

Offshoring, job satisfaction and job insecurity

Santiago Budría and Juliette Milgram Baleix

Abstract

This paper investigates the effects of offshoring on individual job satisfaction and perceived risk of job loss. The authors merge microdata from the German Socio-economic Panel dataset (SOEP) with indicators of insertion in global value chains at the industry level for the period 2000-2013. They test two hypotheses. First, they investigate whether workers in industries with higher offshoring intensity report lower job satisfaction and/or are more prone to be unsecure at their jobs. Second, they test whether these effects differ among four categories of collars. Their findings indicate that offshoring is associated with lower job satisfaction. Specifically, the reference individual would need a compensation of about 0.25% of her labour income to experience a 1% increase in offshoring intensity in order to maintain her job satisfaction constant. The results are also indicative of some heterogeneity in the offshoring effect, with high skilled white-collar worker being mostly unaffected by offshoring and low skilled blue-collar workers showing the largest negative effects. Moreover, the authors find that offshoring is not significantly related with job insecurity, a result that applies to all workers' categories.

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1. Introduction

The Great recession and rise of China in World Trade has raised the debate about the impact of trade on wages and employment, in particular in the US (Autor et al., 2013; Feenstra et al., 2017) but also in Europe. Globalization is frequently blamed for fuelling wage inequality, and a flourishing and promising literature intends to gauge the role of trade on different aspects of labour markets.

This paper focusses on a specific aspect of trade globalization, offshoring, and on two specific labour market outcomes: individual job satisfaction and perceived job insecurity. The paper investigates two hypotheses. First, we wonder whether offshoring intensity affects job satisfaction and perceived job insecurity. Second, the paper tests whether the association between job satisfaction and perceived job insecurity differs among collars. To that purpose, we merge micro data from the 2000-2013 waves of the German Socioeconomic Panel (GSOEP) with information from the Trade in Value Added (TiVA) database from the OCDE. We use industry as matching criterion and therefore combine detailed individual information on personal and job characteristics with the offshoring intensity within the industry where the individual works. This allows us to estimate a set of job satisfaction and job insecurity equations controlling for individual fixed effects and a number of socio-economic and job level characteristics.

Empirical studies have drawn in recent years a complex picture of the effect of the internationalisation process on labour markets. Actually, it seems more complicated than ever to identify globalisation's winners and losers (Crozet and Orifice, 2017 for a survey) and to isolate all the possible links between trade and labour markets. While most research to date has focussed on the impact of globalization on wages and inequality (Crinó, 2009, for a review), only a few papers have examined the effects of the internalization process on job insecurity and none has examined its effects on job satisfaction. The first contribution of this paper is precisely to fill this gap. Job satisfaction is an important component of subjective well-being (Van Praag and Ferrer-i-Carbonell, 2008) and is also related to a number of economic outcomes, including labour productivity and lower absenteeism (Oswald et al. 2015). However, the literature to date has remained silent about the effects of firm internationalization on job satisfaction¹. In this paper we hypothesise that even if offshoring does not have direct effects on

¹ The closest question analyzed is whether life satisfaction is positively associated with globalization, broadly defined as a concept including economic, social and political aspects (Khun et al., 2015).

wages, it can lower workers' job satisfaction by worsening their job conditions, bargaining power and turnover rates.

Job insecurity refers to perceptions of risk and forward-looking labour outcomes. The distinction between job insecurity and previous literature focusing on wages and employment transitions relies on the notion that future risks can be more damaging to people's life than real events. In fact, concerns about job loss could be as detrimental, if not more, than the actual occurrence of job loss (Burgard et al., 2009). Moreover, the perceived rather than the formal job insecurity is what matters for workers' well-being (Jahn, 2015). Apart from this, due to globalisation and increasing competition, European labour markets have experienced an increasing flexibility, and workers at all levels of the occupational hierarchy have seen their future threatened (László et al., 2010). Therefore, the concepts of job and economic perceived insecurity have acquired their own status in the economics literature and are now studied as stand-alone subject (Rohde et al., 2017). Earlier studies examining the links between offshoring and job risk are based on objective unemployment hazards (Görg and Görlich, 2012 and 2015 for studies using the same dataset as we do). As far as we know Geishecker et al (2012) is the only study that focusses on perceived job fears². Our interest in subjective appraisals relies on the fact that individual wellbeing is more dependent on ex-ante individual perceptions than on ex-ante objective hazards. Moreover, what arguably matters most in terms of public support for free trade or wage bargaining are subjective concerns about job security. The underlying hypothesis is that in a context of increasing vertical fragmentation of production at the world level, trade in intermediate goods may imply more subtle mobility of workers within and among sectors, and ultimately can impact the perception of workers regarding the stability of their jobs.

The second contribution of this study is to test for heterogeneous effects among groups of workers. Indeed, the associations between offshoring and labour market outcomes can hide important differences across individuals. For instance, workers performing highly non-routine or interactive tasks— that is, tasks that are arguably difficult or more costly to offshore – are less likely to suffer the consequences of increased offshoring intensity. Numerous empirical studies indicate that in terms of objective job loss risk, high-skilled workers tend to be less affected by offshoring than low-skilled worker (Görg and Görlich, 2012, 2015). Moreover, the risk of job loss is higher for blue-collar workers (Lo Turco et al., 2013) and workers performing non-routine and interactive tasks (Baumgarten, 2015). One of the objectives of this paper is to examine whether such discrepancies hold when we switch

² Lurweg (2010) also studies this issue but focus on the service sector.

from objective job loss risks to perceived risks and job satisfaction. To that purpose, we report estimates for four categories of workers: high and low skill, white and blue-collar workers.

There are several reasons to focus on Germany. First, it is one of the biggest markets within the EU. It is also more open to international trade than most other large developed Economies and registers highest level of exports worldwide (Bachmann and Braun, 2011). Second, as emphasised by Bachmann et al. (2014), the German labour markets is highly regulated with rigid wages, and shocks such as outsourcing might well be absorbed through employment rather than through wages, as confirmed by Gorg and Goerlich (2012). Third, international outsourcing has grown substantially in Germany over recent years. This makes its industry less exposed to external shocks on demand of final consumption goods and would explained why this country returned quite quickly to the level of employment prior to the Great Recession. In particular, German firms takes the opportunity brought about by the proximity of countries in Central and Eastern Europe, abundant in highly skilled workers but with lower wages (Baumgarten, 2015). The period we analysed is also marked by the increase of the participation in China in the trade of all developed countries, including Germany (Huber and Winkler, 2019). Finally, the integration of Germany into GVC is salient. As pointed by OECD (2018) (p. 4), employment driven by foreign final demand increased between 2005 and 2015 in the majority of OECD countries but “Germany is the country among G20 for which a greater part of employment depends on foreign final demand”.

The paper shows that offshoring is negatively associated with job satisfaction. Specifically, the benchmark estimates indicate that a 1% increase in offshoring intensity is as harmful for job satisfaction as a 0.25% decrease in labour income. Moreover, this effect differs among categories of workers, with high skill white-collar workers being mostly unaffected by offshoring and low skill blue-collar workers suffering the largest negative effects. The paper also shows that offshoring intensity is not significantly associated with increased job insecurity, a results that holds for all workers’ categories.

The paper is organized as follows. Section 2 describes the theoretical background. Section 3 describes the dataset and variables used in the regressions. Section 4 presents the results. Section 5 includes some sensitivity checks to test the robustness of the results. Section 6 contains the concluding remarks. The paper includes an Appendix that describes the correspondence between NACE industry codes and TiVA industries.

2. Background

Theoretical predictions concerning the effects of offshoring on wages and employment are not as clear-cut as international trade theory predicted (Stolper and Samuelson, 1941). The effects of production fragmentation on employment are far from straightforward. The effects on wages have been more intensively studied so far. However, we can draw some lessons in terms of job satisfaction or job insecurities perception, as long as a foreseen decrease in wages could be assimilated with a risk of unemployment.

The seminal reference in this literature is the theoretical model of Grossman and Rossi-Hansberg (2008) that draws the attention to the fact that the fragmentation of production at the international level calls for a new approximation to trade and trade policies where trade does not consist in exchanging goods but exchanging tasks and value added. Thanks to advances in transportation and communications technology, it is increasingly viable to separate tasks in time and space. Certain type of tasks or labour can more easily be performed abroad. According to these authors, the decision to offshore faces a trade-off between the cost advantage of offshoring some tasks against the difficulties to supervise and coordinate the work. This is a reason why offshoring is not beneficial for all the tasks. Then, firms that can relate more intensively on offshorable tasks would expand and increase their demand for local workers who realise less offshorable tasks and whose productivity has increased³. Grossman and Rossi-Hansberg (2006) approximate the offshorable category of works by least skilled blue-collars and conclude that productivity gains and improvement in the terms of trade allow compensating the falling demand for this category of labour, ending up with a moderated reduction of wages. Wright (2014) offers a more detailed empirical verification of the previous model using US data. They approximate the nature of work by low- and high-skill wages. Their results support the prediction of Grossman and Rossi-Hansberg (2008), especially regarding productivity gains.

