0.00 | 24.778 | 1.96 | | |
| average years of education | -0.349 | -0.09 | 0.000 | 0.00 | -0.714 | -0.20 | | |
| Trend | 1.699 | 3.74 | 1.216 | 2.99 | 1.766 | 5.73 | 1.683 | 5.40 |
| pseudo - adj R2 | | 0.820 | | 0.790 | | 0.826 | | 0.812 |
| simple r (model) | | 0.913 | | 0.897 | | 0.912 | | 0.905 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -905,136 | -2.33 | -469,455 | -1.19 | -857,444 | -2.22 | -670,441 | -1.72 |
| QiW | 232 | 3.60 | 337 | 5.41 | 240 | 3.74 | 287 | 4.52 |
| K/L | 3.2E-02 | 3.88 | 2.3E-02 | 2.74 | 3.2E-02 | 3.86 | 2.8E-02 | 3.34 |
| Actives | -4.5E-03 | -1.79 | -3.7E-03 | -1.37 | -4.2E-03 | -1.67 | -3.9E-03 | -1.52 |
| Education | 160 | 0.21 | -9 | -0.01 | 112 | 0.15 | -73 | -0.10 |
| %Salaried workers | 100,545 | 7.34 | 102,343 | 7.00 | 100,618 | 7.36 | 100,044 | 7.15 |
| LR/Y | -67,950 | -7.23 | -67,688 | -6.73 | -68,074 | -7.24 | -68,160 | -7.08 |
| Trend | 431.4 | 2.21 | 206.9 | 1.05 | 407.1 | 2.10 | 311.4 | 1.60 |
| pseudo - adj R2 | | 0.984 | | 0.982 | | 0.984 | | 0.983 |
| simple r (model) | | 0.992 | | 0.992 | | 0.992 | | 0.992 |

| **Model 4 (Composite Index of QiW, GVA per worked hour)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -3,095 | -3.20 | -2,109 | -2.38 | -3,301 | -5.03 | -3,181 | -4.79 |
| Productivity | 0.798 | 3.207 | 1.171 | 5.017 | 0.784 | 3.387 | 0.954 | 4.185 |
| %women | -7.509 | -1.03 | -1.262 | -0.19 | | | -5.092 | -0.74 |
| %children | 1.796 | 0.30 | -2.322 | -0.45 | | | | |
| % partner | -8.247 | -0.88 | -9.094 | -1.07 | | | | |
| % college educated | 30.378 | 1.40 | | | 30.575 | 1.54 | 24.648 | 2.96 |
| % non comp secondary | 21.436 | 1.49 | | | 23.781 | 1.85 | | |
| average years of education | 0.013 | 0.00 | | | -0.410 | -0.11 | | |
| Trend | 1.592 | 3.30 | 1.105 | 2.50 | 1.691 | 5.16 | 1.634 | 4.90 |
| pseudo - adj R2 | | 0.821 | | 0.796 | | 0.826 | | 0.814 |
| simple r (model) | | 0.913 | | 0.899 | | 0.912 | | 0.906 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -866 | -3.77 | -639 | -2.77 | -843 | -3.69 | -757 | -3.31 |
| QiW | 0.119 | 3.11 | 0.172 | 4.62 | 0.123 | 3.22 | 0.143 | 3.80 |
| K/L | 2.3E-05 | 4.66 | 1.9E-05 | 3.76 | 2.3E-05 | 4.65 | 2.1E-05 | 4.31 |
| Actives | -3.7E-06 | -2.48 | -3.2E-06 | -2.08 | -3.6E-06 | -2.39 | -3.4E-06 | -2.27 |
| Education | 0.132 | 0.30 | 0.042 | 0.09 | 0.108 | 0.25 | 0.026 | 0.06 |
| %Salaried workers | 61.106 | 7.55 | 61.613 | 7.33 | 61.121 | 7.57 | 60.775 | 7.45 |
| LR/Y | -35.922 | -6.47 | -35.966 | -6.23 | -35.978 | -6.49 | -36.063 | -6.43 |
| Trend | 0.420 | 3.64 | 0.303 | 2.62 | 0.408 | 3.55 | 0.364 | 3.17 |
| pseudo - adj R2 | | 0.985 | | 0.984 | | 0.985 | | 0.984 |
| simple r (model) | | 0.993 | | 0.993 | | 0.993 | | 0.993 |

