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Trade Liberalization, Collective Bargaining and Workers: Wages and Working Conditions

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Highlights

- Using large scale data on workers, we analyse the impact of trade liberalization and of the erosion of collective bargaining on workers' wage, employment and working condition.

- We use the accession of Eastern Europe countries in 2004 and 2007 to assess the impact of the adoption of Western European MFN tariff schemes and of preferential trade agreements on workers' wage, employment and working condition.

- We show that import tariffs liberalization reduces workers' wages. The deterioration of working conditions is mostly driven by increased labor demand due to the improvement of Eastern countries' international market access. The erosion of collective bargaining worsens wages and working conditions.

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▌ Abstract

Using large scale data on Eastern European workers, we show significant and sizable deteriorations of their wages and working conditions in regions that faced large tariff liberalization and strong erosion of collective bargaining over the process of accession to the European Union. Import tariffs liberalization reduces workers' wages. The deterioration of working conditions is mostly driven by increased labor demand due to the improvement of Eastern countries' international market access. The erosion of collective bargaining worsens wages and working conditions.

▌ Keywords

Trade Liberalization, Working Conditions, Wages, Labor Market Institutions, Eastern Europe, E.U. Enlargement.

▌ JEL

F15, F16, J30, J51, J81.

Trade Liberalization, Collective Bargaining and Workers: Wages and Working Conditions[1]

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1. Introduction

There is a popular belief that globalization has driven greater inequalities making the majority of workers worse off. The extent of this feeling and how it affects the political debate differ significantly across and within countries.[2] Whereas in some countries, popular concern over the effects of trade liberalization is widespread and has been met with marked protectionist responses by governments, opposition to trade liberalization has been much less intense elsewhere (Colantone et al. 2021, Colantone & Stanig 2018, Dippel et al. 2021).[3] These differences across and within countries point to the importance of assessing how trade liberalization affects workers' wages and working conditions across different locations.

[2]The global attitudes survey conducted by the PEW Research Center in 2018 reveals a negative attitude toward trade liberalization across European Union countries (https://ropercenter.cornell.edu/CFIDE/pewglobal/question_view.cfm?qid=1890&cntIDs=&stdIDs=).

[3]Colantone & Stanig (2018) and Dippel et al. (2021) show that high exposure to trade causes an increase in support for nationalist, far right and isolationist parties. Colantone et al. (2021) propose a thorough survey of the literature on the globalization backlash.

In this paper, we take a fresh look at the labor market repercussions of trade liberalization. In addition to wages, we focus in particular on the impact of trade liberalization on working conditions, an important aspect of worker welfare that has been largely overlooked in the empirical literature. We adopt a broad definition of working conditions as the probability of working "non-standard" working hours, including shifts, weekends and night work. According to the OECD Job Quality Index (Cazes et al. 2015), atypical working time is a key aspect of the *"quality of the working environment"*.[4]

We use the European Union (EU) enlargement to Eastern European countries (ECCs) to examine the effects of tariff liberalization on working condition and wage of individual Eastern European workers.[5] The enlargements took place in the context of structural adjustment programs in EECs which made substantial changes to their labor market institutions. In particular, the erosion of collective bargaining observed in many countries worldwide, has been found to be particularly marked in Eastern Europe (Cazes et al. 2019), where the collapse of the old regimes abruptly reduced the share of workers covered by collective bargaining agreements. This has influenced workers' labor market outcomes We show that the erosion of collective bargaining is also intrinsically linked to trade liberalization. Omitting this erosion could have the effect of placing more weight on the impact of trade liberalization on workers' wages and working conditions. We find a deterioration in wages and working conditions among Eastern European workers due to the trade liberalization induced by EU-enlargement and by the erosion of collective bargaining.

We investigate two important aspects of trade liberalization. First, the accession of Eastern European countries led to the adoption of the European Union's pre-existing preferential trade agreements (PTAs). New PTAs may have increased competition, but they might also have eased Eastern

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[4]See also https://www.oecd.org/statistics/job-quality.htm

[5]Accession of Eastern European members concerned the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia in 2004, and Bulgaria and Romania in 2007.