Studies exploring the determinants of changes in the nature of work in industrialized countries illustrate that there is a variety of forces at play in the economy, which alters the distribution of workplace tasks. There is a consensus in the literature (Hummels et al., 2018, for a survey) to consider, at least, two important distinct features of offshorable tasks, regardless skill requirements. First,

³ Grossman and Rossi-Hansberg (2008) complete their model to account for the recent debate about offshoring of high skilled tasks in particular in the service sector. They also conclude that the productivity gains would mitigate the reduction of wages of high skilled at home.

routine tasks can be transmitted in a codified form and more easily transferred from one firm to another, or coordinated from abroad (Autor et al., 2013). Moreover, Blinder (2006) point out that tasks requiring more interaction are less easily offshorable. Ottaviano et al. (2013) underline that offshoring would in turn induce workers to perform more interactive tasks.

2.1 Offshoring and wages

Recent studies confirm the importance of the nature of tasks when accounting for the effects of offshoring on wages. Ebenstein et al. (2014) support the hypothesis that wage losses from offshoring are more pronounced for routine tasks. For the US, they show that globalization may affect wages by displacing workers from the manufacturing sector to other sectors in which they obtain less wages. Moreover, the negative wage effect of low-income-country offshoring is especially pronounced for the workers whose occupations have high routine-task indices. Hummels et al. (2014) draw similar conclusions in the Danish case. Conditional on education, workers suffer larger wage declines in response to offshoring if their occupations have high routineness⁴.

The impact of offshoring on wages has been extensively studied in the case of Germany. Using German Qualification and Career Survey, Brändle and Koch (2015) evidence that most manufacturing sectors, and many of the tasks performed in this area are both easily offshorable and outsourceable. Baumgarten et al. (2013) have linked the SOEP to German Qualification and Career Survey to qualify properly tasks. Their findings support the hypothesis according to which offshoring would have less negative impact on wages of workers which tasks require a higher degree of interactivity and a non-routine. Becker et al. (2013), using plant data, evidence that high offshoring is associated with large shares of non-routine-task workers and interactive-task workers at the headquarters. Görg and Görlich (2012) conclude that the nexus between export intensities of industries (or imports) and wages are weak, while trade would have more obvious effects on employment. Services offshoring would matter more than material offshoring for wages. Görg and Görlich (2015) re-examine similar questions focusing on the difference among temporary and permanent workers. In this more recent study, they account for offshoring at the industry level using data from the world input–output database (WIOD) where offshoring is measured by the share of imported value added in industry production. They conclude that the effects of offshoring on wages is similar for temporary and permanent. Taking a different perspective, Hogrefe and Yao (2016) compare transitory short-term fluctuations and

⁴ Other authors have studied similar questions for other countries, including Casabianca et al. (2019) for Peru; Consoli et al. (2016) for US; Parteka (2018) for Poland and Parteka and Wolszczak-Derlacz (2019) for a set of European countries and the United States.

permanent fluctuations of individuals' income of German workers. They find that the latter would decrease with offshoring, and especially with offshoring to low-income destinations.

2.2 Job insecurity

The effect of offshoring on perceived job insecurity has been scarcely studied but we rely in this section on studies that investigate the effect of offshoring on observed turnovers, risk of losing jobs, switch to other sectors or to unemployment. In line with the findings of Grossman and Rossi-Hansberg (2008), offshoring may have contradictory effects on employment, which make rather unclear the overall expected effect and preview an increase in job insecurity. On the one hand, offshoring may induce a substitution of domestic workers by foreign suppliers provoking job losses. On the other hand, domestic firms may gain in market shares by increasing their productivity and thereby raise the demand for local workers.

Crinó (2009) conduct an exhaustive survey of the empirical literature on this matter and concludes that relocation of production activities (material offshoring) seems to raise the volatility of employment, while service offshoring would have a lower impact on total employment but would favour high-skilled white-collar employees. She conjectures that these differences emerge from the still limited extension of service offshoring. Moreover service offshoring also contributes to create new jobs in the domestic market. Evidence on services offshoring is still scarce to draw robust conclusions. An exception is Liu and Trefler (2019) who find that service offshoring to China and India has larger effects on switching down (switching to an occupation that pays less on average than the current occupation) than on switching up, in the US. Service offshoring would also have not affected so much the average wage of the workers from the service sector but would have raised unemployment rate of these white-collars.

With a similar setting, Görg and Görlich (2012) rely on objective unemployment hazards to study the different effect of trade exposure (measured using gross trade values) on the probability for workers to lose their jobs. They compare export intensive and non –export intensive sectors, and distinguish between service and material offshoring and between different categories of skilled workers. Their results tend to show that the effects of trade on unemployment probabilities (and on wages) are small, except for services industries where export exposure is significantly correlated with high probability of becoming unemployed. Görg and Görlich (2015) underline that offshoring increases the unemployment risk of temporary low-skilled workers more than the one of permanent low-skilled workers. Moreover, offshoring may, through reallocation of activities lead to more employment opportunities for high-skilled workers.

Bachmann and Braun (2011) use the IAB Employment Sample to explore the effect of trade on individual risk of losing a job in Germany. Both conclude that outsourcing would contribute to job stability in the service sector. The authors conclude that outsourcing has a positive but small impact on overall job stability in the manufacturing sector but would hurt more medium-skilled and older workers. Baumgarten (2015) with the same dataset focuses on the difference between material and service offshoring. They confirm a small impact of both type of offshoring on job security, even if the risk is higher for workers performing non-routine and interactive tasks.

Following similar strategies, other authors have focused on other countries. Pfaffermayr et al. (2007) find that outsourcing increases the labour turnover in Austria. For Italy, Lo Turco et al. (2013) conclude that material offshoring to low income countries would hurt especially blue collars by raising their probability to exit the manufacturing sectors. White collars would be more affected by offshoring to high income countries that would increase the likelihood of switching to another job within the manufacturing sector.

As far as we know, only two studies investigate the nexus between trade and a subjective measure of job insecurity as we do. Lurweg (2010) focus on the job insecurity of workers in German service industries using both a “subjective” and a more “objective” measure. Employees from sectors producing a traded service, or a service which exports are growing, are objectively more exposed to unemployment, and their feelings accurately reflect the situation. Thus, this study does not account for manufacturing industries, the ones that are more affected by offshoring. Geiskecker et al (2012) use data from Germany covering the 1995-2006 period to examine the relation between offshoring and job loss fears. Using linear fixed effects estimates, they find that offshoring to low-wage countries significantly raises job loss fears whilst offshoring to high-wage countries somewhat lowers them. Moreover, their results indicate that high-skilled workers are more sensitive to offshoring.

3. Empirical strategy

3.1 Data set and variables

The analysis is based on individual level data from the 2000-2013 waves of the German Social Economic Panel (SOEP). Initiated in 1984, the German SOEP is a representative longitudinal annual household survey that contains information on a large set of personal and household characteristics.⁵It also

⁵ For detailed information see Wagner et al. (2007).

includes the industry in which an individual works. The sample includes male full-time employees of prime age (i.e., aged 18-64) who are employed in manufacturing (NACE 15-36) or services industries (NACE 40-74). We remove the self-employed and those currently in (occupational) education or retraining. The various reduction steps result in an unbalanced panel of 69,733 observations from 17,888 respondents.

Job satisfaction is measured with a question in which respondents are asked “How satisfied are you with your job (if employed)?” on a 0 to 10 scale, where 0 is “completely dissatisfied” and 10 is “completely satisfied”. Hereafter, the answer to this will be referred to as Job Satisfaction (JS). Despite a long tradition among sociologists and psychologists, subjective data was subject to criticisms among some economists concerned about the potential biases arising from cultural differences, framing problems, cognitive bias, and mood effects. Although for reasons of space we do not enter into details, we note that the evidence accumulated over recent years has proven the validity and consistency of self-reported data. In a nutshell, self-reported measures of job satisfaction have shown predictive power over relevant actions such as job absence, dismissals, job quits and productivity.

Perceived Job Insecurity (JI) is captured by “How concerned are you about the following issues: Your job security (if you are employed)?” Respondents can either answer “very concerned”, “somewhat concerned”, or “not concerned at all”. We consider respondents to perceive their job as insecure if they check “very concerned” or “somewhat concerned”, whereas respondents perceive their jobs as secure if they responded “not at all concerned”. Therefore, our measure of job insecurity is a binary variable.

