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GDAŃSK UNIVERSITY OF TECHNOLOGY
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WORKING CONDITIONS IN GLOBAL VALUE CHAINS. EVIDENCE FOR EUROPEAN EMPLOYEES

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WORKING CONDITIONS IN GLOBAL VALUE CHAINS. EVIDENCE FOR EUROPEAN EMPLOYEES

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Abstract

This paper investigates how involvement in Global Value Chains (GVCs) affects working conditions. We use linked employer-employee data from the Structure of Earnings Survey merged with industry-level statistics on GVCs based on the World Input-Output Database. The sample consists of almost 9 million workers in 24 European countries in 2014. Given the multidimensional nature of the dependent variable, we compare the estimates resulting from a Mincerian wage model with zero-inflated negative binomial regressions that analyse other aspects of working conditions (overtime work and bonus payments). As to the impact of production fragmentation on social upgrading, wages prove to be negatively related to sectoral GVC involvement. Workers in sectors more deeply involved in GVCs have lower and less stable earnings, meaning worse working conditions; on the other hand, they are also less likely to have to work overtime, which one may see as a sign of better labour standards.

Keywords: working conditions, Global Value Chains, wellbeing of workers, social upgrading

JEL: F16, F66, J81

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1. Introduction

In analysing the labour market outcomes of economic globalisation, one cannot neglect social effects. Changes in industrial relations between countries and the proliferation of Global Production Networks (GPNs) or Global Value Chains (GVCs)¹ have profoundly altered industrial relations between countries and their specialisation patterns. These changes are likely to have a powerful impact on social structures and labour standards for workers. The bulk of research in this field concerns the economic impact of GVCs on countries and firms (among others: Gereffi & Fernandez-Stark, 2016; Gereffi, Humphrey & Sturgeon, 2005; Kaplinsky, 2000) while comparatively less attention has been paid to the socio-economic effects for workers of the changing international structure of production (Nadvi, 2004). While there are a good many economic studies on how production fragmentation affects the demand for skills, the task composition of the labour force, or labour market polarisation (Amador & Cabral, 2015; Autor & Dorn, 2013; Baumgarten, Geishecker & Görg, 2013; Egger, Kreickemeier & Wrona, 2015; Foster-McGregor, Stehrer & de Vries, 2013; Goos, Manning & Salomons, 2009, 2014; Murphy & Oesch, 2017; Timmer, Los, Stehrer & de Vries, 2013; Wright, 2014), much less attention has been paid to analysing the effects on working conditions. To fill this gap we seek to answer the following general question: How does inclusion in globally integrated value chains affect working conditions?

The literature indicates the linkages between economic and social upgrading, as well as the social impact of GVCs on workers, as a promising topic for future research (Barrientos, Gereffi, Posthuma, Mayer & Pickles, 2011; Posthuma, 2010; Rainnie, Herod & McGrath-Champ, 2011; Selwyn, 2013). *Economic upgrading*, which fosters innovation and competitiveness, is defined as the ability of producers “to make better products, to make products more efficiently, or to move into more skilled activities” (Pietrobelli & Rabellotti, 2006, p.1). It does not necessarily entail *social upgrading*, defined as “the process of improvements in the rights and entitlements of workers as social actors, which enhances the quality of their employment” (Barrientos, Gereffi & Rossi, 2011, p. 324). The notion of social upgrading is promoted by the International Labour Organization (ILO) as the concept of “decent work.” The ILO’s Decent Work Agenda covers measurable labour standards like wages, type of employment, hours, and social protection, but also non-quantifiable factors such as non-discrimination and harassment, freedom of association, and empowerment (Barrientos, Gereffi, Posthuma et al., 2011).

¹ GVC is defined as “the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond. This includes activities such as research and development (R&D), design, production, marketing, distribution and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms.” (Gereffi & Fernandez-Stark, 2016, p. 7)

Whereas early studies on GVCs suggested that the relationship between social and economic upgrading was straightforward (Kabeer & Mahmud, 2004; McCulloch & Ota, 2002; Nadvi et al., 2004), recent research denies this hypothesis and holds that this relationship is not fully demonstrated (Bernhardt & Pollak, 2016; Lee, 2016; Xiaoxia, Xiaoni & Fang, 2013). On the one side, cross-border production links may create new job opportunities for marginalised workers and enable the inclusion of typically discriminated groups like women and unskilled workers. On the other hand, the globalisation of production may also increase the pressure to reduce labour costs, which often entails worse working conditions and less respect for labour standards (Plank, Rossi & Staritz, 2012). Moreover, the geographical dispersion of production in GVCs may also be an important determinant of precarious employment (Siegmann & Schiphorst, 2016). Hence, participation in GVCs brings economic benefits, but their translation into better working conditions is not automatic or self-evident.

The literature suffers a number of shortcomings that need to be addressed. First of all, studies on the economic and social upgrading of workers within globalised structures of production relate mainly to developing countries (Barrientos, Gereffi & Rossi, 2011; Gereffi & Lee, 2016; Milberg & Winkler, 2011)² and focus on problems typical of low-income countries (for a more detailed review of this literature see Section 2); studies of developed countries are comparatively rare (Smith & Pickles, 2015). In particular, there is hardly any research on the social impact in Europe of global production links, going beyond the purely economic effects in terms of employment, productivity or wages. Yet we know that in recent decades working conditions in many European countries have changed, and not necessarily for the better. For instance, the share of part-time employment has grown significantly,³ which implies changes in the general well-being of workers (Pirani & Salvini, 2015). Helfen, Schüßler & Sydow (2018) examine employment relations (including labour standards) in Global Value Networks (GVNs). Analysing the motor and garment industries they emphasise the positive role of managers in creating socially responsible multi-employer relations (network management). The Clean Clothes Campaign,⁴ for its part, points out that “Made in Europe” is not automatically equivalent to “fair labour conditions”: many garment workers in East and South-East Europe earn less than the actual living wage, and the Campaign’s November 2017 report found 1.7 million garment

² The ways in which economic and social upgrading are attained in GPNs, mainly in developing countries, have been researched under the policy research programme entitled *Capturing the Gains: Economic and social upgrading in Global Production Networks* (<http://www.capturingthegains.org/project>).

³ The share of part-time in total employment increased by 7.2 percentage points in Western Europe (EU15) between 1995 and 2017 (<https://ec.europa.eu/eurostat> accessed on 3rd of January 2019).

⁴ Clean Clothes Campaign is a global association devoted to improving working standards in the global garment and sportswear industries.

workers living in poverty, with poor working conditions or overtime work.⁵ Thus working conditions in Europe can well be an issue, but it is by no means clear whether the proliferation of GVCs has been a factor in lowering working standards.

Secondly, there are some major methodological problems. Empirically, the concept of “social upgrading” has been quantified mainly using country-level data (where the individual, worker-specific dimension is lost) and indicators based exclusively on wages (see Bernhardt & Pollak, 2016; Bernhardt & Milberg, 2011; Gimet, Guilhon & Roux, 2015). This is an oversimplification, as the quality of employment depends not only on wage levels but on such additional factors as non-standard payments, working hours and overtime work, freedom of association, and workplace safety. Just like economic upgrading, social upgrading may be fostered by GVC governance, sector specificities, firm-level efforts, and public policy (Selwyn, 2013). Moreover, as the recent GVC literature notes (see e.g. IBRD/World Bank, 2017), precise indicators are needed to capture all the dimensions of cross-border production links, including industries’ position within the production chain, complementing the information on the intensity of foreign inputs in domestic production. Integration into global structures of production may create greater income opportunities and better working conditions, but these benefits will depend on position in the value chain and may also aggravate the divide between skilled and unskilled labour (Shingal, 2015).

This paper addresses these shortcomings in the literature, focusing on GVCs as one potential determinant of working standards in a sample of almost 9 million workers in 24 European countries. The key question is how a domestic industry’s inclusion and position in GVCs affect the working conditions of its employees in Europe? However, we do not ignore other employment/wage determination mechanisms that are likely to affect working conditions (such as workers’ individual characteristics and the degree of job routinisation), so the impact of GVCs is assessed in relation to other factors. To this aim we use linked employee-employer data from the Structure of Earnings Survey (2014) merged with industry level measures of GVC involvement from the World Input-Output Database. Because our database covers both enterprises and workers’ characteristics, we can quantify various aspects of employment conditions such as wages, share of overtime work and share of bonus payments in total earnings. GVC involvement is measured by the novel concepts of global import intensity (*GII* – Timmer et al., 2016) and “upstreamness” (*UP* – Antràs et al., 2012). Econometric modelling shows that a higher degree of production fragmentation tends to be correlated with lower wages and a higher share of bonus payments in total earnings, which may mean less stable employment and worse

⁵ <https://cleanclothes.org/livingwage/europe>, access on 12th of September 2018.

working conditions. However, we also find that workers in sectors more involved in GVCs are less likely to work overtime, which could be seen as a positive sign of labour standards helping to maintain the work-life balance. Several extensions of the analysis, moreover, indicate that the relationship between GVC and working conditions is not unambiguous. In particular, the negative impact of greater GVC involvement on wages materialises mainly in the old EU member states and in countries with centralised wage bargaining, while the relationship between intensification of production-sharing and overtime work and bonus payments is diversified depending on country-specific institutional factors.

The structure of the paper is as follows. Section 2 presents the key concepts and reviews the literature on GVCs, social upgrading, decent work and working conditions. Section 3 describes the data and the methodology. Section 4 reports and discusses the estimation results, and Section 5 concludes.

2. Social upgrading and decent work - key concepts and past evidence on the impact of GVCs on working conditions

We focus on the literature relating to globalisation, social upgrading and working conditions. The term “social upgrading” refers to the quality of work and working conditions. “Labour standards” refers to the “core labour standards” established by the ILO, which involve: (i) freedom of association and collective bargaining, (ii) elimination of forced labour, (iii) elimination of child labour, and (iv) elimination of discrimination in respect of employment and occupation (Kamata, 2014).⁶ However, the concept can be extended to include other conditions, such as wages, working hours, and occupational safety and health.

Wages alone are not a sufficient indicator of social upgrading and do not allow any conclusion concerning working conditions in the broader sense (Bernhardt & Pollak, 2016). A good many other factors (labour standards, social protection, etc.) must be taken into account (Xiaoxia et al., 2013). This broader view has been taken, among others by: Lee, Gereffi & Lee (2016), who also consider working hours, wages and overtime, hiring and contract practices, and health and safety conditions; Kabeer & Mahmud (2004), who instrument working conditions with permanent employment status, maternity benefits, paid leave, accommodations, medical care, and overtime pay; Barrientos, Knorringa, Evers, Visser & Opondo (2015), who define social upgrading in terms of work opportunities, measurable labour standards and enabling rights; Bair & Gereffi (2001), who focus on safety, exploitation of workers, compliance with local labour

⁶ There is an abundant literature on the impact of trade (or globalisation in general) on such aspects of working conditions as child labour, forced labour, and freedom of association (for a review see Brown et al., 2011 or Kamata, 2014). As our study bears on developed countries, these aspects – typically more problematic in the developing world – are beyond our scope here.

laws, and sanitary conditions at the workplace; and Rossi (2013), who considers work environment, overtime, employment and social security, and enabling rights. The range of aspects considered as affecting the quality of work is thus potentially very considerable.

The literature postulates two main mechanisms whereby trade integration and involvement in GVCs affect working conditions in a country or an industry. One is linked to participation in Preferential Trade Arrangements or Regional Trade Agreements (RTAs)⁷ that compel the introduction of certain labour standards, mainly in developing countries. Kamata (2014) analysed this question for 220 countries in the period 1995-2012 and found that labour-clause inclusive RTAs may positively impact on earnings but not, apparently, on other aspects of working conditions. Other studies are case-specific. Bair & Gereffi (2003) focused on the garment industry to analyse the way in which NAFTA has affected firms and workers in the United States, Mexico and the Caribbean, finding that the Agreement has helped to create opportunities for upgrading in some Mexican firms and contributed to the upgrading of working conditions at plant level. Berik & Rodgers (2010) used a combination of survey, focus group and inspection data to examine the garment industry in Bangladesh and Cambodia. Here, even though in both countries trade is governed by the Agreement on Textiles and Clothing (ATC), only Cambodian workers saw an improvement in working conditions. The reason could be Cambodia's introduction of a trade-based labour standards program, which additionally underlines the necessity of improvements in labour standards. By contrast, Harrison et al. (2018), based on interviews with 121 informants on three European Union free trade agreements (with Caribbean nations, South Korea, and Moldova), argue that the EU has accepted or even relaxed the core labour standard requirements. Van Roozendaal (2015), based on the CAFTA-DR case study, contends that the inclusion of labour standards is not effective, and cites the case of Guatemala where the labour standards are not reflected.