European firms' access to new partners' markets, thereby increasing demand for labor. We use the change in the scope of the Eastern European countries' trade agreements implied by the integration of the pre-existing (exogenous) set of EU preferential trade agreements.[6] Second, the EECs' accessions provide a nice setting to analyze the effects on workers of the adoption of Western European MFN tariff schemes by acceding EECs. MFN tariff adoption by EECs was rapid and comprehensive, and the tariff scheme already implemented and designed by Western European countries.[7] Hence, the changes in EEC levels of protection were neither guided by domestic economic and political factors (such as the strength of domestic interest groups) nor related to individual worker's labor market conditions. EEC accession to the European Union brought a large and exogenous reduction in their applied MFN tariffs *vis-à-vis* the rest of the world. This increased the level of competition from non-EU trade partners. We use the variation in Eastern European *MFN* tariff rates due to the EECs' accession to the European Union.[8] We do not use the change in the effectively applied import tariffs for EECs because the EU *preferential* import tariff in the pre-enlargement period might (somehow) have incorporated the future accession of EECs (and thereby been endogenous). Workers' wages and working conditions might have been impacted differently by increased competition from adopting EU MFN tariff schemes and increased market access to destinations where the EU had preferential trade agreements. We therefore analyze both the effects of export and import tariff liberalization on the wages and working conditions of Eastern European workers.

Our empirical analysis draws on a very large cross-section of some 2.8 million Eastern European workers across nine acceding countries and their 20 regions in 2014. The dataset also provides

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[6] The preferential tariff set for PTAs partners to EU countries in the pre-enlargement period is unlikely to be influenced by EEC characteristics.

[7] All Eastern European countries had preferential trade agreements with the EU-15 before the enlargement (see, for example, the 1993 Slovakia EU Agreement, or the 1991 Poland Interim Agreement signed in 1991). However, such pre-accession PTAs only covered part of all traded products and did not affect the external tariff scheme of Eastern European countries *vis-à-vis* the rest of the world (i.e. non-EU countries).

[8] Note that, before EU enlargement, Eastern European countries did not have preferential trade agreements with the rest of the world, and the change to the external MFN tariff scheme after their accession to the EU was a significant trade liberalization event. See Section 2 for further details.

precise details about workers' hourly wages and paid overtime hours (including overtime worked during otherwise standard working hours). It has also information on other individual attributes such as education, age, occupation, gender, type of contract and region of employment. In addition, we observe some characteristics relating to the employers (i.e. firms) such as size, activity sector, and whether they are private or state-owned corporations. We supplement the data by collecting information on collective bargaining coverage rates at the level of each region and sector. This is an important contribution to previous literature, which often uses country-level labor market institution data when collective bargaining actually takes place at regional (or even firm) level.

The construction of the trade liberalization indexes draws on the work of Topalova (2010) and Kovak (2013). We construct a region-specific measure of tariff liberalization by computing the weighted average of industry-region level tariff changes between 1997, the earliest available data in the WTO tariff datasets, and 2008 – to include the period of transition to full implementation (see European Union 2003 for a description of tariff phase-in arrangements). We interact a time-invariant vector of employment shares (identifying the industrial structure of each region) with a time-varying tariff vector (identifying the magnitude of trade liberalization). Our paper complements nicely the literature on the effects of trade liberalization on workers' outcomes by considering the impacts of both export and import tariff liberalization. Our analysis has implications for understanding the long-run effects of tariff liberalization because we are focusing on workers' labor market conditions in 2014. As shown by Dix-Carneiro (2014), there is a large labor market response following trade liberalization but the transition may take several years. Our empirical strategy exploits the fact that regional labor markets with different industry mixes are affected differently by the country-wide tariff liberalization induced by the 2004 and 2007 EU enlargements.

We find that workers employed on local labor markets where import tariffs have dropped sharply earn lower hourly wages than observationally equivalent workers on less affected local labor markets.