As for the measurement of offshoring, there is consensus that exports and imports have become a poor indicator of openness. Due to the increasing importance of international trade of intermediate products, gross values of exports does not reflect accurately the domestic value added embodied in goods and services while imports may include not only foreign value added but also domestic value added incorporated in previous stage of the production of these imported goods. To avoid the double account of foreign value added embodied in exports and in imports, it is necessary disentangle the content of domestic and foreign value added in gross exports and, additionally to take into account the domestic content incorporated in imported inputs used in exported production.

Several methodological proposal have emerged in recent years, including Koopman et al. (2010, 2014), Daudin et al. (2011), Johnson and Noguera (2012), Timmer et al. (2012, 2014). With some nuances, all the calculations proposed are based on tables input-output at the world level that provide intensity in

the use of intermediate goods by sectors and partner countries. They end up with the Foreign Value Added (FVA) in country gross exports and the Domestic Value Added (DVA) in imports. FVA and DVA can be expressed either in function of total gross exports or imports or in terms of industry production, depending on the purpose of the study. There are two main sources providing such data for large sample of countries: world input–output database (WIOD) from the World Bank and the Trade in Value Added (TiVA) database from the OCDE. The period covered by the second one is longer and offers the advantage of directly provide the main indicators already calculated. To proxy the intensity of offshoring, we use in a first step, the indicator Foreign Value Added in country gross exports (FVAX) expressed as a share of total gross exports (EXP) from the 2016 version of TiVA (2000-2011) and extrapolate using the 2018 version of TiVA for the years 2012-2013. A higher value of the indicator expresses a higher intensity of offshoring.

TiVA data are provided at a quite broad aggregated level. The categories are shown in the Appendix. These include several sectors of the two-digit ISIC rev 4 nomenclature. We match this classification with the 2-digit NACE industry codes included in the GSOEP and, therefore, pair individual information in the GSOEP sample with industry offshoring levels. As a limitation, TiVA categories are more aggregated than NACE codes. Hence, some industries from the SOEP classification have been assigned the same offshoring intensity. For almost all industries the matching between TiVA and NACE is univocal except for 2 categories, which belong to several TiVA sectors. In these cases, we aggregate the FVAX of these TiVA industries, and we calculate the share in overall exports of this broad category. Overall, the 59 NACE industries of the SOEP have been assigned 36 offshoring intensities (see appendix). Specifically, the 23 manufactures' industries that have been matched with 18 TiVA categories, the 28 services' industries has been matched with 17 TiVA industries and, finally, the 8 industries of the primary sector (NACE 1 to 14) correspond to 4 TiVA categories. In the Appendix we include a table with the correspondence between TiVA and NACE industries.

To test how offshoring affects job satisfaction and job security of workers performing different tasks, we group the 2-digit level ISCO codes provided in the SOEP into 4 different task categories. Our classification criteria is inspired in Baumgarten et al. (2013) and Brändle and Koch (2015), who propose a procedure that assigns the SOEP ISCO codes different task profiles using information from the German Qualifications and Career survey. The German Qualifications and Career survey is a random sample of around one tenth of the German labor force. Issued for the first time in 1979 and repeated periodically every seven years, it contains detailed information on workplace and workers characteristics, including occupation and industry level variables. These data allow the characterization

of the task profile of German workplaces through the surveyed worker's response to relatively objective questions (such as the declaration of the main activity on the job and the use of workplace tools) and subjective questions (the worker's assessment of the skills required to perform a job and the worker's assessment of the intensity of job requirements to conduct the job such as the degree of repetitiveness, the relevance of deadlines, or the adaptation to new situations). This information allows for the mapping between occupations and task profiles. Therefore, we differentiate among four task categories, each one corresponding to specific ISCO 88 occupation codes: i) high skilled white collar (legislators, senior officials and managers, professionals and technicians and associate professionals), ii) low skilled white collar (clerks and service workers and shop and market sales workers), iii) high skilled blue collar (skilled agricultural and fishery workers and craft and related trades workers) and iv) low skilled blue collar (plant and machine operators and assemblers and elementary occupations). Armed forces are excluded.

3.2 Specification and research hypotheses

JS and JI are assumed to be functions of individual and job characteristics,

$$Y_{it} = f(Y^*(X_{it}, O_{it-1}, \varepsilon_{it})) \quad (1)$$

where vector X includes gross pay per month (in real terms), age and age squared, job tenure, hours of work years of schooling and number of children and adults at home. All the variables are in logs. The model also includes health status, marital status, a full vector of industry dummy variables, controls for the type of task performed by the individual, dummies for the 16 German federal states and year fixed effects. O is an index of offshoring intensity at the industry level and ε_{it} is an independent error term.

There are two potential concerns on the direction of causality if offshoring is correlated with industry-specific non-observables. First, lower JS in industries with more offshoring intensity may suggest a true effect but, also, that these industries have other characteristics that affect negatively JS. This could be the case if, for example, workers in industries exposed to more import competition have worse working conditions (less hours flexibility, higher turnovers, etc). A same reasoning applies to job insecurity. We address this concern by, firstly, including the full vector of industry dummies, so that any characteristic of the industry that may affect both offshoring and job satisfaction and/or job insecurity are controlled for in our estimations. In addition, we allow for full sets of industry-year fixed effects, which flexibly absorb any other time-varying determinant of job satisfaction and job insecurity operating at the sector level. Secondly, we use offshoring intensity at time $t-1$ to explain job

satisfaction and job insecurity at time t . Since the offshoring variable pre-dates the dependent variable, we are factoring out from the estimates any spurious correlation that may run from contemporaneous job satisfaction and insecurity to offshoring intensity.

As second concern, working in specific industries could reflect individual unobserved characteristics: for example, individuals who self-select in “Arts, entertainment, recreation and other service activities” may have specific personality traits that are correlated with the perception of their jobs and the satisfaction derived from them. Therefore, we estimate the equations allowing for individual fixed effects. Fixed effects remove time-invariant determinants of job satisfaction and job insecurity at the individual level (e.g., differences in personality, attitudes towards risk, etc) and imply that we exploit within-person variation over time for model identification.

We take reported JS to be cardinal. This is, we assume that the distance between the eleven satisfaction categories carry a meaning. It has been shown that assuming cardinality as oppose to regress satisfaction with ordinal models is rather irrelevant for the results in terms of trade-offs between explanatory variables (Ferrer-i-Carbonell and Frijters, 2004), while it has the advantage of yielding coefficients that can be directly interpreted as marginal effects. In the JS equation we rely on the Probit Adapted Ordinary Least Squares (POLS) as developed by Van Praag and Ferrer-i-Carbonell (2008, p. 29-34). As a robustness check, we have estimated the model with the standard linear model and found very small differences in terms of trade-offs between variables and statistical significance.

Implementing POLS begins by deriving $\{\mu_j\}_{j=0}^J$ values of a standard normal associated with the cumulative frequencies of the J different categories of the dependent variable, with $\mu_0 = -\infty$, $\mu_J = \infty$. Then the expectation of a standard normally distributed variable is taken for an interval between any two adjacent values. Thus, if the true unobserved continuous variable for individual i at time t is JS_{it}^* , where the observed is $JS_{it} = j$ if $\mu_{j-1} < JS_{it}^* \leq \mu_j$, $j = 1, \dots, J$, then the conditional expectation of the latent variable is given by:

$$j\dot{S}_{it} = E(JS_{it}^* | \mu_{j-1} < JS_{it}^* < \mu_j) = \frac{n(\mu_{j-1}) - n(\mu_j)}{N(\mu_j) - N(\mu_{j-1})} \quad (2)$$

where n is the normal density and N is the cumulative normal distribution. $j\dot{S}_{it}$ is normalized so that it has a zero mean and a standard deviation of one. The approach allows the application of a linear estimator on the conditional expectations:

$$j\dot{S}_{it} = \alpha X_{it} + \beta O_{it-1} + v_i + \eta_{it} \quad (3)$$

where η_{it} an independent error term for individual i at time t and v_i is an individual effect that varies across individuals and is constant over time. We hypothesize that the effect that offshoring intensity has on JS depends on the type of task performed by the individual. Thus we define a dummy variable T_{it}^j that takes value 1 if the individual's task corresponds to category j , $j = 1, 2, 3, 4$, and include an interaction term between O and the corresponding task category. We leave $j=1$ (high skilled white collar worker) as the reference category and therefore do not include the interaction term in this case,

$$j\ddot{S}_{it} = \alpha X_{it} + \beta O_{it-1} + \gamma T_{it}^j \times O_{it-1} + v_i + \eta_{it} \quad (4)$$

A well-determined coefficient on the type of task-offshoring interaction term δ would imply that the effects of offshoring differ between individuals with permanent and fixed-term contracts.