The second mechanism operates via market forces. Labels (such as “fair trade”) informing consumers that the product meets certain labour standards and assuring fair working conditions enable consumers who are sensitive to human rights to choose goods produced under humane working conditions (Brown, Deardorff & Stern, 2011; Khalid & Wältring, 2004). However, given the relatively small demand for such goods, this would not appear to be a sufficient or effective strategy for improving working conditions worldwide.

⁷ The World Trade Organization defines RTAs as “reciprocal trade agreements between two or more partners. They include free trade agreements and customs unions. (...) PTAs in the WTO are unilateral trade preferences. They include Generalized System of Preferences schemes (under which developed countries grant preferential tariffs to imports from developing countries), as well as other non-reciprocal preferential schemes granted a waiver by the General Council.” (source: https://www.wto.org/english/tratop_e/region_e/rta_pta_e.htm, assessed on February the 6th, 2019).

According to neo-classical theory, social upgrading and economic upgrading should go hand-in-hand. Assuming that economic upgrading consists in an increase in productivity and that wage gains are a proxy for social upgrading, then according to marginalist economics an increase in marginal labour productivity will be associated with higher wages (Xiaoxia et al., 2013).

However, the empirical literature on the social consequences of trade (and globalisation in general) and the proliferation of GVCs gives contrasting findings on the relationship between the two processes. On the one hand, some empirical studies confirm a positive relationship. For instance Bair and Gereffi (2001) report an improvement in labour conditions in the export-oriented blue jeans industry in Torreon in Mexico. Crozet et al. (2018) identify the relationship between export opportunities and life satisfaction at the local level in China, concluding that the quality of life improves significantly as export opportunities grow. Similarly, McCulloch and Ota (2002) compared the incomes of Kenyan households involved in higher-value-added tasks related to export horticulture with other households and reported higher incomes for the former, in both rural and urban areas. Nadvi et al. (2004) study the Vietnamese garment and textile industry and find that inclusion in GVCs has a positive impact on productivity and wages in export-oriented textile enterprises.

Another set of scholars and studies, however, assert that economic upgrading (benefiting firms or industries in terms of productivity) does not necessarily translate into social upgrading for workers. This thesis, typical of institutionalist political economy (Gereffi, 1995), is consistent with the ILO's Decent Work Agenda. Economic upgrading within GVCs may even be coupled with deterioration in working conditions, insofar as the relocation of production in the labour-intensive sectors where offshoring is typical may be driven by low wages, worse employment arrangements and precarious labour conditions (Barrientos, Gereffi, & Rossi, 2011). Knorringa and Pegler (2006) argue that GVC participation may have an adverse effect on labour conditions owing to the segmentation of employment conditions, job insecurity and longer hours.

GVCs are heterogeneous in sectoral dependence on foreign value added (Timmer et al., 2013), so some authors have addressed the issue of industry-specific social effects. Bernhardt and Pollak (2016) analyse four GVCs (apparel, wood furniture, motor vehicles, and mobile phones) involving 35 countries in the period 2000-2012. They find that social upgrading (defined as an increase in employment and real wages) may be accompanied by economic upgrading, but the relationship is not strong. The pattern varies between GVCs: the strongest relationship is found in the motor vehicles sector, the weakest in wood furniture. Interestingly, in the apparel and mobile phone chains the economic upgrading often does not entail any social upgrading of the country (Bernhardt and Pollak, 2016). Gimet et al. (2015) examine the impact of GPN

involvement on wages in the textile and clothing industry in 26 countries in 1990-2007. According to their results, the integration of the less developed countries into globalized production networks may not produce better pay. Bernhardt and Milberg (2011) investigate four global value chains (apparel, mobile phones, horticulture and tourism) in 19 developing countries in 1990-2009. Defining social upgrading as a combination of changes in employment and real wages at national level, they find that economic and social upgrading are often unrelated. Lee and Gereffi (2013) examine mobile phone manufacturing GVCs in the years 2001-2011 in the U.S., Europe, and two emerging economies (China and India). Defining social upgrading as rising employment and wages, they analyse economic upgrading (at country level) and social upgrading (at firm level). Their data indicate that in the emerging economies the GVCs have a greater impact on employment and only a limited upward effect on wages.

Another strand of research in this field consists of specific case studies. Barrientos, Gereffi & Rossi (2011), in an examination of the garment industry in Morocco, conclude that economic upgrading there does not automatically lead to social upgrading. Lund-Thomsen et al. (2012) reach similar conclusions in a study based on primary data from factories, stitching centres and home-based settings in the global football industry in Pakistan, India and China. Plank et al. (2012) report on the fast fashion industry in Morocco and Romania and find that irregular workers are excluded from social upgrading opportunities. Puppim de Oliveira & de Oliveira Cerqueira Fortes (2014), in an analysis of the agro-industrial sector (oil for cosmetics and organic honey) in the Northeast of Brazil, show that the processes of social upgrading in the course of integration into the global economy are driven by strong local organisations. Flecker & Meil (2010) argue that employment and work arrangements are affected by the reorganisation of value chains and network relationships. Rossi (2013), on data from Moroccan garment supply firms, reports that the relation between production process and social upgrading is mixed, and that unskilled workers employed in the last segments of the GPN are excluded from social upgrading. Similarly, Barrientos et al. (2015) study fresh fruit and vegetable value chains in South and East Africa and find that producers and workers with insufficient skills are excluded from economic and social upgrading, defined as job opportunities, measurable labour standards and enabling rights. Lee, Gereffi & Lee (2016) conclude that the social upgrading process within mobile phone GVCs in China and India is complicated and that no clear-cut assessment of the relationship between social upgrading and position within the GVC is possible. Kabeer & Mahmud (2004), in a survey of 1322 women in the garment industry in Bangladesh, conclude that not only average earnings (controlling for education) but also other working conditions (e.g. job stability, maternity

and other leave, accommodations, medical care, overtime pay) are better in exporting firms than in those producing for the domestic market.

This review makes it clear that the bulk of the literature on the impact of trade integration and GVCs on labour standards refers to the developing countries. However, some literature does focus on impacts on workers in the developed economies. A significant amount of research has been devoted to the US economy and the impact of globalisation on wages (among others, see Ebenstein et al., 2014; Shen & Silva, 2018).

The evidence on European workers, however, is quite limited. Smith & Pickles (2015) analyse the clothing industry in Central and Eastern Europe, focusing on Slovakia. They find that workers in export-oriented companies have higher wages and better working conditions but are also more exposed to job loss due to external shocks. Lloyd & James (2008) weigh the impact of supply chains on occupational health and safety in the UK food processing industry. They report a considerable decline in the number of accidents and moderate improvement in labour conditions, despite the supply chain pressures. Hummels et al. (2016), with data on Denmark, find that workers in export firms are more exposed to work and are more affected by work accidents and illness.

There is some empirical research on how global value chains affect European wages (among others: Baumgarten et al., 2013; Geishecker, Görg & Munch, 2010; Parteka & Wolszczak-Derlacz, 2018),⁸ which may be treated as an imperfect indicator of social upgrading of workers. In any event, social upgrading is a far more complex question that demands a broader methodological perspective.

3. Methodology and data

In order to determine the impact of GVCs on working conditions we construct a combined worker-industry dataset, merging microdata from the Structure of Earnings Survey (SES) with industry-level statistics on GVCs based on the World Input-Output Database (WIOD), described below. SES is a large four-yearly cross-country cyclical enterprise survey (conducted in 2002, 2006, 2012, 2016). It gives comparable information on the relationships between earnings and the individual characteristics of employees and those of employers.⁹ For the purposes of this study we use the latest wave of SES (reference year 2014), described in

⁸ Shen & Silva (2018) analyse the case of American workers: they study the relationship between involvement in GPNs (measured as the value added of exports from China) and wages in the U.S., finding that the effects depend on the position (upstreamness or downstreamness) of the Chinese industry in the GVC.

⁹ Access to the micro-level SES data was granted by Eurostat on an individual research proposal (Proposal 225/2016-EU-SILC-SES). For details on methodological aspects of SES and the microdata access procedures, see: <https://ec.europa.eu/eurostat/web/microdata/structure-of-earnings-survey>

Eurostat (2014). It covers workers in 24 European countries (listed in Table A1 in the Appendix), giving us a sample of 8,932,178 observations.

Given data availability and the convention used in the literature, we take as dependent variable one of the three SES indicators referring to working conditions: *lnwage* (average gross hourly earnings in relation to the sectoral mean),¹⁰ *overtimes* (share of overtime in total hours worked)¹¹ and *bonus payments* (share of bonus payments in total earnings).¹² The descriptive statistics (by country and industry) are presented in Appendix Table A2 and Table A3; the correlations between various measures of working conditions are reported in Table A4.

We interpret higher wages, a lower share of overtime and a lower share of bonus payments as signs of better working conditions. This reading follows the literature, which generally holds that excessive overtime and longer working hours, due to pressure to meet delivery schedules and cut costs, may worsen the well-being of workers (among others: Posthuma, 2010) and have an adverse overall impact on the quality of life (Drobnič, Beham & Präg, 2010). For bonus payments the evaluation is less straightforward. As is observed by Mkoka et al. (2015), unfair allocation of allowances and bonuses may harm workers' morale and impact negatively on labour standards. A study based on the British Household Panel Survey (Pouliakas, 2010) finds instead that bonus payments have a fairly insignificant influence on job satisfaction and productivity. Importantly, Schweiker & Groß (2017), based on the German Structure of Earnings Survey, find that bonus payments may significantly increase wage inequality, and that such flexibilisation of the pay scheme may heighten insecurity about remuneration. Against this background, we consider that a larger share of bonus payments may engender insecurity and hence unsatisfactory working conditions.

As is shown in Figure 1, working conditions (assessed via the aforementioned indicators) vary considerably in Europe. Salaries in western and northern Europe are much higher than in the central and eastern countries.¹³ The highest average hourly wages are reported in Norway (€26.34), Sweden (€19.70), and Luxembourg (€19.79), the lowest in Romania (€3.34) and Bulgaria

¹⁰ *Wages* and *bonus payments* as well as total earnings are given in national currency, which we convert into EUR using exchange rates from Eurostat. For *wages*, *overtimes* and total earnings we remove the extreme values (below the 1st and above the 99th percentile), which might distort the results.

¹¹ Specifically, we use the ratio of overtime hours paid in the reference month (i.e. hours worked above those of the normal or conventional working month) to the total number of hours actually paid (hours *actually* paid means normal and overtime hours worked and remunerated. Hours not worked but nevertheless paid are counted as "paid hours", e.g. for annual leave, public holidays, paid sick leave, paid vocational training, paid special leave etc. (Eurostat, 2014).

¹² We compute the ratio of bonus payments (periodic, irregular, ad-hoc and exceptional bonuses and other payments that do not occur in every pay period; typical examples are Christmas and holiday bonuses, 13th or 14th month payments, allowances for leave not taken, occasional commissions, productivity bonuses and profit-sharing premiums) to gross annual earnings in the reference year. Note that gross annual earnings also include all payments not occurring regularly in each (monthly) pay period, i.e. the bonus payments, Eurostat (2014)

¹³ This is in line with the slow wage convergence documented by Parteka & Wolszczak-Derlacz (2015).

(€2.94). By sector (Table A3), average hourly wages range from €9.73 an hour in manufacturing to €12.77 in education. As to overtime, the largest shares are recorded by workers in Czech Republic, Italy, France and Malta (more than 1.3% of total hours in the reference month); workers in Lithuania, Belgium, Spain and Latvia show the smallest shares (less than 0.2%). Our third proxy for working conditions – share of bonus payments in total earnings – is highest in Spain, Italy and Portugal, lowest in the Netherlands, Sweden and Norway.