## Results for Low-HK sectors

| **Model 1 (Job Satisfaction, GVA per worker)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -98.445 | -0.88 | -101.665 | -4.33 | -74.831 | -3.13 | -56.448 | -2.91 |
| Productivity | -0.000 | -0.900 | -0.000 | -4.534 | -0.000 | -2.519 | -0.000 | -2.203 |
| %women | -0.445 | -1.74 | -0.340 | -2.86 | -0.372 | -3.78 | -0.276 | -3.56 |
| %children | 0.068 | 0.20 | 0.108 | 1.12 | 0.000 | 0.00 | | |
| % partner | -0.165 | -0.49 | -0.208 | -1.30 | 0.000 | 0.00 | | |
| % college educated | 0.231 | 0.61 | | | 0.276 | 0.90 | 0.228 | 1.44 |
| % non comp secondary | -0.037 | -0.10 | | | -0.049 | -0.25 | | |
| average years of education | -0.040 | -0.43 | | | -0.034 | -0.79 | | |
| Trend | 0.050 | 0.89 | 0.052 | 4.38 | 0.038 | 3.15 | 0.029 | 2.94 |
| pseudo - adj R2 | | 0.215 | | 0.104 | | 0.389 | | 0.420 |
| simple r (model) | | 0.519 | | 0.394 | | 0.640 | | 0.663 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -892,351 | -1.70 | -1,276,646 | -2.61 | -875,159 | -1.67 | -1,262,379 | -2.49 |
| QiW | -12,294 | -1.91 | -18,782 | -3.37 | -12,406 | -1.92 | -19,504 | -3.32 |
| K/L | 1.1E-01 | 2.92 | 1.0E-01 | 2.82 | 1.2E-01 | 3.16 | 1.1E-01 | 2.99 |
| Actives | 1.9E-02 | 3.40 | 1.5E-02 | 2.82 | 1.8E-02 | 3.36 | 1.4E-02 | 2.67 |
| Education | 2,694 | 1.21 | 1,462 | 0.67 | 2,635 | 1.19 | 1,399 | 0.63 |
| %Salaried workers | 19,346 | 3.21 | 16,328 | 2.76 | 19,173 | 3.17 | 15,650 | 2.58 |
| LR/Y | -62,226 | -7.43 | -61,941 | -7.20 | -62,276 | -7.44 | -62,963 | -7.25 |
| Trend | 475.3 | 1.80 | 671.2 | 2.73 | 466.9 | 1.77 | 664.9 | 2.61 |
| pseudo - adj R2 | | 0.772 | | 0.716 | | 0.795 | | 0.813 |
| simple r (model) | | 0.887 | | 0.857 | | 0.899 | | 0.905 |

| **Model 2 (Job Satisfaction, GVA per worked hour)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -64.858 | -0.71 | -106.630 | -4.61 | -75.354 | -3.19 | -59.032 | -2.98 |
| Productivity | -2.5E-02 | -0.644 | -4.8E-02 | -4.845 | -3.0E-02 | -2.552 | -2.2E-02 | -2.282 |
| %women | -0.360 | -2.01 | -0.328 | -2.95 | | | -0.275 | -3.61 |
| %children | -0.0257 | -0.09 | 0.1059 | 1.16 | | | | |
| % partner | 0.0116 | 0.05 | -0.2054 | -1.35 | | | | |
| % college educated | 0.2960 | 0.98 | | | 0.2861 | 0.98 | 0.2281 | 1.47 |
| % non comp secondary | -0.0672 | -0.20 | | | -0.0426 | -0.22 | | |
| average years of education | -0.0287 | -0.37 | | | -0.0332 | -0.81 | | |
| Trend | 0.033 | 0.72 | 0.054 | 4.66 | 0.038 | 3.22 | 0.030 | 3.01 |
| pseudo - adj R2 | | 0.426 | | 0.104 | | 0.408 | | 0.425 |
| simple r (model) | | 0.682 | | 0.395 | | 0.654 | | 0.666 |
| | | | | | | | | |
| **Productivity equation** | | | | | | | | |
| Constant | -702.3 | -2.29 | -936.8 | -3.35 | -706.7 | -2.33 | -923.1 | -3.17 |
| QiW | -7.696 | -2.04 | -11.395 | -3.59 | -7.700 | -2.07 | -11.578 | -3.43 |
| K/L | 6.2E-05 | 2.75 | 5.3E-05 | 2.59 | 6.3E-05 | 2.86 | 5.7E-05 | 2.70 |
| Actives | 1.1E-05 | 3.25 | 8.2E-06 | 2.72 | 1.0E-05 | 3.26 | 8.1E-06 | 2.61 |
| Education | 1.591 | 1.23 | 0.859 | 0.68 | 1.561 | 1.22 | 0.864 | 0.67 |
| %Salaried workers | 10.244 | 2.93 | 8.595 | 2.53 | 10.228 | 2.94 | 8.294 | 2.38 |
| LR/Y | -34.274 | -7.08 | -33.956 | -6.86 | -34.227 | -7.09 | -34.527 | -6.93 |
| Trend | 0.368 | 2.39 | 0.487 | 3.47 | 0.370 | 2.43 | 0.481 | 3.29 |
| pseudo - adj R2 | | 0.805 | | 0.714 | | 0.800 | | 0.811 |
| simple r (model) | | 0.904 | | 0.856 | | 0.902 | | 0.907 |