As for our binary dependent variable, job insecurity (Jl), it may be modelled as a function of a latent variable Jl^* that is not measured, is continuous, has a threshold point that determines the observed value of Jl , and is a function of observable characteristics

$$Jl_{it}^* = \alpha X_{it} + \beta O_{it-1} + \gamma T_{it}^j \times O_{it-1} + v_i + \eta_{it} \quad (5)$$

with

$$\begin{aligned} Jl_{it} &= 1 \quad \text{if} \quad Jl_{it}^* > 0 \\ Jl_{it} &= 0 \quad \text{if} \quad Jl_{it}^* \leq 0 \end{aligned} \quad (6)$$

For simplicity, we will ignore the binary dependent nature of the dependent variable and replace Jl_{it}^* with Jl_{it} in Eq. (4). The advantage of using the linear estimator is that the coefficients can be directly interpreted as marginal effects and these are very similar to those obtained using non-linear methods. The results from a probit model are available from the authors upon request.

4. Results

4.1 Descriptive analysis

In Table 1, we report summary statistics. Average JS is 7.0 whereas 14.5% of the workers report to be insecure at their jobs. These figures indicate that, in general, individuals are fairly satisfied and feel secure about conserving their jobs. Average gross labour income amounts to €2,540.7 and 11.9% of the sample has a temporary contract. Foreign value added represents on average 14.4 % of gross exports with a sizable dispersion among industries, ranging from a minimum of 2.6 ("Real state,

property activities”) to a maximum of 46.0 (“Manufacturing of basic metals”). Women account for 46.8% of the sample. Average age and tenure amount to 42.2 and 11.5 years, respectively. On average, individuals in the sample work 39.4 hours per week, have completed 12.6 years of schooling, live in a household with 2.3 adults and 0.6 children. Most individuals in the sample are married (64.4%) and 10% report a bad health status.

4.2 Offshoring and job satisfaction

In Table 2, we report the estimates of the determinants of JS. All the effects reported in Table 2 are expressed as standard deviations of JS. Model 1a constitutes a parsimonious specification, controlling only for individual and year fixed effects. Before focusing on the effects of offshoring, we first describe the results for the remaining covariates. The results do not present surprises for the connoisseur of the literature. Job satisfaction depends positively on labour income and negatively on age, tenure and hours of work. Years of schooling are negatively related to JS, a result that can be explained by the negative effects that overeducation exerts upon satisfaction at the job, a phenomenon that is more prevalent among the educated. We do not detect significant differences due to contract duration. Moreover, singles and individuals living in households with more adults report lower JS, while having a bad health status emerges as a salient determinant of job dissatisfaction.

Turning to the crux of our analysis, we find that offshoring intensity is negatively related with JS. The coefficient is significant at the 5% level and suggests that a 0.01 increase in logarithmic offshoring intensity (an approximately 1% increase of the index) is associated with a loss of 0.00033 standard deviations of JS. The figure may seem negligible but it should not be so if we compare it with the relative effects of other covariates. Satisfaction equations can be used to assess the importance of a given dimension relative to other dimensions, and to construct equivalence scales between relevant variables (Ferrer-i-Carbonell, 2013). For instance, we may take labour income as a reference, since it is one of the most relevant determinants of JS. An 0.01 increase in logarithmic labour income (an approximately 1% increase in labour income) is associated with an increase of 0.00131 standard deviations of JS. Therefore, using the coefficient of labour income as a reference we can calculate the trade-off between labour income and offshoring that maintains JS constant. The reference individual would need a compensation of about 0.252% of her labour income to experience a 1% increase in offshoring intensity ($[\exp(0.033/0.131 \times 0.01) - 1] \times 100 = 0.252$). Similarly, other things equal, a 1% increase in offshoring intensity would be equivalent to an increase in hours worked of 1.80% ($[\exp(0.033/0.056 \times 0.01) - 1] \times 100 = 1.8$).

In Model 1b we include a full vector of industry dummies and industry-year fixed effects. In this case, the estimate of the offshoring fails to be statistically significant. This result suggests the existence of industry characteristics that may affect both offshoring and job satisfaction. There might be time-varying determinants of offshoring and job satisfaction operating at the sector level.

However, once we allow for interactions between offshoring and worker's category we obtain, again, significant effects of offshoring even after controlling for industry (Models 2a and 2b). The models unveil substantial heterogeneity surrounding the offshoring effect. Specifically, we find that the reference individual (a high skilled white-collar worker) is not affected by offshoring intensity. In contrast, workers in the remaining three categories are worse off if they work in industries with higher offshoring intensity. The estimates in Model 2b indicate that a 1% increase of offshoring intensity would need a compensation of 0.160%, 0.275% and 0.321% of labour income depending on whether the individual is a low skilled white collar, high skilled blue collar or low skilled blue collar worker, respectively. Overall, these results tend to show that the estimates obtained in Models 1a and 1b regarding the offshoring effect represent an average across workers from different categories. Once we allow for a differentiated effect, the model is indicative of sensitive differences across groups of workers. The fact that low skilled workers are more sensitive to variations in offshoring would be consistent with the notion that trade accelerates skill biased technological changes through a diffusion of technologies worldwide.

4.3 Offshoring and job insecurity

In Table 3, we focus on the determinants of JI. According to the results, JI depends crucially on contract duration, where workers with temporary contract being more than 12 percentage points more likely to feel insecure at their jobs. JI also depends positively on tenure and bad health. A perhaps surprising result is that workers with more education are more likely to report insecurity. However, we must recall that the results are controlling for individual fixed effects and, therefore, they are based on within individual variation of schooling, a variable that shows very little yearly variation among adult workers. Only 2.5% of the sample workers register an interannual variation in years of schooling, and most of them (43%) are aged below 35. It is likely that the positive effect of schooling on JI is driven by a small group of young workers with low professional experience and tenure who have recently accessed the labour market.

The offshoring coefficient is significant in Model 1a but non-significant in Model 1b. Again, this result is suggestive of industry-level conditioners of JI and offshoring that are not controlled for in the

regressions. For instance, macroeconomic shocks, which are expected to affect both offshoring intensity and employment conditions, may have a differential effect across industries. Similarly, there might be industries characteristics that are correlated with offshoring and variables that affect JI (turnover, dismissal rates, working conditions, etc.). In Models 2a and 2b, we allow for a differential effect of offshoring across categories of workers. The interaction terms fail to be statistically significant, thus suggesting that as far as JI is concerned, none of the categories of workers (high skilled white collar, low skilled white collar, high skilled blue collar and low skilled blue collar) is affected by offshoring intensity at the industry level.

Our results are in line with Görg and Görlich (2015) and Autor et al. (2013), who argue that firms are more likely to retain more productive workers. If low-skilled workers are considered less productive than high-skilled workers, then we should expect that the former are more exposed to economic shocks, including foreign competition, economic slowdown and technological progress (Lo Turco et al., 2013). Our results suggest that workers perceive these threats and estimate the risks of losing their jobs accordingly.

5. Discussion and sensitivity checks

The results show that the effects of offshoring on JS differ across workers from different categories. High skill white-collar workers are mostly unaffected by offshoring, while the remaining categories are significantly worse off, the higher the offshoring intensity in their industry is. On the opposite, JI is not affected by the offshoring intensity, a result that holds among all workers' categories.

In this section, we test the robustness of these results. To that purpose, we perform a set of sensitivity checks. First, we start by noting that the results presented so far include sectors that are intensive in natural resources. This is the case of agriculture, hunting, forestry, mining and extraction (NACE codes from 1 to 14). Although only 1.05% of the sample workers are employed in these sectors, it might be the case that the inclusion of these activities distorts to some extent the relation between offshoring, JS and JI. This is so because imports in sectors that are intensive in natural resources may not reflect the displacement or substitution of national production by international competitors, but mirrors the fact that the country does not possess the natural resources required in the production process. If this is the case, the offshoring index used in the regressions would not capture intentional import competition but a mere need of intermediate inputs. Then, these sectors intensive in natural resources are mainly traded on an inter-industry basis with no possibility of offshoring. In Tables 4, we re-estimate the Models 2a and 2b after dropping individuals employed in natural resources intensive

methods. For space reasons, we report only the income and offshoring coefficients. Again, we find that the offshoring effect on JS differs among workers with different categories, the more negative effect corresponding to low skilled blue-collar workers. We find that the estimates remain practically unaltered relative to the previous estimates. The same applies to the JI equations. Offshoring intensity affects positively the probability of feeling insecure at the job (Model 2a). However, this effect is mostly driven by non-observable conditioners at the industry level. Once we introduce controls for activity sector (Model 2b), the coefficient become non-significant.