[Figure 1 about here]

To seek out the determinants of these proxies for working conditions, we consider individual, company, industry and country characteristics. The first two are derived from SES: sex, age, education, type of employment contract, seniority in the enterprise¹⁴ and size of enterprise.¹⁵ Table A5 presents the descriptive statistics of all these micro-variables, which also describe the composition of our sample. Around half (51%) of the observations are men, 53% are aged 30 to 49 years old and 18% under 30, and 48% have medium educational attainment. Most of the workers (83%) are full-time, 31% have worked in their enterprise for less than 4 years and 13% for less than 1 year, and 54% are employed in small or medium-sized enterprises (under 250 employees). Following the task-based approach to labour market analysis (Autor, 2013; Autor et al., 2014; Baumgarten et al., 2013), we control for degree of job routinisation using the *routine task intensity* index (*RTI*)¹⁶ elaborated by Hardy et al. (2018). The higher the index, the more routine the job or occupation (the list of occupations is given in Table A6). The variation of *RTI* across sectors and countries is reported in Table A7.

A crucial step in the construction of our database is matching individual (worker) data with sectoral indicators of GVC using the World Input-Output Database released in November 2016 (Timmer, Dietzenbacher, Los, Stehrer & De Vries, 2015). The WIOD has input-output data for 43 countries and 56 sectors according to the ISIC Rev. 4 classification (the list of WIOD

¹⁴ For *sex* we use a binary variable (0 for female, 1 for male). *Age* is in cohorts: 14-19, 20-29, 30-39, 40-49, 50-59 and 60+ which we recode into: *ageyoung* (below 30), *ageaverage* (30-49) and *ageold* (50 and more). The education variable is the highest completed level of education according to the ISCED-2011 classification. We recode this variable into three variables: *loweduc*, *mededuc* and *higheduc*, corresponding respectively to the G1 level (less than primary, primary, lower secondary), the G2 level (upper secondary and post-secondary) and the G3 or G4 level (tertiary education up to 4 years and more than 4 years). Type of employment contract is expressed by 3 variables: *indefinite*, *temporary*, and *apprentice*. Seniority is recoded into 4 variables: *shortdur* for less than 1 year, *meddur* for 1 to 4 years, *longdur* for 5 to 14 years and *vlongdur* for 15 years and more.

¹⁵ We recode size of enterprise into 3 variables: *small*, *medium* and *large* for work force of respectively 1-49, 50-249, and 250 or more.

¹⁶ We are grateful to Piotr Lewandowski from IBS Warsaw for sharing cross-country occupation-specific routinisation indices. We match them with workers' ISCO-08 occupation given in SES. For most countries and occupations we use 3-digit ISCO-08 codes, for some countries the 2-digit classification (a detailed description of the unification process is available on request). Further, for some countries where data are lacking, we take those of the most similar country (in terms of economic development, location, and size): for Luxembourg we use the values of Belgium; for Bulgaria, Hungary, Romania, those of Poland; for Croatia, those of Slovenia; for Latvia, those of Lithuania; for Portugal, those of Spain; for Malta, Cyprus; and for Switzerland, Germany.

sectors is in Table A8). SES shows the industry of the employee (according to NACE Rev. 2), so we match WIOD with SES on the basis of the statistical classification of economic activities.¹⁷ This matching procedure allows us to check if GVC involvement is an important determinant of working conditions for European workers.

We use two measures of international production fragmentation within GVCs; both are sector- and country-specific. One is the index of global import intensity of production (*GII*) proposed by Timmer et al. (2016), which counts imports of goods and services from all stages of production; that is, it has the advantage of tracing the entire value chain, whereas classic measures of offshoring or such GVC measures as the share of foreign value added typically count only the final stage of production. Most recently *GII* has been used by Szymczak et al. (2019).¹⁸ The index ranges from 0 to 1, values closer to 1 indicating greater dependence of domestic sectors on foreign inputs (hence greater GVC involvement). Our measure here is the relative change in *GII* between 2004 and 2014, to capture the increase in GVC involvement of particular sectors (Figure 2 shows noticeable cross-country variability).

[Figure 2 about here]

The recent literature makes it clear that in addition to the intensity of foreign inputs the relative position of an industry with the GVC is important, for instance as a wage determinant. The widely discussed and empirically proven “smile curve” of value added at each stage of production in GVCs (Baldwin, 2012) confirms that wages tend to be higher at the beginning and at the end of the chain, so an industry’s position within the GVC helps to determine the wage level (see e.g. IBRD/World Bank, 2017). Accordingly we use, as an additional control variable, the measure of *upstreamness* (*UP*) constructed by Antràs et al. (2012), i.e. the national industry’s position in the global production chain. The greater the upstreamness, the further the industry is from final demand. An upstreamness index equal to 1 designates a strictly downstream industry, i.e. one whose output is the final good.

¹⁷ In order to match SES with WIOD we have adjusted some sector/division classifications; in particular we use more highly aggregated levels of certain divisions. A detailed description of these transformations is available upon request.

¹⁸ Their code to compute *GII* with WIOD data is available at: https://ekontakt.zic.pg.gda.pl/WorkingPapers/pdf/WP_GUTFME_A_53_code_accompanyingWP53_GII_56ind.R

4. Empirical analysis

4.1 Model specification

To determine the impact of GVCs on working conditions, we estimate the following regression:

$$y_{ijc} = \alpha + \beta Ind_i + \gamma Firm_i + \theta Sector_{jc} + \vartheta \Delta GVC_{jc} + D_c + D_j + \varepsilon_{ijc} \quad (1)$$

where i denotes workers, j the sector of employment, c the country. The dependent variable y_{ijc} is the indicator of working conditions. We run separate estimations for our three different dependent variables: relative wages *lnwage* - average gross hourly earnings in the reference month expressed in relation to the sectoral mean;¹⁹ *overtimes* - the share of overtime hours in total work hours; and *bonus payments* - share of bonus payments in total earnings.

Specifically, we have:

$$lnwage_{ijc} = \alpha + \beta Ind_i + \gamma Firm_i + \theta Sector_{jc} + \vartheta \Delta GVC_{jc} + D_c + D_j + \varepsilon_{ijc} \quad (2)$$

$$overtimes_{ijc} = \alpha + \beta Ind_i + \gamma Firm_i + \theta Sector_{jc} + \vartheta \Delta GVC_{jc} + D_c + D_j + \varepsilon_{ijc} \quad (3)$$

$$bonus\ payments_{ijc} = \alpha + \beta Ind_i + \gamma Firm_i + \theta Sector_{jc} + \vartheta \Delta GVC_{jc} + D_c + D_j + \varepsilon_{ijc} \quad (4)$$

Among independent variables we have the set of individual worker characteristics Ind_i (sex, age, education, job routinisation RTI); $Firm_i$ - firm characteristics (length of service in enterprise, size of enterprise, type of contract (temporary or permanent));²⁰ $Sector_{jc}$ - productivity calculated as the ratio of value added to total number of hours worked, and upstreamness; and D_c , D_j - country- and sector-specific effects. The key causal variable posited is ΔGVC - the change in GVC involvement (measured by the GII index) between 2004 and 2014 (ten years should be long enough for any effects to materialise).²¹

The estimation method chosen depends on the nature of the dependent variables. To estimate eq. (2) we use weighted regression with robust standard errors, clustered at the industry level, where the weights are based on the grossing-up factor for employees (from SES) normalised by the number of observations per country.²² For models (3) and (4) we use zero-inflated negative binomial regression, which is suitable for the characteristics of those variables. Given dispersed data with excess zero counts, between 43% (for *bonus payments*) and 83% (for

¹⁹ Alternatively we express relative wages in relation to the sectoral median. The results of this robustness check are reported in Table S4 in supplementary materials.

²⁰ Enterprise size and contract type are not available for all individuals; the data on firm size are lacking for Cyprus, Spain, Luxembourg and Malta, those on type of employment contract for Sweden.

²¹ A similar approach to assessing the effects of trade shocks on workers has been used, among others, by Autor et al. (2014), who examine worker-level adjustment to trade with China. They compute their trade exposure variable as the change in import penetration of U.S. industries between 1991 and 2007.

²² Specifically, we recalculate the grossing-up factor for employees (from SES) in such a way that for the pooled sample of 24 countries, the observations from each country sum to 10 000 in order to give each country equal weight in the model. We thank Piotr Paradowski for the Stata codes; see more in: LIS Self Teaching Package 2018, Stata version: <http://www.lisdatacenter.org/wp-content/uploads/files/resources-stata-Part-II.pdf>

overtimes) of the observations are equal to zero (individuals who work no overtime, or receive no bonus payment). In these cases, the models have two parts, a negative binomial count model and the logit model for predicting excess zeros; and the change in production fragmentation can have different effects in the two parts.²³ In particular, we determine whether greater GVC involvement is followed by greater probability of overtime work and bonus payments (using the logit model) and the way in which this involvement affects the amount of overtime and the size of bonuses (negative binomial count model).

4.2 The results

The results of regression (2) are reported in Table 1. The coefficients for all individual and firm-level characteristics are of the expected sign. On average, men, older workers, better educated workers, those with more seniority and those performing less routine tasks earn more. Similarly, other things being equal the wages of those employed in large enterprises and on permanent rather than fixed-term or apprenticeship contracts are higher. Our special focus, however, is on the effects of the change in GVC involvement for the specific industry in which workers are employed. We can see that higher ΔGII is correlated with lower relative wages. In short, the indication is that integration into GVCs may result in a worsening of working conditions, most notably wages.

[Table 1 about here]

We have also estimated equations 3 and 4, with the share of overtime and of bonus payments as dependent variables. We show the results separately for the negative binomial count model (upper panel of Table 2) and the logit model predicting whether an employee works overtime hours or obtains bonus payments (lower panel). In both models we use the same predictors – the same individual, firm and sectoral characteristics – as in eq. 2. We do not report them here, as again the focus is on the GVC variables. The results for the share of overtime work and that of bonus payments differ quite markedly. As production fragmentation increases (measured by ΔGII), the probability of overtime work and bonus payments decreases. Although it is postulated in the literature (see e.g. Posthuma, 2010) that pressure from buyers for fast delivery may heighten labour flexibility and generate more overtime work, we find no evidence of this in our European sample countries. On the contrary, workers in the most highly fragmented sectors rarely have overtime hours. Looking deeper, we find that for workers who already do some

²³ The choice of zero-inflated negative binomial estimation was also checked through the Vuong statistical test, which compares the zero-inflated negative binomial model with a standard negative binomial model.

overtime work or receive bonus payments, as GVC involvement increases the predicted share of overtime hours decreases while that of bonus payments increases.

[Table 2 about here]

Moreover, the position in GVC may affect the indicators of working conditions in different ways. In the sectors farther from the production of final goods (those with higher *UP*), we observe negative effects on overtime and bonus payments but no effect on relative wages (the coefficient for *UP* is not statistically significant in Table 1). That is to say, our results indicate that the impact of GVC involvement on workers' well-being needs to be analysed in broader perspective and definitely cannot be described as a win-win situation. We find that greater dependence on foreign inputs may put downward pressure on working conditions. Workers in the sectors more closely involved in GVCs earn less and have a larger share of bonus payments in total earnings. This may mean worker insecurity, given that wage stability is recognised as an important factor in decent work. As regards overtime work, however, our analysis offers evidence of a beneficial effect of integration into GVCs on working conditions. In the sectors more heavily engaged in global production sharing, overtime work is less common and hours fewer.

4.3 Extensions and sensitivity analysis

Assuming that national labour market arrangements may influence the relationship between GVC measures and working conditions, we also use an institutional labour market index derived from the ICTWSS database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (Visser, 2016). Specifically, we group countries according to the wage setting mechanism: wage bargaining at company level (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, United Kingdom); and predominantly industry-wide and centralised bargaining (Belgium, Germany, Finland, France, Italy, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden).²⁴ The results, reported in Table 3, indicate that the negative effect of change in GVC materialises mainly in countries with centralised wage bargaining, while a powerful company-level adjustment mechanism can offset the wage shock associated with rising *GII*.