In particular, in regions with one standard deviation more import tariff liberalization, workers' hourly wages are 10% lower. The negative import competition effect on workers' welfare is exacerbated by the deterioration in working conditions on local labor markets that posted a greater increase in their foreign market access. In regions with one standard deviation more market access, workers have a 2.5-percentage-point greater probability of poor working conditions. The structural change in labor market institutions seen by EECs over the enlargement period, and in particular the reduction in the share of workers covered by collective bargaining (de-unionization) also had a significant negative effect on wages and working conditions.

This paper ties in with the broad literature exploring the impact of globalization on wages and employment. Over the 1990s, many empirical studies found trade liberalization had a mild effect on wages and employment, alleviating widespread concern that globalization might have a negative impact on labor market outcomes (see Richardson 1995 for a survey). However, recent empirical evidence – conducted mainly at the local labor market level – has changed the shape of this debate with strong evidence of a negative impact of trade liberalization episodes on employment in both developed countries (Autor et al. 2013, Dauth et al. 2014) and developing countries (Topalova 2007, Dix-Carneiro & Kovak 2017, 2019).[9] Our findings contribute to a more accurate picture of the impact of trade liberalization on individual welfare which includes working conditions over and above wage and employment effects. Moreover, whereas existing studies examine these effects using individual-level data from a single country, we use large-scale data across several countries to examine the effects of trade liberalization on individuals' wages and working conditions. This is the third important contribution of the present paper.

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[9]Topalova (2007) and Dix-Carneiro & Kovak (2017) find a significant negative impact of trade liberalization episodes on employment in India and Brazil respectively. Autor et al. (2013) specifically test the effect of Chinese import penetration on manufacturing employment across local US labor markets. Comparing two commuting zones over the 2000-2007 period, one at the 25th percentile and one at the 75th percentile of exposure to Chinese import growth, Autor et al. (2013) find that the more exposed commuting zone experiences a differential 4.5 percent drop in the number of manufacturing employees.

By providing a direct link between trade liberalization and the erosion of collective bargaining on the worsening of individuals' working conditions, our paper also contributes to the emerging literature investigating the health effects of trade liberalization and trade union deterioration (Fan et al. 2020, Colantone et al. 2019). Focusing on variations in input tariff shocks across Chinese prefectures, Fan et al. (2020) find that input tariff reductions following China's WTO accession adversely affected worker health due to increased working hours. We show that it is rather the increase in EEC foreign market access (i.e. demand shock) that increased the likelihood of working overtime and atypical hours.[10] This may have negative impacts on workers' health. Research by the American Public Health Association has highlighted links between unions, working conditions, and public health (Hagedorn et al. 2016, Malinowski et al. 2015).[11]

The rest of this paper is organized as follows. Section 2 describes the history and institutional environment of EU enlargements in 2004 and 2007. Section 3 presents the main data sources used in the empirical section and some descriptive statistics that drove our research. Section 4 describes the econometric strategy and section 5 discusses the results. Section 6 concludes.

2. Liberalization in Eastern European Countries

2.1. European enlargement and tariff liberalization

Enlargement to the Eastern European countries represented the largest expansion by the European Economic Community (EEC) in terms of countries and numbers of workers. The process of in-

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[10]Colantone et al. (2019) find robust evidence of a negative impact of import competition on many indicators of individual mental distress – such as anxiety and depression, social dysfunction and loss of confidence.

[11]The worsening of working conditions has been shown to be causal to mental distress (Cottini & Lucifora 2013, Robone et al. 2011, Marchand et al. 2005). In particular, Cottini & Lucifora (2013) investigate the link between working conditions and mental health across 15 European countries and find evidence of a positive causal effect of adverse working conditions on mental health distress. In the same vein, using British Household Panel Survey, Robone et al. (2011) find overwhelming evidence of the working conditions effect on health and psychological well-being. Marchand et al. (2005) analyze the contribution of working conditions to the probability of experiencing single or repeated episodes of psychological distress and find evidence of a causal relationship between job insecurity and psychological distress events.

tegration started in the mid-1990s when candidate countries signed bilateral interim agreements including trade-related provisions with existing EU Member States. The interim agreements defined a few industries such as food, textiles and clothing excluded from the immediate trade liberalization granted by the European Community (The European Commission 2006). These provisions were specific and varied across particular industries and countries. In 2004 and 2007, with official access to the European Customs Union, the new member states became even more integrated into the internal market and adopted the common trade policy rules.