Second, we inspect the relation between offshoring, workers' categories and temporary contracts. There are reasons to believe that workers with fixed-term contracts are affected differently by offshoring than workers with permanent contracts. Temporary workers are frequently used as a channel to buffer negative economic shocks. They are more prone to see their labour market position worsen following a shock, and they have a weaker bargaining position than permanent workers. Hence, they might face stronger JS and JI variations in case employers adjust to globalization pressure. To explore this issue, we expand our specification to allow for interactions between offshoring, temporary contracts and workers' categories. This specification allows us not only to test whether offshoring affects differently workers with a temporary contract, but also to examine to what extent the differences across workers' categories reported in the paper can be due to the unequal prevalence of temporary contracts among the different categories. Results displayed in Table 5 reject this hypothesis. We do not find significant differences among temporary and permanent workers regarding the offshoring effect. This result applies to the four categories of workers considered in the analysis, and for the two dependent variables considered in the regressions. The only significant effect corresponds to the differential effect of offshoring among low skill blue collar workers with a temporary contract when accounting for job insecurity. In this group the effects of offshoring are negative, although the coefficient is significant only at the 10% level.

Third, the large sets of controls and fixed effects included in Models 1b and 2b substantially mitigate concerns with omitted variables. Still, the results may be misleading if workers sort across industries based on their JS or JI and in anticipation changes in the offshoring intensity. If workers less satisfied with their jobs or more insecure at their jobs sort into less trade exposed industries, then the estimates reported so far would be downward biased; the opposite sorting pattern would instead induce an upward bias. To shed light on the patterns and implications of worker sorting, we examine industry switching in our data. In a given year, approximately 15% of workers change for a job in another industry, and only 50.7% of individuals remain always in the same industry. We start by studying

whether industry switching is correlated with changes in offshoring intensity. To this purpose, for each worker, we compute the year-to-year change in offshoring intensity (ΔO), based on her industries of employment at t and $t-1$. For industry stayers, ΔO only reflects variation in offshoring intensity within the same industry, whereas for industry switchers it captures the additional change due to the switch. Then, we regress ΔO on a dummy equals to 1 for workers who always remain in the same industry ('stayers'). The results are reported in the first column of Table 6. We find a small and not statistically significant coefficient, suggesting that a worker who switches industry does not experience a significantly different change in offshoring intensity compared to a worker who remains in the same industry. Next, we look for differential patterns of correlation between ΔO and the lag value of JS for stayers and switchers separately. The next columns of Table 6 show virtually no relation between the two variables, for any group of workers. In other words, industry switching is largely independent of the interplay between JS and changes in offshoring intensity. In the last two columns, we proceed likewise with JI. In this case, JI at time $t-1$ does not predict ΔO at time t among switchers. Therefore, we must reject the hypothesis that workers that are more insecure sort into industries with less offshoring intensity. Still, the coefficient among stayers is statistically significant, a result that suggests that reported JI may reflect anticipation effects related with future increasing offshoring.

6. Conclusions

This paper examines the link between offshoring, job satisfaction and job insecurity. The results are based on micro data from the 2000-2013 waves of the German Socioeconomic Panel (GSOEP) and information from the Trade in Value Added (TiVA) database from the OCDE. Merging the two datasets using industry as matching criterion allowed us to estimate a set of JS and JI equations where the offshoring intensity within the industry where the individual works was the crux of our analysis.

Offshoring was found to be negatively associated with JS. Specifically, a 1% increase in offshoring intensity is as harmful for JS as a 0.25% decrease in labour income. Moreover, this effect differed among categories of workers, with high skill white-collar workers being mostly unaffected by offshoring and low skill blue-collar workers exhibiting the largest negative effects. The results also indicate that offshoring intensity is not significantly associated with increased JI, a results that holds for all workers' categories. Our conjecture for this result is that offshoring may induce restructuring and changes at the job level that are quite demanding for workers and affect job satisfaction. However,

these changes may guarantee the future of the jobs in a convincing manner, maintaining the prospects of unemployment unaltered.

The paper's main findings were robust to several sensitivity checks. We found no significant differences among temporary and permanent workers regarding the offshoring effect, meaning that in our data the consequences of offshoring are not related with the personal risk of losing the job but with the overall perception of the internationalization of the sector and its consequences on unobserved job conditions. We also examined to what extent worker sort across industries based on their previous JS or JI and in anticipation of changes in the offshoring intensity. Workers' sorting could bias the estimates of offshoring downwards. Offshoring doesn't seem to affect worker sorting.

Previous research has found small but significant effects of trade exposure on unemployment transitions (Bachmann and Braun, 2011, Görg and Görlich, 2012, Görg and Görlich, 2015). The divergence with our results may be explained by the fact that we rely on the job insecurity perceived by workers, and not on objective labour market transitions. In fact, this divergence may be indicative of two things. Firstly, objective indicators may be poorly related to workers' perceptions, insofar as workers have first-hand information regarding their personal conditions, intentions and motivations. Individuals may not process objective transitions to unemployment as a realized risk if the individual has anticipated the event, or if it occurred due to decisions consciously taken by the individual. Secondly, despite having privileged information about their personal life and conditions, individuals may be unaware of the events at the firm, regional and country level that affect their true unemployment probability. Personal wellbeing is well-known as being more dependent on ex-ante individual perceptions than on ex-ante objective hazards. In terms of public support to free trade, or wage bargaining, what arguably matters most are subjective concerns about job security. This is a question for future research is to test for explanations that can reconcile the results under the objective and the subjective approach.

From a policy point of view, our findings support partially the notion that globalisation would be a source of important dissatisfaction and negative feelings at the workplace, at least for German workers. However, the fact that low skilled, and in particular blue-collar workers, are more affected by offshoring calls for a need of policies that facilitate the adaptation of this group. In this respect, the promotion of training policies oriented towards the acquisition of skills and credentials that are valuable at the international level could be of special importance.

Our research could be extended in several directions. A promising avenue would be to distinguish among destinations of offshoring. In a paper very related to ours, Geishecker et al (2012) find that offshoring to low-wage countries raises job loss fears whilst offshoring towards high-wage countries reduces job loss fears, the two effects being very similar in magnitude. Similarly, the nature of offshoring could be taken into account more precisely by differentiating between service and material offshoring, and between the service and manufacturing sectors. Our approximation of workers' categories could be also refined by detailing how the type of tasks affect JS and JI.

References

- Autor, D H, D Dorn, and G H Hanson (2013), The China Syndrome: Local Labor Market Effects of Import Competition in the United States, *American Economic Review* 103(6): 2121-2168.
- Bachmann, R. , Baumgarten, D. and Stiebale, J. (2014), Foreign direct investment, heterogeneous workers and employment security: Evidence from Germany. *Canadian Journal of Economics/Revue canadienne d'économie*, 47: 720-757. doi:10.1111/caje.12094
- Bachmann, R., & Braun, S. (2011), The impact of international outsourcing on labour market dynamics in Germany. *Scottish Journal of Political Economy*, 58(1), 1–28.
- Baumgarten, D. (2015), Offshoring, the Nature of Tasks, and Occupational Stability: Empirical Evidence for Germany. *World Econ*, 38: 479-508. doi:10.1111/twec.12155
- Baumgarten, D., Geishecker, I., Görg, H., 2013. Offshoring, tasks, and the skill-wage pattern. *European Economic Review*, 61, 132-152.
- Becker, S. O., Ekholm, K., Muendler, M., (2013), Offshoring and the onshore composition of tasks and skills. *Journal of International Economics*, 90, 91-106.
- Blinder, A.S. (2006), Offshoring: the Next Industrial Revolution?, *Foreign Affairs*, March-April 2006, 85(2), 113-128.
- Brändle, T., Koch (2015) Offshoreability and wages. Evidence from German task data, *Econ Polit Ind*, 42: 189. <https://doi.org/10.1007/s40812-014-0004-z>
- Burgard, Sarah A., Jennie Brand, and James S. House. (2009), Perceived Job Insecurity and Worker Health in the United States. *Social Science and Medicine*, 69,777-785.
- Casabianca, E.J., Lo Turco, A., Pigini, C. (2019), Import penetration and returns to tasks: recent evidence from the Peruvian labour market, *Empirical Economics*, 56: 551. <https://doi.org/10.1007/s00181-017-1412-5>.
- Consoli, D., Vona, F., Rentocchini, F., (2016) That was then, this is now: Skills and routinization in the 2000s, *Industrial and Corporate Change*, Volume 25, Issue 5, October 2016, Pages 847–866, <https://doi.org/10.1093/icc/dtw030>.
- Crinò, R. (2009), Offshoring, Multinationals and Labour Market: A Review of the Empirical Literature. *Journal of Economic Surveys*, 23: 197-249. doi:10.1111/j.1467-6419.2008.00561.x
- Crozet M. and Orefice G. (2017), Trade and Labor Market: What Do We Know?, CEPII Policy Brief 2017-15 , 2017 , CEPII.
- Daudin, G., Riffart, C., & Schweisguth, D. (2011), Who produces for whom in the world economy? *Canadian Journal of Economics/Revue canadienne d'économie*, 44(4), 1403–1437.
- Ebenstein, A., Harrison, A., McMillan, M., & Phillips, S. (2014), Estimating the impact of trade and offshoring on American workers using the current population survey. *Review of Economics and Statistics*, 96(4), 581–595.