[Table 3 about here]

When working conditions are gauged by the shares of overtime and bonus payments, the effect is more complex (Table 4). The decreased probability of overtime work in sectors where GVC participation increases more sharply is sustained in countries with company-level wage-setting, while this distinction does not seem to affect the share of bonus payments. However, for those

²⁴ Schäfer & Gottschall (2015) classified countries similarly in order to see how national wage-setting institutions shape the gender wage gap.

workers who do get bonus payments, greater GVC integration results in a larger share of bonus payments in countries where collective bargaining is weak. Importantly, collective bargaining at industry or national level allows for improvements in working conditions for all workers in the industry. Workers with little collective representation may experience considerable wage instability, insofar as a growing portion of their remuneration is variable.

[Table 4 about here]

As further sensitivity checks, we have also classified countries by various labour market measures, such as: articulation of enterprise bargaining (countries where bargaining is not under union control, those with supplementary wage bargaining restricted by law or sectoral agreement or under union control),²⁵ coordination of wage-setting,²⁶ and whether collective agreements contain general opening clauses.²⁷ The results confirm the general conclusions set out above.²⁸ Wages are affected mainly in countries with centralised coordination of wage bargaining, where collective agreements contain general opening clauses, and where supplementary company-level bargaining is under trade union control.

We have run separate regressions for “old” and “new” EU Member States. The old members (OMS) are Belgium, Germany, Finland, France, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom; the new (NMS) are Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, Slovenia. The wage impact of changing GVC involvement is confirmed for OMS rather than NMS (Table 5). When working conditions are assessed using our other two measures, the situation is different (Table 6). The probability of overtime work and bonus payments does not depend on national status as “old” or “new” EU member. However, there are some differences for workers who already have overtime hours and bonus payments. The negative correlation between rising production

²⁵ We use variable *Art: Articulation of enterprise bargaining* derived from (Visser (2016) and recode the variables into a 0-1 variable, 1 representing countries where supplementary enterprise wage bargaining is informal and prohibited or restricted by law or sectoral agreement, or where it is recognized but under trade union control (Belgium, Bulgaria, Cyprus, Germany, Finland, Italy, Luxembourg, Netherlands, Norway, Slovakia, Slovenia, Spain, Sweden). The value 0 stands for countries where additional enterprise wage bargaining, when it occurs, is formally or informally conducted also by non-union bodies or where the articulation does not apply (Czech Republic, Estonia, France, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania and the United Kingdom)

²⁶ We use variable *Coord: coordination of wage-setting* derived from (Visser (2016) and recode it into a 0-1 variable. 0 is for countries with mixed industry and firm-level bargaining, little or no pattern bargaining and relatively weak government coordination through minimum wage or indexation or for fragmented wage bargaining, confined largely to individual firms or plants (Bulgaria, Cyprus, Czech Republic, Estonia, France, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, United Kingdom). The value 1 stands for centralised or industry level bargaining (Belgium, Finland, Germany, Italy, Netherlands, Norway, Slovak Republic, Slovenia, Spain, Sweden).

²⁷ We use variable *OCG: General Opening clauses in collective agreement* derived from Visser (2016), where 1 means that agreements contain general opening clauses, defined as renegotiation of contractual provisions at lower levels, under specified conditions (Belgium, Finland, France, Germany, Italy, Netherlands, Norway, Portugal, Spain, Sweden) and 0 means that agreements contain no opening clauses (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Luxembourg, Malta, Poland, Romania, Slovak Republic, Slovenia, United Kingdom).

²⁸ The detailed results are presented in the supplementary materials (Tables S1–S3).

fragmentation and share of overtime hours is maintained for workers in the new members, which confirms our previous results on the absence of overtime pressure due to GVC involvement. In the old member states, the effect of intensity of production fragmentation on overtime hours is statistically insignificant. Interestingly, the effect of an increase in global import intensity on the share of bonus payments differs between OMS and NMS. In the former, in sectors that are more import-dependent the share of bonus payments is lower, which may contribute to greater wage stability. In the latter, this relationship is reversed and, in line with our previous results, confirms the negative effect of GVCs on wage stabilisation.

[Table 5 about here]

[Table 6 about here]

We also ran a number of robustness checks.²⁹ These involved measuring wages in relation to the median rather than the mean for the sector; calculating the mean for sectors at a lower level of aggregation (e.g. NACE); and calculating the change in GII for 5-year and 15-year intervals: 2014/2009 and 2014/2000. In all these cases the results are fairly similar to benchmark. For wages, the 5-year period does not give statistically significant results, which might reflect a slowdown in the advance of production fragmentation in the wake of the crisis (Timmer et al., 2016). We also augmented the regression by additional country characteristics, namely size and openness. Finally, we eliminated observations country-by-country and sector-by-sector, to check whether the results are driven by some specific country or sector. Again the original findings are confirmed; that is, the relationship between changing GVC participation and working conditions is not straightforward. As for wages, there is a clear negative relationship with ΔGII . In sectors where production fragmentation has increased more, wages are relatively lower, which can be seen as a deterioration in working conditions due to GVC involvement. However, the effect of ΔGII on the probability of overtime work and bonus payments for workers who already have them varies. In sectors with more growth of GII , workers usually are less likely to work overtime or receive bonuses, which can be seen as an improvement in working conditions. Finally, for employees who do have some overtime hours their share of the total is smaller in GII -intensive sectors, but that of bonus payments is larger. That is, we find no pressure on working hours in the import-intensive sectors, but there is a tendency towards more unstable wages by making bonus payments a significant part of total earnings.

²⁹ Detailed results available in supplementary materials (Table S4 –S13).

5. Conclusions

We have considered the effect of global value chains on working conditions, measured as the ratio of hourly wages to the sectoral mean, share of overtime in total working hours, and share of bonus payments in total earnings. In most of the literature, this type of analysis has been conducted mainly for developing economies, and the problems considered have been those typical of low-income countries. And for the most part past studies of the effects of GVCs have used purely economic indicators, making it difficult to draw conclusions concerning the impact on the socio-economic well-being of workers more broadly defined.

We add to the literature with extensive empirical data on workers in Europe and with different proxies for working conditions. The study involves almost 9 million observations based on detailed SES employee-employer data on 24 European countries in 2014 combined with WIOD sector-level data on the cross-border flows of intermediate inputs, allowing us to quantify the magnitude of GVC involvement quite precisely. We measure it in terms of global import intensity of production (*GII*), and we also capture the relative position of domestic industries within global production chains. Controlling for individual, sectoral, firm and occupational factors, we create a comprehensive framework for analysis of the factors that affect working conditions. We also address some of the methodological issues raised by the complexity of this socio-economic analysis, adopting alternative methods (in particular weighted regression and negative binomial regression) for the different proxies of working conditions (namely wages, overtime hours and bonus payments).

The main finding is that in the sectors that experienced major increases in GVC involvement between 2004 and 2014, wage trends were worse than in industries where no substantial change was registered. But when the analysis is extended to indicators of working conditions other than pure hourly wages, the relationship turns ambiguous. Workers in sectors that are more dependent on foreign inputs (i.e. those with greater GVC involvement) are less likely to work overtime, which may benefit their well-being, and are also more likely to have more stable remuneration. However, for employees whose earnings already consist in part in bonus components, the share of the latter in total earnings grows as GVC participation intensifies, which may mean more severe instability of earnings. Our sensitivity analysis for workers in different groups of European countries confirms that the effect of global production chains on workers' well-being may vary.

In short, we contribute to the literature on decent work and social upgrading with a finding that the impact of GVC on working conditions is rather complex. We show that it is important to consider aspects of working conditions other than just wages, because it is clear that

the influence of production fragmentation on workers' socio-economic situation is not one-dimensional.

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Tables

Table 1. Estimation results – the impact of GVC on working conditions assessed via wages

Dependent variable	lnwage: wage expressed in relation to the sectoral mean					
	(1)	(2)	(3)	(4)	(5)	(6)
sex (male=1)	0.114***	0.114***	0.116***	0.117***	0.120***	0.120***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
ageyoung	-0.150***	-0.150***	-0.149***	-0.149***	-0.144***	-0.144***
	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]
ageaverage	-0.027**	-0.027**	-0.024**	-0.024**	-0.023**	-0.023**
	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
loweduc	-0.262***	-0.262***	-0.257***	-0.257***	-0.262***	-0.262***
	[0.012]	[0.012]	[0.009]	[0.009]	[0.010]	[0.010]
mededuc	-0.202***	-0.202***	-0.204***	-0.204***	-0.212***	-0.212***
	[0.007]	[0.007]	[0.006]	[0.006]	[0.007]	[0.007]
shortdur	-0.133***	-0.133***	-0.116***	-0.116***	-0.090***	-0.090***
	[0.007]	[0.007]	[0.006]	[0.006]	[0.005]	[0.005]
meddur	-0.092***	-0.092***	-0.080***	-0.080***	-0.071***	-0.072***
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
RTI	-0.438***	-0.438***	-0.441***	-0.441***	-0.449***	-0.449***
	[0.014]	[0.014]	[0.013]	[0.013]	[0.013]	[0.013]
ln_Prod	-0.038***	-0.037***	-0.049***	-0.048***	-0.047***	-0.047***
	[0.009]	[0.009]	[0.012]	[0.012]	[0.012]	[0.012]
ΔGII	-0.032**	-0.028*	-0.036***	-0.032**	-0.039***	-0.035***
	[0.015]	[0.015]	[0.012]	[0.012]	[0.012]	[0.012]
UP		-0.018		-0.017		-0.017
		[0.011]		[0.012]		[0.012]
Size_small			-0.161***	-0.161***	-0.169***	-0.169***
			[0.015]	[0.015]	[0.015]	[0.015]
Size_medium			-0.047***	-0.047***	-0.052***	-0.052***
			[0.013]	[0.013]	[0.014]	[0.014]
indefinite					0.077***	0.076***
					[0.008]	[0.008]
R ²	0.24	0.24	0.25	0.25	0.26	0.26
N	8929690	8929690	8803884	8803884	8571469	8571469

Notes: Country and industry dummies included. Normalised weighted regression with robust standard errors, clustered at industry, the weights are based on grossing-up factor for employees (from SES) normalised by the number of observation per country (see main text for the details); Default categories: ageold, higheduc, large, temporary, longdur and vlongdur; *p ≤ .10, **p ≤ .05, ***p ≤ .01.

Source: own elaboration based on data from SES and WIOD

Table 2. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments

Dependent variable	Share of overtime hours		Share of bonus payments	
	(1)	(2)	(3)	(4)
Negative binomial count model				
ΔGII	-0.243***	-0.185***	0.025***	0.028***
	[0.017]	[0.017]	[0.005]	[0.005]
UP		-0.329***		-0.021***
		[0.015]		[0.007]
Probability of being an extra zero				
ΔGII	-0.295***	-0.089***	-1.109***	-0.067***
	[0.012]	[0.012]	[0.007]	[0.006]
UP		0.001		0.017***
		[0.004]		[0.002]
II	-7112.64	-7109.2	-33344.7	-33344.6
N	8571469	8571469	8571469	8571469
N_zero	7149600	7149600	3623654	3623654
Chi2	146130.1	147726.9	588412.9	589344.6
p-value	0.00	0.00	0.00	0.00

Notes: Individual and firm characteristics as in specification (3) of Table 1. Country and industry dummies included. Zero - inflated negative binomial regression. Normalised weighted regression with robust standard errors, the weights are based on grossing-up factor for employees (from SES) normalised by the number of observation per country (see main text for the details). * $p \leq .10$, ** $p \leq .05$, *** $p \leq .01$.

Source: own elaboration based on data from SES and WIOD

Table 3. Estimation results – the impact of GVC on working conditions assessed via wages, sample of workers from countries with different wage bargaining schemes

Dependent variable	lnwage: wage expressed in relation to the sectoral mean							
	<i>Wage bargaining = 0</i>				<i>Wage bargaining = 1</i>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.02	-0.014	-0.003	0.005	-0.057**	-0.059**	-0.063**	-0.065**
	[0.021]	[0.019]	[0.021]	[0.023]	[0.023]	[0.025]	[0.024]	[0.026]
UP		-0.021		-0.029*		0.01		0.015
		[0.014]		[0.017]		[0.019]		[0.019]
R ²	0.22	0.22	0.23	0.23	0.33	0.33	0.34	0.34
N	5209189	5209189	5124658	5124658	3720501	3720501	3679226	3679226

Notes: Individual and firm characteristics as in Table 1. Specifications: (3), (4), (7), (8) with additional firm's characteristics considering its size. Wage bargaining = 0 stands for predominant company level, Wage bargaining = 1 for predominant centralised wage bargaining scheme.