Where accession implied a further reduction in Eastern European countries' import tariffs with Western European members, it also involved substantial trade liberalization *vis-á-vis* the rest of the world. Eastern European members had to adopt the external MFN import tariff schemes already implemented in the EU. By imposing compliance with the European Union's bound and applied MFN import tariffs on external trade relationships, enlargement represented a significant and exogenous trade liberalization episode for new member states. As shown by Table A1 in the Appendix, Eastern European countries' shares of imports from non-EU countries substantially increased between the beginning of our sample period in 1997 and its end in 2014. As shown by Figure 1, the reductions in Eastern European countries' applied MFN import tariffs across sectors and countries were considerable.

The magnitude of trade liberalization was comparable to the episodes described by Dix-Carneiro and Kovak, (2019) for Brazil and Topalova (2010) for India. Interestingly, Figure 1 shows strong heterogeneity in tariff reductions across Eastern European countries, with large tariff cuts in Romania and Bulgaria and modest tariff changes in the Baltic countries. This heterogeneity is not solely the result of different industry specializations across different countries. As can be seen from Figure A1 in the Appendix, there are substantial differences in tariff changes both within- and across-sectors.[12]

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[12]Estonia had the smallest tariff liberalization across all sectors – with the exception of Lithuania's publishing and printing industry. The countries with the largest drops in tariffs were Bulgaria across most industries, Poland in the
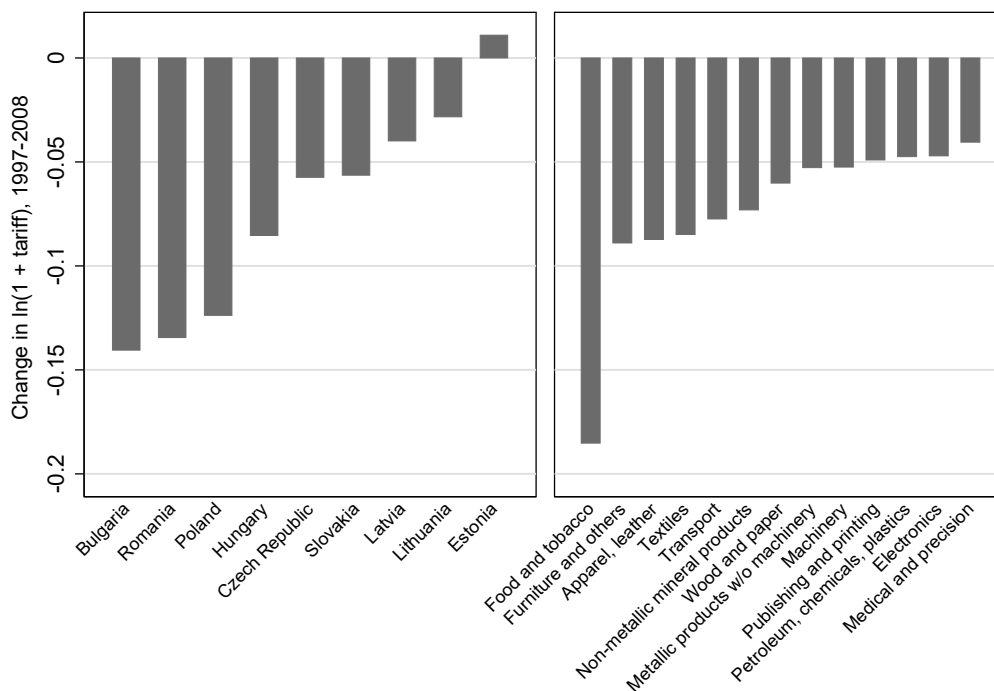
Figure 1 – Change in applied MFN tariffs between 1997 and 2008

Estonia is an interesting exception because accession to the EU brought an increase in its MFN import tariffs – due to the very low MFN import tariffs that Estonia had in the pre-accession period. Behind the large average reduction in applied MFN import tariffs shown in Figure 1 lies substantial heterogeneity in tariff cuts across industries. Whereas the electronic and medical precision manufacturing sectors saw modest tariff cuts of less than 5 percentage points, the food and tobacco industry posted the highest level of tariff liberalization with a reduction of more than 18 percentage points.