- Ferrer-i-Carbonell, A. and P. Frijters, (2004), How Important is Methodology for the Estimates of the Determinants of Happiness?, *Economic Journal*, 114, 641–659.
- Ferrer-i-Carbonell, A. (2013), Happiness Economics, *SERIES*, 4, 335–60, 2013.
- Geishecker, I., Riedl, M. and Frijters, P. (2012), Offshoring and job loss fears: An econometric analysis of individual perceptions, *Labour Economics* 19, 738–747.
- Görg and Görlich (2015), Offshoring, wages and job security of temporary worker *Rev World Econ* (2015) 151:533–554
- Görg, H., Görlich, D. (2012), Trade and Labour Market Outcomes, in OECD (2012), Policy Priorities for International Trade and Jobs, Chapter 6, OECD May 23, 2012 OECD Publishing
- Grossman, Gene M., and Esteban Rossi-Hansberg (2006), Trading Tasks: A Simple Theory of Offshoring. National Bureau of Economic Research Working Paper 12721.
- Grossman, G.M., and E. Rossi-Hansberg (2008), Trading tasks: A simple theory of offshoring, *American Economic Review* 98(5), 1978–97.
- Hogrefe, J. and Yao, Y., (2016), Offshoring and labor income risk: an empirical investigation, *Empirical Economics*, 50, issue 3, p. 1045-1063,
- Huber, K., Winkler, E. (2019), All you need is love? Trade shocks, inequality, and risk sharing between partners, *European Economic Review*, Volume 111, 305-335.
- Hummels, David, Jakob R. Munch, and Chong Xiang (2018), Offshoring and Labor Markets. *Journal of Economic Literature*, 56 (3): 981-1028.
- Jahn, E. (2015), Don't worry, be flexible? – Job satisfaction among flexible workers. *Australian Journal of Labour Economics*, 18(2), 147.
- Johnson, R. C., & Noguera, G. (2012). Accounting for intermediates: Production sharing and trade in value added. *Journal of International Economics*, 86(2), 224–236.
- Khun, C., Lahiri, S., & Lim, S. (2015). Do people really support trade restrictions? Cross-country evidence. *The Journal of International Trade & Economic Development*, 24(1), 132-146.
- Koopman, R., Wang, Z., & Wei, S.-J. (2014). Tracing value-added and double counting in gross exports. *American Economic Review*, 104(2), 459–494.
- László, K., Pikhart, H., Kopp, M., Bobak, M., Pajak, A., Malyutina, S., Salavec, G., and Marmot, M. (2010). Job insecurity and health: A study of 16 European countries. *Social Science and Medicine*, 70, 867-874.
- Liu, R., Trefler, D. (2019), A sorted tale of globalization: White collar jobs and the rise of service offshoring, *Journal of International Economics*, 118, 105-122, <https://doi.org/10.1016/j.jinteco.2018.11.004>.
- Lo Turco, A., Maggioni, D., Picchio, M. (2013) Offshoring and job stability: Evidence from Italian manufacturing, *Structural Change and Economic Dynamics*, 26, 27-46, <https://doi.org/10.1016/j.strueco.2013.04.001>.
- Lurweg, Maren, (2010), Perceived job insecurity, unemployment risk and international trade: A micro-level analysis of employees in German service industries, No 32, CAWM Discussion Papers, University of Münster, Center of Applied Economic Research Münster (CAWM),
- OECD (2018) The changing nature of international production: Insights from Trade in Value Added and related indicators, <http://www.oecd.org/industry/ind/tiva-2018-flyer.pdf>
- Oswald, A.J. E. Proto, and D. Sgroi, "Happiness and Productivity," *Journal of Labor Economics* 33, no. 4 (October 2015): 789-822. <https://doi.org/10.1086/681096>
- Ottaviano, Gianmarco I. P., Giovanni Peri, and Greg C. Wright. 2013. "Immigration, Offshoring, and American Jobs." *American Economic Review*, 103 (5): 1925-59.
- Parteka, A. (2018) Import intensity of production, tasks and wages: Micro-level evidence for Poland, *Entrepreneurial Business and Economics Review*, 2, 71-89.

- Parteka, A., Wolszczak-Derlacz, J. (2019) Global Value Chains and Wages: Multi-Country Evidence from Linked Worker-Industry Data, *Open Economies Review*, (2019) 30: 505. <https://doi.org/10.1007/s11079-018-9518-8>.
- Pfaffermayr, M., Egger, P., & Weber, A. (2007). Sectoral adjustment of employment to shifts in outsourcing and trade: Evidence from a dynamic fixed effects multinomial logit model. *Journal of Applied Econometrics*, 22(3), 559–580.
- Rohde, N., Tang, K.K., Osberg, L., and Rao, P. (2017). Is it vulnerability or economic insecurity that matters for health?. *Journal of Economic Behavior and Organization*, 134(C), 307-319.
- Stolper, W. F., & Samuelson, P. A. (1941). Protection and real wages. *The Review of Economic Studies*, 9(1), 58-73.
- Timmer, M. (2012). The world input-output database (WIOD): Contents, sources and methods (WIOD Working Paper 10).
- Van Praag, B.M.S. and Ferrer-i-Carbonell, A. (2008). *Happiness Quantified: A Satisfaction Calculus Approach*. Oxford University Press, Revised edition.
- Wagner, G.G., J.R. Frick, and J. Schupp (2007). The German Socio-Economic Panel Study (SOEP) - Scope, Evolution and Enhancements. *Schmollers Jahrbuch* 127, 139-169.
- Wright Greg C. (2014), Revisiting the employment impact of offshoring, *European Economic Review*, 66, 63-83.

Appendix

Table A1. Correspondence between NACE and TiVA industries.

| tiva | label_tiva | nace | label_nace |
|--------|--|------|--|
| D01T03 | Agriculture, forestry and fishing | 1 | Agriculture, hunting and related service activities |
| D01T03 | Agriculture, forestry and fishing | 2 | Forestry, logging and related service activities |
| D01T03 | Agriculture, forestry and fishing | 5 | Fishing, operation of fish hatcheries and fish farms |
| D05T06 | Mining and extraction of energy producing products | 10 | Mining of coal and lignite |
| D05T06 | Mining and extraction of energy producing products | 11 | Extraction of crude petroleum and natural gas |
| D09 | Mining support service activities | 12 | Mining of uranium and thorium ores |
| D07T08 | Mining and quarrying of non-energy producing products | 13 | Mining of metal ores |
| D07T08 | Mining and quarrying of non-energy producing products | 14 | Other mining and quarrying |
| D10T12 | Food products, beverages and tobacco | 15 | Manufacture of food products and beverages |
| D10T12 | Food products, beverages and tobacco | 16 | Manufacture of tobacco products |
| D13T15 | Textiles, wearing apparel, leather and related products | 17 | Manufacture of textiles |
| D13T15 | Textiles, wearing apparel, leather and related products | 18 | Manufacture of wearing apparel |
| D13T15 | Textiles, wearing apparel, leather and related products | 19 | Tanning and dressing of leather |
| D16 | Wood and products of wood and cork | 20 | Manufacture of wood and of products of wood and cork, except furniture |
| D17T18 | Paper products and printing | 21 | Manufacture of pulp, paper and paper products |
| D17T18 | Paper products and printing | 22 | Publishing, printing and reproduction of recorded media |
| D19 | Coke and refined petroleum products | 23 | Manufacture of coke, refined petroleum products and nuclear fuel |
| D20T21 | Chemicals and pharmaceutical products | 24 | Manufacture of chemicals and chemical products |
| D22 | Rubber and plastic products | 25 | Manufacture of rubber and plastic products |
| D23 | Other non-metallic mineral products | 26 | Manufacture of other non-metallic mineral products |
| D24 | Basic metals | 27 | Manufacture of basic metals |
| D25 | Fabricated metal products | 28 | Manufacture of fabricated metal products, except machinery and equipment |
| D28 | Machinery and equipment, nec | 29 | Manufacture of machinery and equipment n.e.c. |
| D26 | Computer, electronic and optical products | 30 | Manufacture of office machinery and computers |
| D27 | Electrical equipment | 31 | Manufacture of electrical machinery and apparatus n.e.c. |
| D26 | Computer, electronic and optical products | 32 | Manufacture of radio, television and communication equipment and apparatus |
| D26 | Computer, electronic and optical products | 33 | Manufacture of medical, precision and optical instruments, watches and clocks |
| D29 | Motor vehicles, trailers and semi-trailers | 34 | Manufacture of motor vehicles, trailers and semi-trailers |
| D30 | Other transport equipment | 35 | Manufacture of other transport equipment |
| D31T33 | Other manufacturing; repair and installation of machinery and equipment | 36 | Manufacture of furniture |
| D31T33 | | 37 | Recycling |
| D35T39 | Electricity, gas, water supply, sewerage, waste and remediation services | 40 | Electricity, gas, steam and hot water supply |
| D35T39 | Electricity, gas, water supply, sewerage, waste and remediation services | 41 | Collection, purification and distribution of water |
| D41T43 | Construction | 45 | Construction |
| D45T47 | Wholesale and retail trade; repair of motor vehicles | 50 | Sale, maintenance and repair of motor vehicles and motorcycles |
| D45T47 | Wholesale and retail trade; repair of motor vehicles | 51 | Wholesale trade and commission trade, except of motor vehicles and motorcycles |
| D45T47 | Wholesale and retail trade; repair of motor vehicles | 52 | Retail trade, except of motor vehicles and motorcycles |
| D55T56 | Accommodation and food services | 55 | Hotels and restaurants |
| D49T53 | Transportation and storage | 60 | Land transport |