Source: own elaboration based on data from SES and WIOD

Table 4. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments, countries split by different wage bargaining schemes

Dependent variable	<i>Wage bargaining=0</i>				<i>Wage bargaining=1</i>			
	Share of overtime hours		Share of bonus payments		Share of overtime hours		Share of bonus payments	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Negative binomial count model								
ΔGII	-0.317***	-0.244***	0.072***	0.177***	-0.074**	-0.408***	-0.001	0.009
	[0.031]	[0.019]	[0.010]	[0.012]	[0.029]	[0.031]	[0.005]	[0.005]
UP	-0.167***	-0.364***	-0.029**	0.034**	-0.436***	-0.159***	0.040***	0.057***
	[0.021]	[0.016]	[0.012]	[0.013]	[0.027]	[0.026]	[0.008]	[0.008]
Probability of being an extra zero								
ΔGII	-0.098***	-0.172***	-1.519	-0.840***	-0.022	-57.275	-2.657***	-0.072***
	[0.018]	[0.014]	[0.000]	[0.009]	[0.017]	[0.000]	[0.024]	[0.007]
UP	-0.035***	-0.047***	-13.27	-0.241***	0.028***	-1.877	-0.809***	-0.029***
	[0.007]	[0.005]	[0.000]	[0.003]	[0.006]	[0.000]	[0.007]	[0.003]
Π	-5293.9	-3552.25	-19034.8	-13057.6	-3931.78	-3536.73	-20945.4	-20175.4
N	5209189	5124658	5209189	5124658	3720501	3446811	3720501	3446811
N_zero	4193193	4124258	2121527	2112709	3267461	3025342	1728942	1510945
Chi2	60467.55	87564.39	94281.61	86473.04	53258.49	56928.9	490901.6	472906
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Individual and firm characteristics as in Table 1 Specifications: (2), (4), (6), (8) with additional firm's characteristics considering its size. *p ≤ .10, **p ≤ .05, ***p ≤ .01.

Source: own elaboration based on data from SES and WIOD

Table 5. Estimation results – the impact of GVC on working conditions assessed via wages, sample of workers from Old Member States versus workers from New Member States

Dependent variable	lnwage: wage expressed in relation to the sectoral mean							
	OMS				NMS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.038*	-0.03	-0.067**	-0.067**	-0.023	-0.023	-0.002	0.002
	[0.022]	[0.025]	[0.025]	[0.026]	[0.023]	[0.022]	[0.021]	[0.022]
UP		-0.026		0.002		-0.001		-0.015
		[0.027]		[0.020]		[0.016]		[0.021]
R ²	0.33	0.33	0.35	0.35	0.22	0.22	0.23	0.23
N	2495680	2495680	2435178	2435178	5301556	5301556	5236252	5236252

Notes: as under Table 3.

Source: own elaboration based on data from SES and WIOD

Table 6. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments, OMS versus NMS

	OMS				NMS			
434	Share of overtime hours		Share of bonus payments		Share of overtime hours		Share of bonus payments	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Negative binomial count model								
ΔGII	-0.021	-0.024	-0.079***	-0.047***	-0.552***	-0.181***	0.065***	0.084***
	[0.034]	[0.036]	[0.007]	[0.006]	[0.029]	[0.018]	[0.011]	[0.011]
UP	-0.060*	-0.051	-0.054***	-0.040***	-0.165***	-0.069***	0.092***	0.135***
	[0.032]	[0.039]	[0.009]	[0.008]	[0.026]	[0.021]	[0.014]	[0.014]
Probability of being an extra zero								
ΔGII	-0.032	-0.066***	-0.035***	-0.745***	-0.165***	-0.150***	-0.492***	-2.039***
	[0.020]	[0.023]	[0.008]	[0.009]	[0.020]	[0.014]	[0.009]	[0.018]
UP	0.032***	0.037***	-0.030***	-0.256***	-0.045***	-0.048***	-0.047***	-0.626***
	[0.008]	[0.008]	[0.003]	[0.003]	[0.008]	[0.005]	[0.003]	[0.006]
Π	-4021.28	-3227.17	-21735.8	-18364.3	-4828.08	-3470.56	-17872.8	-14505.8
N	2495680	2202763	2495680	2202763	5301556	5236252	5301556	5236252
N_zero	2265995	2007038	844437	622598	4264869	4212772	2017570	2012594
Chi2	48640.24	47850.36	381038	387517	61829.93	86886.28	73515.99	89620.02
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: as under Table 4.

Source: own elaboration based on data from SES and WIOD

Figures

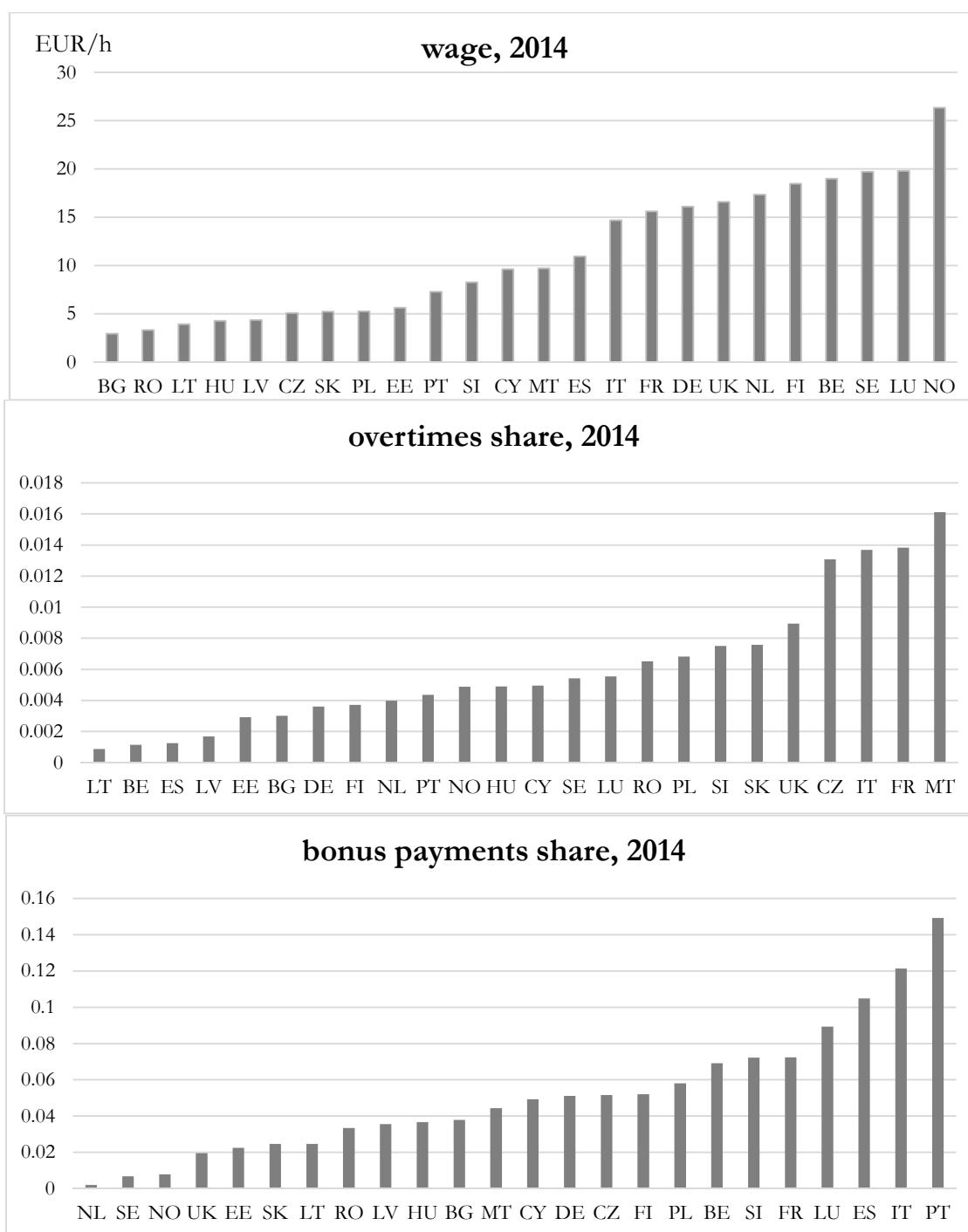


Figure 1. Working conditions in European countries

Source: Own elaboration based on SES 2014 data.

Note: variables described in the main text. Within-country sample averages weighted by grossing-up factor for employees (from SES)

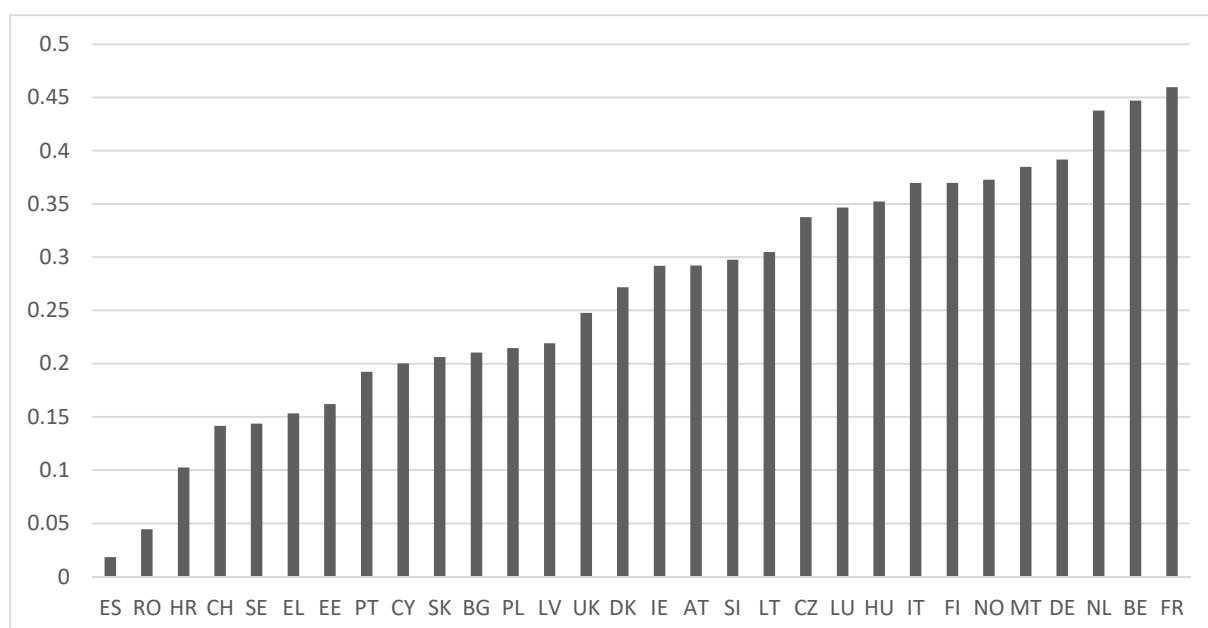


Figure 2. Global import intensity (*GII*) growth rate 2004-2014

Notes: weighted by sectors' value added

Source: own elaboration based on WIOD 2014

Appendix

Table A1. List of countries

<i>Country code</i>	<i>Country name</i>	<i>Country code</i>	<i>Country name</i>
BE	Belgium	LU	Luxembourg
BG	Bulgaria	LV	Latvia
CY	Cyprus	MT	Malta
CZ	Czech Republic	NL	Netherlands
DE	Germany	NO	Norway
EE	Estonia	PL	Poland
ES	Spain	PT	Portugal
FI	Finland	RO	Romania
FR	France	SE	Sweden
HU	Hungary	SI	Slovenia
IT	Italy	SK	Slovak Republic
LT	Lithuania	UK	United Kingdom

Table A2. Descriptive statistics of the dependent variables - by countries.