European Union enlargement to the Eastern European countries also provides the opportunity to investigate the labor market impact of trade liberalization on the export side (i.e. market access channel). As shown in Figure 2, with EU accession, the new member states gained better foreign market access by adopting the European Union's preferential trade agreements. Prior to 2004, most

food and tobacco industry and Romania in the metallic products, machinery and transport industries.

of the Eastern European countries' preferential trade agreements were signed with EU members (blue circles and arrows) and a few non-EU members such as Croatia and Turkey. By adopting the EU PTA scheme, Eastern European countries gained access to many distant countries (white circles and red arrows) with which they did not share a trade agreement before. As we show later, our empirical strategy exploits the exogenous variation in the applied MFN tariffs as well as the changes in the scope of each Eastern European country's PTAs to identify the effects of trade liberalization (both import competition and market access) on workers' working conditions and wages.
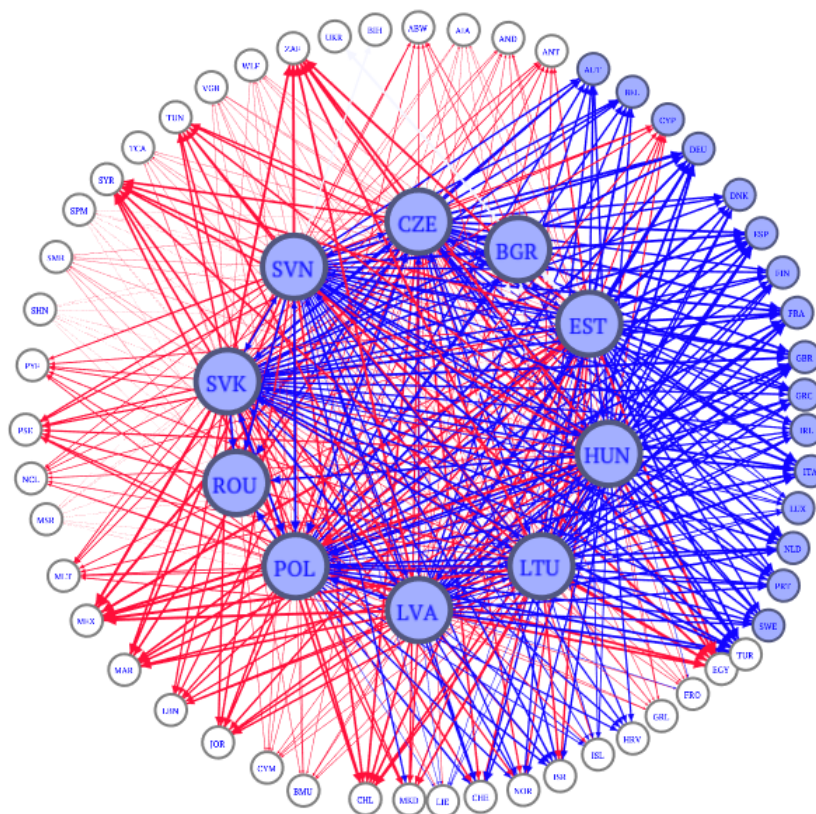
Figure 2 – Old (blue) and new (red) preferential trade agreements following the 2004 and 2007 enlargements.

2.2.   Evolution of labor markets in Eastern European Countries

In addition to trade liberalization, EU enlargement to Eastern European countries induced a series of structural reforms in new member states with significant repercussions for their labor markets (Riboud et al. 2002). The changes in labor market regulations across Eastern European countries had considerable impacts on the type of employment contracts, wages, hours worked, working conditions, and rules for collective representation and bargaining for Eastern European workers (Cazes 2002; Fialová & Schneider 2009). One of the most important changes was the decline in collective agreement coverage rates (Visser 2016). This development was due primarily to the revocation of the usual obligation in Communist countries to belong to a union, the rise in unemployment and the increasing number of small and medium-sized privatized firms.