| | | | |
|--------------|--|----|---|
| D49T53 | Transportation and storage | 61 | Water transport |
| D49T53 | Transportation and storage | 62 | Air transport |
| D49T53D69T82 | Transportation and storage | 63 | Supporting and auxiliary transport activities |
| D61 | Telecommunications | 64 | Post and telecommunications |
| D64T66 | Financial and insurance activities | 65 | Financial intermediation, except insurance and pension funding |
| D64T66 | Financial and insurance activities | 66 | Insurance and pension funding, except compulsory social security |
| D64T66 | Financial and insurance activities | 67 | Activities auxiliary to financial intermediation |
| D68 | Real estate activities | 70 | Real estate activities |
| D69T82 | Other business sector services | 71 | Renting of machinery and equipment without operator and of personal and household goods |
| D62T63 | IT and other information services | 72 | Computer and related activities |
| D69T82 | Other business sector services | 73 | Research and development |
| D69T82 | Other business sector services | 74 | Other business activities |
| D84 | Public admin. and defence; compulsory social security | 75 | Public administration and defence |
| D85 | Education | 80 | Education |
| D86T88 | Human health and social work | 85 | Health and social work |
| D35T39 | Electricity, gas, water supply, sewerage, waste and remediation services | 90 | Sewage and refuse disposal, sanitation and similar activities |
| D90T96 | Arts, entertainment, recreation and other service activities | 91 | Activities of membership organizations n.e.c. |
| D58T60D90T96 | Publishing, audiovisual and broadcasting activities | 92 | Recreational, cultural and sporting activities |
| D90T96 | Arts, entertainment, recreation and other service activities | 93 | Other service activities |
| D97T98 | Private households with employed persons | 95 | Private households with employed persons |

Tables

Table 1. Summary statistics

| | Average | std | Min | Max |
|---------------------------|----------|----------|-----|-------|
| Job satisfaction | 7.012 | 1.990 | 0 | 10 |
| Job insecurity | 0.145 | 0.352 | 0 | 1 |
| Income | 2540.730 | 1810.264 | 0 | 40000 |
| Offshoring | 14.374 | 7.897 | 2.6 | 46.03 |
| High skilled white collar | 0.484 | 0.500 | 0 | 1 |
| Low skilled white collar | 0.227 | 0.419 | 0 | 1 |
| High skilled blue collar | 0.153 | 0.360 | 0 | 1 |
| Low skilled blue collar | 0.136 | 0.343 | 0 | 1 |
| Temporary contract | 0.119 | 0.323 | 0 | 1 |
| Woman | 0.468 | 0.499 | 0 | 1 |
| Age | 42.154 | 11.183 | 18 | 65 |
| Tenure | 11.515 | 10.129 | 0 | 52 |
| Working hours | 39.410 | 10.910 | 10 | 99 |
| Years of schooling | 12.343 | 2.579 | 7 | 18 |
| Numer of adults | 2.261 | 0.866 | 1 | 10 |
| Number of children | 0.625 | 0.914 | 0 | 9 |
| Married | 0.644 | 0.479 | 0 | 1 |
| Single | 0.260 | 0.438 | 0 | 1 |
| Divorced | 0.083 | 0.276 | 0 | 1 |
| Widowed | 0.014 | 0.115 | 0 | 1 |
| Badhealth | 0.102 | 0.303 | 0 | 1 |

Note to Table 1: Source: German SOEP 2000-2013 waves

Table 2. Job Satisfaction and offshoring

| | Model 1a | | Model 1b | | Model 2a | | Model 2b | |
|---------------------------------------|-------------|--------|-------------|--------|-------------|--------|-------------|--------|
| | coefficient | t | coefficient | t | coefficient | t | coefficient | t |
| Ln(Income) | 0.131 *** | 9.72 | 0.133 *** | 9.82 | 0.129 *** | 9.58 | 0.131 *** | 9.68 |
| Offshoring | -0.033 ** | -2.38 | -0.036 ** | -1.22 | -0.011 | -0.77 | -0.018 | -0.61 |
| Offshoring × low skilled white collar | | | | | -0.024 *** | -3.56 | -0.021 *** | -3.19 |
| Offshoring × high skilled blue collar | | | | | -0.032 *** | -3.75 | -0.036 *** | -4.13 |
| Offshoring × low skilled blue collar | | | | | -0.040 *** | -4.57 | -0.042 *** | -4.79 |
| Temporary | 0.001 | 0.05 | -0.006 | -0.38 | 0.001 | 0.04 | -0.006 | -0.39 |
| Ln(age) | -5.474 *** | -2.98 | -5.531 *** | -3.01 | -5.315 *** | -2.89 | -5.383 *** | -2.93 |
| Ln(age) ² | 0.977 *** | 2.78 | 0.985 *** | 2.82 | 0.946 *** | 2.69 | 0.955 *** | 2.72 |
| Ln(tenure) | -0.157 *** | -24.91 | -0.155 *** | -24.59 | -0.157 *** | -24.92 | -0.155 *** | -24.59 |
| Ln(working hours) | -0.056 *** | -2.62 | -0.056 *** | -2.63 | -0.057 *** | -2.69 | -0.057 *** | -2.71 |
| Ln(years of schooling) | -0.626 *** | -4.41 | -0.658 *** | -4.62 | -0.653 *** | -4.58 | -0.685 *** | -4.81 |
| Ln(adults) | 0.003 * | 0.12 | 0.003 | 0.12 | 0.003 | 0.14 | 0.003 | 0.14 |
| Ln(children) | 0.032 | 2.32 | 0.032 ** | 2.31 | 0.031 ** | 2.25 | 0.031 ** | 2.23 |
| Single | -0.044 ** | -2.01 | -0.044 ** | -2.01 | -0.044 ** | -1.98 | -0.044 ** | -1.97 |
| Divorced | -0.072 *** | -3.02 | -0.071 *** | -2.98 | -0.071 *** | -3.01 | -0.070 *** | -2.97 |
| Widowed | -0.017 | -0.27 | -0.021 | -0.33 | -0.015 | -0.23 | -0.018 | -0.31 |
| Bad health | -0.298 *** | -22.25 | -0.298 *** | -22.24 | -0.298 *** | -22.23 | -0.297 *** | -22.21 |
| Fixed effect industry | no | | yes | | no | | yes | |
| Fixed effect year | yes | | yes | | yes | | yes | |
| Fixed effect state | yes | | yes | | yes | | yes | |
| R ² - within | 0.040 | | 0.041 | | 0.041 | | 0.042 | |
| No. of obs | 69,733 | | 69,733 | | 69,733 | | 69,733 | |

Notes to Table 2: i) Source: German SOEP 2000-2013 waves; ii) *** denotes significant at the 1% level, ** denotes significant at the 5% level; * denotes significant at the 10% level; iii) The reference individual has a permanent contract, is married, is a high skill white collar worker, has a good health status, average income, age, tenure, hours of work, years of schooling, number of adults and children at home and is exposed to average offshoring levels.