| **Model 3 (Composite Index of QiW, GVA per worker)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | 1,860.263 | 0.19 | -6,531.077 | -4.86 | -5,483.327 | -4.83 | -5,441.592 | -5.69 |
| Productivity | 0.001 | 0.333 | -0.001 | -3.823 | -0.001 | -2.535 | -0.001 | -3.475 |
| %women | 1.332 | 0.06 | -11.453 | -1.88 | | | -2.230 | -1.20 |
| %children | -24.240 | -0.80 | 5.203 | 1.03 | | | | |
| % partner | 3.604 | 0.12 | -19.813 | -2.36 | | | | |
| % college educated | 54.513 | 1.57 | | | 2.505 | 0.36 | 4.190 | 1.18 |
| % non comp secondary | -6.003 | -0.18 | | | -1.408 | -0.33 | | |
| average years of education | -2.359 | -0.29 | | | 0.184 | 0.16 | | |
| Trend | -0.885 | -0.18 | 3.339 | 4.94 | 2.800 | 4.90 | 2.779 | 5.79 |
| pseudo - adj R2 | | 0.629 | | 0.133 | | 0.496 | | 0.520 |
| simple r (model) | | 0.810 | | 0.427 | | 0.716 | | 0.739 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,525,169 | -2.31 | -3,024,212 | -4.25 | -5,168,577 | -4.64 | -5,264,028 | -5.39 |
| QiW | -271 | -2.40 | -597 | -6.72 | -1,041 | -10.25 | -1,024 | -18.43 |
| K/L | 8.4E-02 | 1.86 | 5.2E-02 | 1.06 | 9.9E-02 | 1.41 | 8.9E-02 | 1.45 |
| Actives | 2.5E-02 | 4.81 | 2.3E-02 | 3.13 | 7.8E-04 | 0.12 | 6.7E-05 | 0.01 |
| Education | 3,853 | 1.69 | 2,590 | 0.79 | -719 | -0.14 | -439 | -0.09 |
| %Salaried workers | 20,051 | 3.01 | 14,306 | 1.61 | 15,631 | 1.05 | 12,253 | 1.21 |
| LR/Y | -58,784 | -6.32 | -54,470 | -4.05 | -42,224 | -1.94 | -39,147 | -1.93 |
| Trend | 798.0 | 2.40 | 1,563.7 | 4.38 | 2,654.7 | 4.76 | 2,702.2 | 5.56 |
| pseudo - adj R2 | | 0.824 | | 0.447 | | 0.637 | | 0.693 |
| simple r (model) | | 0.914 | | 0.695 | | 0.813 | | 0.845 |

| **Model 4 (Composite Index of QiW, GVA per worked hour)** | Case 1 | | Case 2 | | Case 3 | | Case 4 | |
|---|---|---|---|---|---|---|---|---|
| **QiW equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -409 | -0.05 | -6,849 | -5.06 | -6,130 | -5.22 | -6,016 | -6.19 |
| Productivity | 0.336 | 0.093 | -2.185 | -4.061 | -1.575 | -3.146 | -1.521 | -4.332 |
| %women | -4.804 | -0.29 | -11.404 | -1.94 | | | -2.284 | -1.22 |
| %children | -17.780 | -0.70 | 5.205 | 1.06 | | | | |
| % partner | -5.038 | -0.22 | -19.775 | -2.41 | | | | |
| % college educated | 45.313 | 1.58 | | | 2.129 | 0.27 | 3.756 | 1.09 |
| % non comp secondary | -5.701 | -0.19 | | | -1.928 | -0.41 | | |
| average years of education | -2.481 | -0.35 | | | 0.211 | 0.16 | | |
| Trend | 0.262 | 0.06 | 3.497 | 5.15 | 3.125 | 5.28 | 3.068 | 6.29 |
| pseudo - adj R2 | | 0.639 | | 0.116 | | 0.422 | | 0.477 |
| simple r (model) | | 0.815 | | 0.408 | | 0.664 | | 0.703 |
| | | | | | | | | |
| **Productivity equation** | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat | Coeff | t-stat |
| Constant | -1,089 | -2.86 | -1,934 | -4.76 | -2,782 | -4.99 | -3,017 | -6.03 |
| QiW | -0.162 | -2.50 | -0.347 | -6.87 | -0.509 | -9.11 | -0.530 | -18.60 |
| K/L | 4.2E-05 | 1.62 | 2.5E-05 | 0.88 | 5.4E-05 | 1.54 | 4.4E-05 | 1.44 |
| Actives | 1.4E-05 | 4.76 | 1.3E-05 | 3.12 | 1.2E-06 | 0.32 | 7.4E-08 | 0.02 |
| Education | 2.305 | 1.74 | 1.549 | 0.82 | -0.245 | -0.09 | -0.271 | -0.10 |
| %Salaried workers | 10.882 | 2.82 | 7.548 | 1.48 | 9.316 | 1.27 | 6.537 | 1.26 |
| LR/Y | -31.962 | -5.93 | -29.547 | -3.83 | -23.086 | -2.17 | -19.514 | -1.92 |
| Trend | 0.565 | 2.94 | 0.997 | 4.89 | 1.426 | 5.10 | 1.545 | 6.20 |
| pseudo - adj R2 | | 0.821 | | 0.422 | | 0.604 | | 0.658 |
| simple r (model) | | 0.912 | | 0.678 | | 0.794 | | 0.825 |