Table 1 shows the share of firms with a majority of workers covered by collective agreements (by type of agreement). For example, in the Czech Republic 51% of firms had the majority of their workforce covered by firm-level collective agreements, 12% by industry-level agreements, and 36% of firms did not have a majority of workers covered by any collective agreement. Two interesting observations emerge from this table. First, the collective bargaining profile is highly heterogeneous across Eastern European countries. Second, in some ex-Communist countries, the share of firms with a majority of workers not covered by any collective agreement increased drastically over the 2002-2014 period.

The Labor Market Reform (LABREF) dataset put together by the European Commission is useful to glean various anecdotal evidence of reforms that led to the decline in collective bargaining rates across countries. In Hungary, for instance, the revised Labour Code, introduced by the FIDESZ-led government in 2012, removed rights from the unions and weakened the position of the works councils in some areas. In the Czech Republic, reforms were launched in 2008 to reduce the trade unions' capacity to enforce collective agreements. In Latvia, a set of reforms introduced in 2002 opened

Table 1 – Share of firms by type of collective agreement in 2002 and 2014.

Type of agreement : Country	Year	National	Industry	Industry-region	Enterprise	Local unit	Other	No Agreem.
Bulgaria	2002	0	11.13	0.28	26.17	0	0	62.42
	2014	0	1.72	0.23	7.83	0	0	90.23
Czech Rep.	2002	0	12.14	0	51.16	0	0	36.70
	2014	0	7.43	0	22.87	0	0	69.69
Estonia	2002	0.07	0.85	0.10	3.76	0	0	95.23
	2014	0.23	0.41	0.03	2.05	0	0.10	97.18
Hungary	2002	0	3.18	0	28.74	0	0.51	67.57
	2014	0	3.60	0	12.96	0	2.32	81.12
Lithuania	2002	0	0	0	10.44	0.28	0	89.28
	2014	0	0.59	0	22.39	0	0	77.02
Latvia	2002	0.00	0.10	0	8.48	0	0	91.41
	2014	0.02	1.67	0.11	14.11	0.23	0	83.86
Poland	2002							
	2014	1.81	0	0	27.04	0	0	71.15
Romania	2002	7.76	6.77	1.58	83.60	0	0	0.29
	2014	8.73	2.54	2.08	78.45	0	0.59	7.61
Slovakia	2002	0	6.76	0	39.95	0	4.24	49.05
	2014	0	6.81	0	16.04	0	0.00	77.14
Total	2002	1.08	2.81	0.24	24.75	0.03	0.21	49.96
	2014	1.89	2.51	0.43	27.00	0.02	0.53	67.62

Note: Authors' calculation on SES data. Each entry reports the share of firms with a majority of workers covered by a specific type of agreement. The bottom part of the table reports these shares by pooling all countries together. Data are missing for Poland in 2002, as explained in Sections 3.3 and B.

up the possibility for individual contracts to diverge from negotiated agreements – leading to large numbers of violations of rules (Eamets & Masso 2005). The labor market reforms affecting EEC workers are summarized in Table A2. According to (Męcina 2018), many sectors in Poland were protected from foreign competition and agreements with trade unions were highly prevalent and hard to modify. As a result, firms were very reluctant to enter into such agreements, which were virtually absent from new growing sectors, such as media, transport, IT, insurance and finance. Importantly, the details of the LABREF dataset show the effect of labor market reforms on working timeframes. In many countries, use of the atypical working hours arrangement was facilitated for employers and made less expensive by re-qualifying/re-purposing overtime work as standard working hours. These

reforms were implemented in Bulgaria in 2012, Estonia in 2008, Hungary in 2011 and Romania in 2005 and 2011. Rest time between two atypical work periods was reduced following reforms in the Czech Republic in 2007 and 2013 and in Hungary in 2012. Labor market reforms can also reduce the wage premium associated with working atypical hours, as it was the case in Poland after 2002. The erosion of collective bargaining led to largely decentralized and fragmented negotiations regarding wages, employment and working conditions, gradually rolling back worker protection across Eastern European countries.