Table 3. Job insecurity and offshoring

| | Model 1a | | Model 1b | | Model 2a | | Model 2b | |
|---------------------------------------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|
| | coefficient | t | coefficient | t | coefficient | t | coefficient | t |
| Ln(Income) | 0.005 | 0.00 | 0.004 | 0.86 | 0.005 | 0.95 | 0.004 | 0.84 |
| Offshoring | 0.015 *** | 2.79 | -0.002 | -0.19 | 0.014 *** | 2.65 | -0.002 | -0.16 |
| Offshoring × low skilled white collar | | | | | -0.001 | -0.56 | -0.002 | -0.61 |
| Offshoring × high skilled blue collar | | | | | 0.001 | 0.26 | 0.001 | 0.31 |
| Offshoring × low skilled blue collar | | | | | 0.000 | 0.08 | 0.000 | 0.01 |
| Temporary | 0.122 *** | 21.02 | 0.123 ** | 21.06 | 0.122 *** | 21.01 | 0.123 *** | 21.05 |
| Ln(age) | 0.364 | 0.53 | 0.346 | 0.51 | 0.371 | 0.54 | 0.355 | 0.52 |
| Ln(age) ² | -0.058 | -0.44 | -0.055 | -0.42 | -0.059 | -0.45 | -0.056 | -0.43 |
| Ln(tenure) | 0.017 *** | 7.31 | 0.017 ** | 7.31 | 0.017 *** | 7.28 | 0.017 *** | 7.28 |
| Ln(working hours) | 0.005 | 0.67 | 0.006 | 0.75 | 0.005 | 0.66 | 0.006 | 0.73 |
| Ln(years of schooling) | 0.222 *** | 4.11 | 0.225 ** | 4.16 | 0.221 *** | 4.11 | 0.224 *** | 4.15 |
| Ln(adults) | 0.015 * | 1.74 | 0.015 * | 1.76 | 0.015 * | 1.74 | 0.015 * | 1.76 |
| Ln(children) | -0.009 * | -1.72 | -0.009 * | -1.67 | -0.009 * | -1.72 | -0.009 * | -1.67 |
| Single | -0.008 | -0.92 | -0.008 | -0.96 | -0.008 | -0.92 | -0.008 | -0.96 |
| Divorced | 0.006 | 0.65 | 0.005 | 0.61 | 0.006 | 0.65 | 0.005 | 0.61 |
| Widowed | -0.039 * | -1.66 | -0.039 * | -1.65 | -0.039 * | -1.67 | -0.039 * | -1.66 |
| Bad health | 0.028 *** | 5.51 | 0.028 ** | 5.51 | 0.028 *** | 5.51 | 0.028 *** | 5.51 |
| Fixed effect industry | no | | yes | | no | | yes | |
| Fixed effect year | yes | | yes | | yes | | yes | |
| Fixed effect state | yes | | yes | | yes | | yes | |
| R ² - within | 0.025 | | 0.026 | | 0.025 | | 0.026 | |
| No. of obs | 69,733 | | 69,733 | | 69,733 | | 69,733 | |

Notes to Table 3: i) Source: German SOEP 2000-2013 waves; ii) *** denotes significant at the 1% level, ** denotes significant at the 5% level; * denotes significant at the 10% level; iii) The reference individual has a permanent contract, is married, is a high skill white collar worker, has a good health status, average income, age, tenure, hours of work, years of schooling, number of adults and children at home and is exposed to average offshoring levels.

Table 4. Job satisfaction, job insecurity and offshoring – Excluding NACE 1-14 industries

| | Job satisfaction | | | | Job insecurity | | | |
|---------------------------------------|------------------|-------|-------------|-------|----------------|-------|-------------|-------|
| | Model 2a | | Model 2b | | Model 2a | | Model 2b | |
| | coefficient | t | coefficient | t | coefficient | t | coefficient | t |
| Ln(Income) | 0.127 *** | 9.36 | 0.127 *** | 9.35 | 0.004 | 0.77 | 0.004 | 0.72 |
| Offshoring | -0.021 | -1.43 | -0.030 | -1.00 | 0.017 *** | 3.00 | 0.000 | 0.02 |
| Offshoring × low skilled white collar | -0.025 *** | -3.67 | -0.023 *** | -3.36 | -0.001 | -0.59 | -0.001 | -0.59 |
| Offshoring × high skilled blue collar | -0.028 *** | -3.22 | -0.031 *** | -3.50 | 0.001 | 0.44 | 0.001 | 0.41 |
| Offshoring × low skilled blue collar | -0.038 *** | -4.36 | -0.041 *** | -4.59 | 0.000 | 0.05 | 0.000 | 0.00 |
| Fixed effect industry | no | | yes | | no | | yes | |
| Fixed effect year | yes | | yes | | yes | | yes | |
| Fixed effect state | yes | | yes | | yes | | yes | |
| R ² - within | 0.041 | | 0.042 | | 0.025 | | 0.026 | |
| No. of obs | 69,011 | | 69,011 | | 69,011 | | 69,011 | |

Notes to Table 4: i) Source: German SOEP 2000-2013 waves; ii) *** denotes significant at the 1% level, ** denotes significant at the 5% level; * denotes significant at the 10% level; iii) The results are controlling for contract duration, age, tenure, working hours, schooling, number of adults and children, marital and health status; iv) The reference individual has a permanent contract, is married, is a high skill white collar worker, has a good health status, average income, age, tenure, hours of work, years of schooling, number of adults and children at home and is exposed to average offshoring levels.

Table 5. Job satisfaction, job insecurity, offshoring and temporary contracts

| | Job satisfaction | | | | Job insecurity | | | |
|---|------------------|-------|-------------|-------|----------------|-------|-------------|-------|
| | Model 2a | | Model 2b | | Model 2a | | Model 2b | |
| | coefficient | t | coefficient | t | coefficient | t | coefficient | t |
| Ln(Income) | 0.128 *** | 9.46 | 0.129 *** | 9.52 | 0.005 | 1.02 | 0.005 | 0.92 |
| Temporary | -0.059 | -1.02 | -0.098 * | -1.69 | 0.142 *** | 6.58 | 0.144 *** | 6.65 |
| Offshoring | -0.016 | -1.03 | -0.027 * | -1.69 | 0.016 *** | 2.80 | 0.000 | 0.00 |
| Offshoring × low skilled white collar | -0.025 *** | -3.56 | -0.022 *** | -3.23 | -0.001 | -0.47 | -0.001 | -0.51 |
| Offshoring × high skilled blue collar | 0.030 *** | 3.34 | -0.033 *** | -3.67 | 0.001 | 0.38 | 0.001 | 0.40 |
| Offshoring × low skilled blue collar | -0.041 *** | -4.47 | -0.042 *** | -4.66 | 0.002 | 0.51 | 0.002 | 0.46 |
| Offshoring × Temporary × high skill white | 0.028 | 1.03 | 0.044 | 1.11 | -0.007 | -0.63 | -0.007 | -0.71 |
| Offshoring × Temporary × low skill white | 0.032 | 1.16 | 0.048 | 1.22 | -0.008 | -0.76 | -0.009 | -0.86 |
| Offshoring × Temporary × high skill blue | 0.008 | 0.33 | 0.018 | 0.38 | -0.009 | -1.01 | -0.009 | -1.03 |
| Offshoring × Temporary × low skill blue | 0.028 | 1.15 | 0.041 | 1.25 | -0.016 * | -1.71 | -0.017 * | -1.81 |
| Fixed effect industry | no | | yes | | no | | yes | |
| Fixed effect year | yes | | yes | | yes | | yes | |
| Fixed effect state | yes | | yes | | yes | | yes | |
| R ² - within | 0.041 | | 0.042 | | 0.026 | | 0.026 | |
| No. of obs | 69,733 | | 69,733 | | 69,733 | | 69,733 | |

Notes to Table 5: i) Source: German SOEP 2000-2013 waves; ii) *** denotes significant at the 1% level, ** denotes significant at the 5% level; * denotes significant at the 10% level; iii) The results are controlling for contract duration, age, tenure, working hours, schooling, number of adults and children, marital and health status; iv) The reference individual has a permanent contract, is married, is a high skill white collar worker, has a good health status, average income, age, tenure, hours of work, years of schooling, number of adults and children at home and is exposed to average offshoring levels.

Table 6. Cross-industry sorting, offshoring, job satisfaction and job insecurity

| | All sample | | Stayers | | Switchers | | Stayers | | Switchers | |
|-------------------|-------------|------|-------------|--------|-------------|-------|-------------|-------|-------------|--------|
| | coefficient | t | coefficient | t | coefficient | t | coefficient | t | coefficient | t |
| Stayer | 0.005 | 1.37 | | | | | | | | |
| JS _{t-1} | | | -0.002 | -1.000 | 0.000 | 0.100 | | | | |
| Jl _{t-1} | | | | | | | 0.013 ** | 2.070 | -0.002 | -0.310 |
| R ² | 0.025 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| No. of obs | 30,939 | | 13,601 | | 17,079 | | 13,601 | | 17,079 | |

Notes to Table 6: i) Source: German SOEP 2000-2013 waves; ii) ** denotes significant at the 5% level.

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