country	wages					overtimes share					bonus payments share				
	N	Mean	Sd	Max	Min	N	Mean	Sd	Max	Min	N	Mean	Sd	Max	Min
BE	132018	19.004	6.402	41.870	6.010	132018	0.001	0.009	0.205	0	132018	0.069	0.014	0.901	0
BG	121513	2.938	2.437	41.543	1.324	121513	0.003	0.014	0.255	0	121513	0.038	0.079	0.985	0
CY	27930	9.633	5.837	41.730	1.920	27930	0.005	0.020	0.299	0	27930	0.049	0.046	0.718	0
CZ	1994246	5.076	3.153	41.863	1.322	1994246	0.013	0.027	0.333	0	1994246	0.052	0.085	0.936	0
DE	881327	16.114	7.645	41.870	1.330	881327	0.004	0.020	0.714	0	881327	0.051	0.056	0.961	0
EE	114887	5.631	3.555	40.830	1.580	114887	0.003	0.015	0.352	0	114887	0.022	0.050	0.998	0
ES	199255	10.940	5.603	41.850	1.550	199255	0.001	0.010	0.394	0	199255	0.105	0.088	0.887	0
FI	288658	18.480	6.210	41.870	4.030	288658	0.004	0.014	0.388	0	288658	0.052	0.033	1.000	0
FR	211807	15.614	6.203	41.870	1.350	211807	0.014	0.030	0.386	0	211807	0.072	0.093	0.959	0
HU	867316	4.289	3.146	41.841	1.322	867316	0.005	0.019	0.231	0	867316	0.037	0.070	0.972	0
IT	173342	14.689	6.794	41.870	2.010	173342	0.014	0.029	0.372	0	173342	0.121	0.051	0.982	0
LT	39427	3.931	2.694	40.973	1.497	39427	0.001	0.007	0.156	0	39427	0.025	0.068	0.899	0
LU	19227	19.794	7.981	41.850	2.280	19227	0.006	0.019	0.360	0	19227	0.089	0.079	0.842	0
LV	152965	4.370	3.226	41.860	1.330	152965	0.002	0.011	0.333	0	152965	0.036	0.070	0.922	0
MT	36987	9.722	4.901	41.240	4.140	36987	0.016	0.031	0.379	0	36987	0.044	0.032	0.624	0
NL	133688	17.351	7.202	41.800	2.600	133688	0.004	0.022	0.321	0	133688	0.002	0.011	0.687	0
NO	1132466	26.336	6.402	41.875	5.985	1132466	0.005	0.016	0.406	0	1132466	0.008	0.033	0.976	0
PL	655035	5.272	3.822	41.818	1.745	655035	0.007	0.024	0.700	0	655035	0.058	0.089	0.942	0
PT	82711	7.283	5.240	41.710	1.560	82711	0.004	0.018	0.385	0	82711	0.149	0.053	0.964	0
RO	206913	3.335	2.757	41.551	1.321	206913	0.007	0.022	0.343	0	206913	0.033	0.071	0.872	0
SE	234774	19.703	5.553	41.839	7.547	234774	0.005	0.019	0.389	0	234774	0.007	0.029	0.993	0
SI	252896	8.272	4.536	41.790	1.360	252896	0.008	0.024	0.400	0	252896	0.072	0.069	0.985	0
SK	831476	5.245	3.338	41.870	2.020	831476	0.008	0.023	0.387	0	831476	0.025	0.056	0.941	0
UK	141278	16.582	7.837	41.867	2.531	141278	0.009	0.033	0.758	0	141278	0.020	0.060	1.000	0

Note: weights applied. based on grossing-up factor for employees (from SES)

Source: Own elaboration based on SES 2014 data.

Table A3. Descriptive statistics of the dependent variables - by industries.

NACE	wages					overtimes share					bonus payments share				
	N	Mean	Sd	Max	Min	N	Mean	Sd	Max	Min	N	Mean	Sd	Max	Min
B	77390	10.159	9.067	41.875	1.321	77390	0.013	0.029	0.294	0	77390	0.077	0.085	0.973	0
C	1742441	9.729	8.131	41.874	1.321	1742441	0.010	0.026	0.434	0	1742441	0.060	0.077	1.000	0
D E	219093	10.201	8.563	41.871	1.321	219093	0.009	0.023	0.379	0	219093	0.067	0.074	0.985	0
F	291436	10.795	8.226	41.873	1.321	291436	0.007	0.023	0.367	0	291436	0.042	0.071	1.000	0
S	5515019	11.510	8.435	41.875	1.321	5515019	0.005	0.020	0.750	0	5515019	0.051	0.072	1.000	0
P	1086799	12.766	9.868	41.874	1.321	1086799	0.003	0.016	0.758	0	1086799	0.041	0.053	1.000	0

Notes: B-mining and quarrying; C-manufacturing; DE-electricity, gas, steam and air conditioning supply and water supply; sewerage, waste management and remediation activities; F-construction; S-services (sectors G-O and Q R S); P –education. Normalised weights applied.

Source: Own elaboration based on SES 2014 data.

Table A4. Correlations between different measures of working conditions

	wages	overtimes share	bonus payments share
wages	1.000		
overtimes share	-0.082	1.000	
bonus payments share	-0.088	-0.003	1.000

Note: Sample of 8.932.178 workers from 24 European countries listed in Table A1

Source: Own elaboration based on SES 2014 data.

Table A5. Summary statistics of micro-level data.

	Variable	N	Mean	Sd	Min	Max
<i>Working conditions</i>	<i>wage (gross hourly wage per hour, in EUR)</i>	8932142	11.233	8.552	1.321	41.875
	<i>overtimes_share</i>	8932142	0.006	0.021	0	0.758
	<i>bonus payments share</i>	8932142	0.052	0.072	0	1.000
<i>Personal characteristics</i>	<i>sex (=1 if male)</i>	8932142	0.508	0.500	0	1
	<i>ageyoung (=1 if below 30 years)</i>	8932142	0.181	0.385	0	1
	<i>ageaverage (=1 if between 30-49 years old)</i>	8932142	0.528	0.499	0	1
	<i>ageold (=1 if 50 years old or more)</i>	8932142	0.292	0.455	0	1
	<i>loweduc (=1 if less than primary, primary, lower primary)</i>	8932142	0.166	0.372	0	1
	<i>mededuc(=1 if upper secondary and post-secondary)</i>	8932142	0.479	0.500	0	1
	<i>higheduc(=1 if tertiary education)</i>	8932142	0.355	0.476	0	1
<i>Employment and firm characteristics</i>	<i>shortdur(=1 if less than 1 year in the enterprise)</i>	8932142	0.128	0.334	0	1
	<i>meddur(=1 if 1-4 years in the enterprise)</i>	8932142	0.313	0.464	0	1
	<i>longdur (=1 if 5-14 years in the enterprise)</i>	8932142	0.376	0.484	0	1
	<i>vlongdur (=1 if 15 or more years in the enterprise)</i>	8932142	0.183	0.386	0	1
	<i>small(=1 if 1-49 employees in the firm)</i>	8806327	0.295	0.456	0	1
	<i>medium(=1 if 50-249 employees in the firm)</i>	8806327	0.246	0.431	0	1
	<i>large (=1 if 250 or more employees in the firm)</i>	8806327	0.459	0.498	0	1
	<i>indefinite(=1 if indefinite duration of employment contract)</i>	8697368	0.873	0.332	0	1

Note: values in a sample of 24 European countries listed in Table A1 (2014). Normalised weights applied.

Source: Own elaboration based on SES 2014 data.

Table A6. List of occupations

ISCO -08 code	Occupation name
1	Commissioned armed forces officers
2	Non-commissioned armed forces officers
3	Armed forces occupations, other ranks
11	Chief executives, senior officials and legislators
12	Administrative and commercial managers
13	Production and specialised services managers
14	Hospitality, retail and other services managers
21	Science and engineering professionals
22	Health professionals
23	Teaching professionals
24	Business and administration professionals
25	Information and communications technology professionals
26	Legal, social and cultural professionals
31	Science and engineering associate professionals
32	Health associate professionals
33	Business and administration associate professionals
34	Legal, social, cultural and related associate professionals
35	Information and communications technicians
41	General and keyboard clerks
42	Customer services clerks
43	Numerical and material recording clerks
44	Other clerical support workers
51	Personal service workers
52	Sales workers
53	Personal care workers
54	Protective services workers
61	Market-oriented skilled agricultural workers
62	Market-oriented skilled forestry, fishery and hunting workers
63	Subsistence farmers, fishers, hunters and gatherers
71	Building and related trades workers, excluding electricians
72	Metal, machinery and related trades workers
73	Handicraft and printing workers
74	Electrical and electronic trades workers
75	Food processing, wood working, garment and other craft and related trades workers
81	Stationary plant and machine operators
82	Assemblers
83	Drivers and mobile plant operators
91	Cleaners and helpers
92	Agricultural, forestry and fishery labourers
93	Labourers in mining, construction, manufacturing and transport
94	Food preparation assistants
95	Street and related sales and service workers
96	Refuse workers and other elementary workers
99	Other
111	Legislators and senior officials
112	Managing directors and chief executives
121	Business services and administration managers
122	Sales, marketing and development managers
131	Production managers in agriculture, forestry and fisheries
132	Manufacturing, mining, construction, and distribution managers
133	Information and communications technology service managers
134	Professional services managers
141	Hotel and restaurant managers
142	Retail and wholesale trade managers
143	Other services managers
211	Physical and earth science professionals
212	Mathematicians, actuaries and statisticians
213	Life science professionals
214	Engineering professionals (excluding electrotechnology)

215	Electrotechnology engineers
216	Architects, planners, surveyors and designers
221	Medical doctors
222	Nursing and midwifery professionals
223	Nursing and midwifery professionals
224	Paramedical practitioners
225	Veterinarians
226	Other health professionals
231	University and higher education teachers
232	Vocational education teachers
233	Secondary education teachers
234	Primary school and early childhood teachers
235	Other teaching professionals
241	Finance professionals
242	Administration professionals
243	Sales, marketing and public relations professionals
251	Software and applications developers and analysts
252	Database and network professionals
261	Legal professionals
262	Librarians, archivists and curators
263	Social and religious professionals
264	Authors, journalists and linguists
265	Creative and performing artists
311	Physical and engineering science technicians
312	Mining, manufacturing and construction supervisors
313	Process control technicians
314	Life science technicians and related associate professionals
315	Ship and aircraft controllers and technicians
321	Medical and pharmaceutical technicians
322	Nursing and midwifery associate professionals
323	Traditional and complementary medicine associate professionals
324	Veterinary technicians and assistants
325	Other health associate professionals
331	Financial and mathematical associate professionals
332	Sales and purchasing agents and brokers
333	Business services agents
334	Administrative and specialised secretaries
335	Regulatory government associate professionals
341	Legal, social and religious associate professionals
342	Sports and Fitness Workers
343	Artistic, cultural and culinary associate professionals
351	Information and communications technology operations and user support technicians
352	Telecommunications and broadcasting technicians
411	General office clerks
412	Secretaries (general)
413	Keyboard operators
421	Tellers, money collectors and related clerks
422	Client information workers
431	Numerical clerks
432	Material-recording and transport clerks
441	Other clerical support workers
511	Travel attendants, conductors and guides
512	Cooks
513	Waiters and bartenders
514	Hairdressers, beauticians and related workers
515	Building and housekeeping supervisors
516	Other personal services workers
521	Street and market salespersons
522	Shop salespersons
523	Cashiers and ticket clerks
524	Other sales workers

531	Child care workers and teachers' aides
532	Personal care workers in health services
541	Protective services workers
611	Market gardeners and crop growers
612	Animal producers
613	Mixed crop and animal producers
621	Forestry and related workers
622	Fishery Workers. Hunters and Trappers
631	Subsistence crop farmers
632	Subsistence livestock farmers
633	Subsistence mixed crop and livestock farmers
634	Subsistence fishers. hunters. trappers and gatherers
711	Building frame and related trades workers
712	Building finishers and related trades workers
713	Painters. building structure cleaners and related trades workers
721	Sheet and structural metal workers. moulders and welders. and related workers
722	Blacksmiths. toolmakers and related trades workers
723	Machinery mechanics and repairers
731	Handicraft workers
732	Printing trades workers
741	Electrical equipment installers and repairers
742	Electronics and telecommunications installers and repairers
751	Food processing and related trades workers
752	Wood treaters. cabinet-makers and related trades workers
753	Garment and related trades workers
754	Other craft and related workers
811	Mining and mineral processing plant operators
812	Metal processing and finishing plant operators
813	Chemical and photographic products plant and machine operators
814	Rubber. plastic and paper products machine operators
815	Textile. fur and leather products machine operators
816	Food and related products machine operators
817	Wood processing and papermaking plant operators
818	Other stationary plant and machine operators
821	Assemblers
831	Locomotive engine drivers and related workers
832	Car. van and motorcycle drivers
833	Heavy truck and bus drivers
834	Mobile plant operators
835	Ships' deck crews and related workers
911	Domestic. hotel and office cleaners and helpers
912	Vehicle. window. laundry and other hand cleaning workers
921	Agricultural. forestry and fishery labourers
931	Mining and construction labourers
932	Manufacturing labourers
933	Transport and storage labourers
941	Food preparation assistants
951	Street and related service workers
952	Street vendors (excluding food)
961	Refuse workers
962	Other Elementary Workers

Table A7. RTI across countries and sectors.

country	naceB	naceC	naceDE	naceF	naceS	naceP
BE	0.776821	0.704399	0.613132	0.747539	0.685428	0.209694
BG	0.66218	0.742699	0.633561	0.658337	0.481225	0.25155
CY	0.589825	0.712612	0.600352	0.60869	0.593473	0.213339
CZ	0.88226	0.76039	0.677034	0.535713	0.587152	0.250565
DE	0.662602	0.562082	0.532492	0.618119	0.490441	0.256443
EE	0.673864	0.648859	0.42171	0.557313	0.401445	0.204436
ES	0.738698	0.676612	0.659501	0.647673	0.569441	0.236773
FI	0.414905	0.363565	0.240054	0.366126	0.243458	-0.00734
FR	0.673123	0.303883	0.405606	0.452317	0.330065	0.105498
HU	0.68253	0.714002	0.63184	0.697595	0.49608	0.19837
IT	0.592927	0.661888	0.639409	0.607937	0.602919	0.428633
LT	0.894265	0.909047	0.727803	0.850874	0.630019	0.332492
LU	0.774674	0.758444	0.745375	0.763727	0.603842	0.185012
LV	0.991871	0.883819	0.845041	0.835271	0.598829	0.539088
MT	0.460779	0.705657	0.671331	0.683532	0.538167	0.483249
NL	0.363972	0.579237	0.445845	0.611067	0.512497	0.246895
NO	0.199905	0.39272	0.350278	0.447692	0.372399	0.054134
PL	0.622551	0.739785	0.570613	0.613831	0.511063	0.304694
PT	0.773778	0.718696	0.608089	0.647918	0.589993	0.291296
RO	0.60666	0.732429	0.587086	0.590205	0.414725	0.192313
SE	0.199784	0.05754	-0.00938	0.096651	-0.01104	-0.09508
SI	0.797117	0.815031	0.616354	0.805147	0.570455	0.277638
SK	0.735835	0.801315	0.654221	0.664374	0.592246	0.271256
UK	0.328761	0.557846	0.463771	0.470726	0.514697	0.397485

Table A8. List of sectors in WIOD database.

Sector code	Description
B	Mining and quarrying
C10-C12	Manufacture of food products, beverages and tobacco products
C13-C15	Manufacture of textiles, wearing apparel and leather products
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of str..
C17	Manufacture of paper and paper products
C18	Printing and reproduction of recorded media
C19	Manufacture of coke and refined petroleum products
C20	Manufacture of chemicals and chemical products
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22	Manufacture of rubber and plastic products
C23	Manufacture of other non-metallic mineral products
C24	Manufacture of basic metals
C25	Manufacture of fabricated metal products, except machinery and equipment
C26	Manufacture of computer, electronic and optical products
C27	Manufacture of electrical equipment
C28	Manufacture of machinery and equipment n.e.c.
C29	Manufacture of motor vehicles, trailers and semi-trailers
C30	Manufacture of other transport equipment
C33	Repair and installation of machinery and equipment
D35	Electricity, gas, steam and air conditioning supply
E36	Water collection, treatment and supply
E37-E39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities
F	Construction
G45	Wholesale and retail trade and repair of motor vehicles and motorcycles
G46	Wholesale trade, except of motor vehicles and motorcycles
G47	Retail trade, except of motor vehicles and motorcycles
H49	Land transport and transport via pipelines
H50	Water transport
H51	Air transport
H52	Warehousing and support activities for transportation
H53	Postal and courier activities
I	Accommodation and food service activities
J58	Publishing activities
J59_J60	Motion picture, video and television programme production, sound recording and music publishing activities
J61	Telecommunications
J62_J63	Computer programming, consultancy and related activities; information service activities
K64	Financial service activities, except insurance and pension funding
K65	Insurance, reinsurance and pension funding, except compulsory social security
K66	Activities auxiliary to financial services and insurance activities
M69_M70	Legal and accounting activities; activities of head offices; management consultancy activities
M71	Architectural and engineering activities; technical testing and analysis
M72	Scientific research and development
M73	Advertising and market research
M74_M75	Other professional, scientific and technical activities; veterinary activities
N	Administrative and support service activities
O84	Public administration and defence; compulsory social security
P85	Education
Q	Human health and social work activities
R_S	Other service activities

Supplementary materials

Table S1. Estimation results – the impact of GVC on working conditions assessed via wages. sample of workers from countries with different articulation of enterprise bargaining (Art)

	Art = 0				Art=1			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.022	-0.014	-0.032	-0.022	-0.042**	-0.043**	-0.041**	-0.043**
	[0.027]	[0.025]	[0.021]	[0.019]	[0.016]	[0.017]	[0.016]	[0.017]
UP		-0.036**		-0.041**		0.004		0.011
		[0.016]		[0.020]		[0.014]		[0.016]
R ²	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27
N	4503561	4503561	4466296	4466296	4426129	4426129	4337588	4337588

Notes: Individual and firm characteristics as in Table 1. Specifications: (3). (4). (7). (8) with additional firm's characteristics considering its size. Art=0 if additional enterprise bargaining on wages when it happens is. formally or informally. also conducted by non-union bodies (not under union control) or the articulation does not apply; Art =1 if additional enterprise bargaining on wages when it happens is informal and suppressed or restricted by law or sectoral agreement or additional enterprise bargaining on wages is recognized and takes place under control of union

Source: own elaboration based on data from SES and WIOD

Table S2. Estimation results – the impact of GVC on working conditions assessed via wages. sample of workers from countries with different coordination of wage-setting (Coord)

	Coord = 0				Coord=1			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.022	-0.019	-0.019	-0.014	-0.046**	-0.045*	-0.047**	-0.047**
	[0.023]	[0.021]	[0.020]	[0.019]	[0.022]	[0.023]	[0.021]	[0.022]
UP		-0.013		-0.015		-0.009		-0.005
		[0.016]		[0.020]		[0.021]		[0.021]
R ²	0.23	0.23	0.24	0.24	0.3	0.3	0.31	0.31
N	4672231	4672231	4587700	4587700	4257459	4257459	4216184	4216184

Notes: Individual and firm characteristics as in Table 1. Specifications: (3). (4). (7). (8) with additional firm's characteristics considering its size. Coord=0 for countries with mixed industry and firm-level bargaining. with no or little pattern bargaining and relatively weak elements of government coordination through the setting of minimum wage or wage indexation or fragmented wage bargaining. confined largely to individual firms or plants; Coord=1 for centralised or industry level bargaining.

Source: own elaboration based on data from SES and WIOD

Table S3. Estimation results – the impact of GVC on working conditions assessed via wages. sample of workers from countries with different general opening clauses in collective agreement (Ocg)

	Ocg = 0				Ocg=1			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.021	-0.017	-0.009	-0.004	-0.051**	-0.054**	-0.056**	-0.060**
	[0.020]	[0.019]	[0.022]	[0.022]	[0.021]	[0.023]	[0.023]	[0.025]
UP		-0.014		-0.018		0.017		0.02
		[0.013]		[0.016]		[0.017]		[0.018]
R ²	0.23	0.23	0.24	0.24	0.33	0.33	0.34	0.34
N	5462089	5462089	5377558	5377558	3467601	3467601	3426326	3426326

Notes: Individual and firm characteristics as in Table 1. Specifications: (3). (4). (7). (8) with additional firm's characteristics considering its size. Ocg=0 for countries if agreements contain no opening clauses; Ocg=1 for countries if agreements contain general opening clauses. defined as renegotiation of contractual provisions at lower levels. under specified conditions

Source: own elaboration based on data from SES and WIOD

Table S4. Estimation results – the impact of GVC on working conditions assessed via wages. wage expressed in relation to the sectoral median

Dependent variable	lnwage: wage expressed in relation to the sectoral median					
	(1)	(2)	(3)	(4)	(5)	(6)
sex (male=1)	0.131***	0.131***	0.135***	0.135***	0.138***	0.138***
	[0.007]	[0.007]	[0.008]	[0.008]	[0.007]	[0.007]
ageyoung	-0.168***	-0.168***	-0.166***	-0.166***	-0.161***	-0.161***
	[0.016]	[0.016]	[0.017]	[0.017]	[0.017]	[0.017]
ageaverage	-0.029**	-0.029**	-0.025**	-0.025**	-0.024*	-0.024*
	[0.012]	[0.012]	[0.012]	[0.012]	[0.012]	[0.012]
loweduc	-0.303***	-0.303***	-0.299***	-0.299***	-0.305***	-0.305***
	[0.015]	[0.015]	[0.014]	[0.014]	[0.015]	[0.015]
mededuc	-0.240***	-0.240***	-0.244***	-0.244***	-0.255***	-0.255***
	[0.010]	[0.010]	[0.009]	[0.009]	[0.010]	[0.010]
shortdur	-0.154***	-0.154***	-0.135***	-0.135***	-0.107***	-0.107***
	[0.008]	[0.008]	[0.007]	[0.007]	[0.006]	[0.006]
meddur	-0.104***	-0.104***	-0.090***	-0.090***	-0.081***	-0.081***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
RTI	-0.511***	-0.511***	-0.515***	-0.515***	-0.526***	-0.526***
	[0.020]	[0.020]	[0.020]	[0.020]	[0.020]	[0.019]
ln_Prod	-0.033***	-0.033***	-0.042**	-0.042**	-0.039**	-0.039**
	[0.011]	[0.011]	[0.016]	[0.016]	[0.016]	[0.016]
ΔGII	-0.051***	-0.052***	-0.054***	-0.056***	-0.059***	-0.062***
	[0.018]	[0.019]	[0.015]	[0.016]	[0.015]	[0.015]
UP		0.004		0.009		0.01
		[0.014]		[0.014]		[0.014]
Size_small			-0.185***	-0.186***	-0.195***	-0.195***
			[0.017]	[0.017]	[0.018]	[0.018]
Size_medium			-0.052***	-0.052***	-0.057***	-0.057***
			[0.015]	[0.015]	[0.016]	[0.016]
indefinite					0.085***	0.085***
					[0.010]	[0.010]
R ²	0.23	0.23	0.24	0.24	0.25	0.25
N	8929690	8929690	8803884	8803884	8571469	8571469

Notes: Country and industry dummies included. Normalised weighted regression with robust standard errors. clustered at industry. the weights are based on grossing-up factor for employees (from SES) normalised by the number of observation per country (see main text for the details); Default categories: ageold. higheduc. large. temporary. longdur and vlongdur; *p ≤ .10. **p ≤ .05. ***p ≤ .01.

Source: own elaboration based on data from SES and WIOD

Table S5. Estimation results – the impact of GVC on working conditions assessed via wages. wage expressed in relation to the sectoral (NACE level) mean

Dependent variable	lnwage: wage expressed in relation to the sectoral mean					
	(1)	(2)	(3)	(4)	(5)	(6)
sex (male=1)	0.113***	0.114***	0.116***	0.117***	0.119***	0.120***
	[0.006]	[0.006]	[0.007]	[0.007]	[0.006]	[0.007]
ageyoung	-0.151***	-0.151***	-0.149***	-0.149***	-0.144***	-0.144***
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
ageaverage	-0.028**	-0.028**	-0.024**	-0.024**	-0.023**	-0.023**
	[0.010]	[0.010]	[0.011]	[0.011]	[0.011]	[0.011]
loweduc	-0.263***	-0.263***	-0.258***	-0.258***	-0.262***	-0.262***
	[0.013]	[0.013]	[0.011]	[0.011]	[0.012]	[0.012]
mededuc	-0.204***	-0.204***	-0.206***	-0.206***	-0.214***	-0.214***
	[0.009]	[0.009]	[0.008]	[0.008]	[0.008]	[0.008]
shortdur	-0.135***	-0.135***	-0.117***	-0.117***	-0.090***	-0.091***
	[0.007]	[0.007]	[0.006]	[0.006]	[0.005]	[0.005]
meddur	-0.094***	-0.094***	-0.081***	-0.081***	-0.072***	-0.072***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.005]
RTI	-0.442***	-0.442***	-0.445***	-0.445***	-0.453***	-0.453***
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
ln_Prod	-0.016	-0.015	-0.022	-0.022	-0.021	-0.02
	[0.010]	[0.010]	[0.014]	[0.014]	[0.014]	[0.014]
ΔGII	-0.027*	-0.024	-0.029**	-0.026**	-0.033**	-0.029**
	[0.015]	[0.015]	[0.012]	[0.012]	[0.012]	[0.012]
UP		-0.015		-0.013		-0.015
		[0.010]		[0.011]		[0.010]
Size_small			-0.163***	-0.162***	-0.171***	-0.170***
			[0.015]	[0.015]	[0.015]	[0.015]
Size_medium			-0.046***	-0.046***	-0.051***	-0.051***
			[0.014]	[0.014]	[0.015]	[0.015]
indefinite					0.078***	0.078***
					[0.008]	[0.008]
R ²	0.26	0.26	0.27	0.27	0.27	0.27
N	8929690	8929690	8803884	8803884	8571469	8571469

Notes: Country and industry dummies included. Normalised weighted regression with robust standard errors. clustered at industry. the weights are based on grossing-up factor for employees (from SES) normalised by the number of observation per country (see main text for the details); Default categories: ageold. higheduc. large. temporary. longdur and vlongdur; *p ≤ .10. **p ≤ .05. ***p ≤ .01.

Source: own elaboration based on data from SES and WIOD

Table S6. Estimation results – the impact of GVC on working conditions assessed via wages. Δ GVC calculated between 2014-2000 and 2014 - 2009

	Δ GVC: 2014 – 2000		Δ GVC: 2014 - 2009	
	(1)	(2)	(3)	(4)
Δ GII	-0.027***	-0.024***	-0.02	-0.013
	[0.008]	[0.008]	[0.014]	[0.014]
UP		-0.018		-0.021*
		[0.012]		[0.012]
R ²	0.26	0.26	0.26	0.26
N	8571469	8571469	8571469	8571469

Notes: Individual and firm characteristics as in Table 1. Specifications with additional firm's characteristics considering its size.

Source: own elaboration based on data from SES and WIOD

Table S7. Estimation results – the impact of GVC on working conditions assessed via wages. additional country specific variables

	(1)	(2)	(3)	(4)	(5)	(6)
Δ GII	-0.032**	-0.028*	-0.032**	-0.028*	-0.032**	-0.028*
	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]
UP		-0.018		-0.018		-0.018
		[0.011]		[0.011]		[0.011]
ln(GDPpc)	0.219***	0.214***				
	[0.039]	[0.039]				
Exp/GDP			0.118***	0.119***		
			[0.025]	[0.025]		
Imp/GDP					0.129***	0.129***
					[0.018]	[0.018]
R ²	0.24	0.24	0.24	0.24	0.24	0.24
N	8929690	8929690	8929690	8929690	8929690	8929690

Notes: Individual and firm characteristics as in Table 1.

Source: own elaboration based on data from SES and WIOD

Table S8. Estimation results – the impact of GVC on working conditions assessed via wages. min. average and max coefficients for estimations when country by country or sector by sector is eliminated

	Elimination country by country			Elimination sector by sector		
	Min	Average	Max	Min	Average	Max
	(1)	(2)	(3)	(4)	(5)	(6)
Δ GII	-0.041	-0.030	-0.017	-0.04	-0.03	-0.02
UP	-0.028	-0.018	-0.008	-0.03	-0.02	-0.01
R ²	0.24	0.24	0.25	0.23	0.24	0.25
N	6935478	8557620	8910463	7709994	8743655	8929109

Notes: Individual and firm characteristics as in Table 1.

Source: own elaboration based on data from SES and WIOD

Table S9. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments. sample of workers from countries with different articulation of enterprise bargaining (Art)

	<i>Art=0</i>				<i>Art=1</i>			
	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments
Negative binomial count model								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.168***	-0.062**	-0.004	-0.070***	-0.268***	-0.241***	0.083***	0.082***
	[0.028]	[0.029]	[0.010]	[0.010]	[0.021]	[0.021]	[0.005]	[0.006]
UP		-0.423***		-0.021*		-0.225***		0.006
		[0.020]		[0.012]		[0.019]		[0.007]
Probability of being an extra zero								
ΔGII	-0.223***	-0.409***	-46.291	-0.045***	-3.545***	-0.208***	-0.310***	-0.374***
	[0.019]	[0.020]	[0.000]	[0.010]	[0.185]	[0.016]	[0.007]	[0.007]
UP		-0.069***		0.007**		-0.046***		-0.061***
		[0.006]		[0.003]		[0.006]		[0.002]
Π	-3964.73	-3961.52	-16605.1	-16589.5	-3127.19	-3126.57	-16724.3	-16724.3
N	4466296	4466296	4466296	4466296	4105173	4105173	4105173	4105173
N_zero	3566853	3566853	1610816	1610816	3582747	3582747	2012838	2012838
Chi2	76294.23	77370.51	207126.7	213448.3	51591.3	52783.9	418229.8	418138
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Individual and firm characteristics as in Table 1 Specifications with additional firm's characteristics considering its size. * $p \leq .10$. ** $p \leq .05$. *** $p \leq .01$.

Source: own elaboration based on data from SES and WIOD

Table S10. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments. sample of workers from countries with different coordination of wage-setting (Coord)

	<i>Coord=0</i>				<i>Coord=1</i>			
	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments
Negative binomial count model								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.250***	-0.147***	-0.101***	-0.107***	-0.313***	-0.417***	0.101***	0.100***
	[0.026]	[0.027]	[0.009]	[0.009]	[0.023]	[0.023]	[0.005]	[0.005]
UP		-0.390***		0.034***		-0.076***		0.007
		[0.019]		[0.010]		[0.022]		[0.008]
Probability of being an extra zero								
ΔGII	-0.213***	-0.235***	-0.252***	-0.289***	-4.285	-4.868	-1.215***	-3.800***
	[0.018]	[0.018]	[0.009]	[0.009]	[0.000]	[0.000]	[0.010]	[0.066]
UP		-0.027***		-0.044***		-5.591		-0.970***
		[0.005]		[0.003]		[0.000]		[0.030]
Π	-4207.34	-4204.23	-18018.1	-18017.9	-2892.08	-2907.18	-15276.6	-15276.6
N	4587700	4587700	4587700	4587700	3983769	3983769	3983769	3983769
N_zero	3679985	3679985	1684181	1684181	3469615	3469615	1939473	1939473
Chi2	81537.86	82187.84	217536.2	219206.6	51748.35	46934.4	432855.5	435832.2
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Individual and firm characteristics as in Table 1 Specifications with additional firm's characteristics considering its size. * $p \leq .10$. ** $p \leq .05$. *** $p \leq .01$.

Source: own elaboration based on data from SES and WIOD

Table S11. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments. sample of workers from countries with different general opening clauses in collective agreement (Ocg)

	<i>Ocg=0</i>				<i>Ocg=1</i>			
	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments	Share of overtime hours	Share of bonus payments
Negative binomial count model								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.182***	-0.093***	0.093***	0.086***	-0.158***	-0.104***	0.043***	0.042***
	[0.018]	[0.018]	[0.011]	[0.011]	[0.033]	[0.035]	[0.005]	[0.005]
UP		-0.02		0.032***		-0.313***		0.012*
		[0.016]		[0.012]		[0.032]		[0.007]
Probability of being an extra zero								
ΔGII	-77.009	-4.805	-0.075***	-0.319***	-0.222***	-0.043**	-0.091***	-0.462***
	[0.000]	[0.000]	[0.008]	[0.008]	[0.018]	[0.019]	[0.007]	[0.008]
UP		-4.159		-0.041***		0.033***		-0.143***
		[0.000]		[0.003]		[0.008]		[0.003]
Π	-3995.66	-4000.74	-15373.2	-15373.2	-3084.32	-3083.45	-17914.9	-17914.9
N	5377558	5377558	5377558	5377558	3193911	3193911	3193911	3193911
N_zero	4335325	4335325	2116446	2116446	2814275	2814275	1507208	1507208
Chi2	84932.6	83288.97	106442.6	106442.9	47892.17	48303.61	480658.6	481213.5
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Individual and firm characteristics as in Table 1 Specifications with additional firm's characteristics considering its size. * $p \leq .10$. ** $p \leq .05$. *** $p \leq .01$.

Source: own elaboration based on data from SES and WIOD

Table S12. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments. Δ GII measured over different periods

	ΔGII: 2014 - 2000				ΔGII: 2014 - 2009			
	Share of overtime hours	Share of bonus payments			Share of overtime hours	Share of bonus payments		
Negative binomial count model								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔGII	-0.137***	-0.087***	0.077***	0.081***	-0.466***	-0.369***	-0.121***	-0.120***
	[0.013]	[0.013]	[0.005]	[0.005]	[0.026]	[0.026]	[0.009]	[0.009]
UP		-0.337***		-0.031***		-0.313***		-0.002
		[0.015]		[0.007]		[0.015]		[0.007]
Probability of being an extra zero								
ΔGII	-1.308***	-0.545***	0.002	-2.300***	-0.044**	-0.598***	-10.018	-0.093***
	[0.018]	[0.013]	[0.005]	[0.020]	[0.018]	[0.019]	[0.000]	[0.009]
UP		-0.151***		-0.761***		-0.090***		0.020***
		[0.004]		[0.008]		[0.004]		[0.002]
II	-7113.26	-7109.67	-33343	-33342.8	-7111.62	-7108.57	-33343.4	-33343.4
N	8571469	8571469	8571469	8571469	8571469	8571469	8571469	8571469
N_zero	7149600	7149600	3623654	3623654	7149600	7149600	3623654	3623654
Chi2	144067.9	146292.5	586534.1	587760.8	145992.6	147546.6	591250.8	592490.8
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Individual and firm characteristics as in Table 1 Specifications with additional firm's characteristics considering its size. * $p \leq .10$. ** $p \leq .05$. *** $p \leq .01$.

Source: own elaboration based on data from SES and WIOD

Table S13. Estimation results – the impact of GVC on working conditions assessed via overtime hours and bonus payments. additional country specific variables

	Share of overtime hours			Share of bonus payments		
Negative binomial count model						
	(1)	(2)	(3)	(4)	(5)	(6)
ΔGII	-0.267***	-0.267***	-0.267***	0.003	0.003	0.003
	[0.023]	[0.023]	[0.023]	[0.006]	[0.006]	[0.006]
UP	-0.152***	-0.152***	-0.152***	-0.045***	-0.045***	-0.045***
	[0.017]	[0.017]	[0.017]	[0.007]	[0.007]	[0.007]
ln(GDPpc)	-1.477***			0.665***		
	[0.056]			[0.016]		
Exp/GDP		-1.379***			0.255***	
		[0.036]			[0.010]	
Imp/GDP			-1.578***			1.895***
			[0.025]			[0.006]
Probability of being an extra zero						
ΔGII	-0.280***	-0.276***	-0.277***	-1.935***	-1.933***	-1.942***
	[0.013]	[0.013]	[0.013]	[0.012]	[0.012]	[0.012]
UP	-0.062***	-0.060***	-0.060***	-0.649***	-0.647***	-0.651***
	[0.005]	[0.005]	[0.005]	[0.004]	[0.004]	[0.004]
Π	-9252.85	-9252.85	-9252.85	-40075.3	-40075.3	-40075.3
N	8929690	8929690	8929690	8929690	8929690	8929690
N_zero	7460654	7460654	7460654	3850469	3850469	3850469
Chi2	112557.4	112557.3	112557.3	587338.8	587338.8	587338.8
p-value	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Individual and firm characteristics as in Table 1 Specifications with additional firm's characteristics considering its size. *p ≤ .10. **p ≤ .05. ***p ≤ .01.

Source: own elaboration based on data from SES and WIOD

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