3. Data

This section presents the sources of information used in the empirical analysis. A detailed presentation of the data and of the construction of the main variables of interest is presented in the Appendix section 2.

3.1. Workers' wages and working conditions

Our main data sources are the Eurostat Structure of Earnings Surveys (SES). The SESs are detailed, confidential, individual-level harmonized surveys on earnings and other individual workers' characteristics covering a large panel of European countries in 2002, 2006, 2010 and 2014. Each survey is administered to firms with at least ten employees in all areas of the economy except agriculture and public administration, as defined in the Statistical Classification of Economic Activities in the European Community (NACE). The SESs report information on workers' wages, the number of regular and overtime paid and the "*premium payments during the reference month for shift work, night work or weekend work where these are not treated as overtime*". A worker's total wage includes payments for "regular" and "overtime" hours of work. We use the information on premium payments for atypical working hours to construct an indicator of whether an individual works "non-standard" working hours, including shift, weekend and night work. This is our main proxy of individuals' work-

ing conditions. Indeed, shift and night work are considered to be a risk factor for health, safety and social well-being (Harrington 1994; Costa 2003; Cottini & Lucifora 2013). We also construct a second indicator of whether the individual works overtime.

The SES also contains useful individual characteristics such as the worker's level of education, occupation, age and gender. We focus on the working population of individuals aged 20 to 59. Age is available in five-year brackets. With respect to the education variable, we use the four SES categories based on the 2011 version of the International Standard Classification of Education (ISCED). The first category covers individuals with lower secondary education, the second category covers individuals with upper secondary education and post-secondary non-tertiary education, the third category includes graduates, and the fourth category covers post-graduate education. We use the 2008 International Standard Classification of Occupations (ISCO) at the 1-digit level to classify workers' occupations. The survey contains little, but important information on workers' employers such as firm size, activity sector, private-owned status and type of employment contract (part-time or full-time contract and length of employment). The countries in our dataset use different sector aggregation methods, which we harmonize using the NACE Rev.2 classification to produce individual-level information spanning 16 manufacturing and service industries (see, Appendix B for more details).

The SES has the advantage of containing cross-sectional data at individual level on the vast majority of new EU member countries before and after their accession. For each survey, our sample contains harmonized information for 9 Eastern European countries and 20 NUTS 1-digit level regions including Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia.[13] The final dataset consists of a cross-section of 2,768,472 Eastern European workers aged 25-59,

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[13]Croatia, Malta and Slovenia are excluded from the estimation sample as we only had 2010 data for Croatia and 2014 data for Malta and Slovenia so we were unable to compute the change in weighted tariff liberalization – see section 3.2.

employed in the formal sector of each country in 2014. We also use the 2010 survey to check the robustness of our results to a shorter time period after EU enlargement.

Our dataset spans more Eastern European countries and regions than other studies, enabling us to investigate whether the erosion of collective bargaining has affected workers' welfare in different regions (and countries). Moreover, the dataset provides detailed information at firm and worker levels to enable us to investigate heterogeneous effects of liberalization across firms, occupations, lengths of employment and different types of contracts. An important drawback of the SES surveys is the impossibility of tracking workers across different years. This prevents us from examining *changes* in worker-specific labor market outcomes between the pre- and post-enlargement period. Instead, we investigate how changes in labor market institutions and tariff liberalization impact worker welfare several years after the enlargement.

3.2. Import tariff liberalization and foreign market access

We focus on the 2004 and 2007 trade liberalization episodes in Eastern Europe to disentangle the effects of tariff liberalization on both the export and import side. Eastern European countries had to adopt the common EU trade policy and the applied MFN import tariff scheme of existing EU Member States. They also adopted the EU's preferential rates and benefited from the EU's preferential foreign market access. Compared to previous literature, which considers import tariff liberalization only, our empirical analysis explores tariff liberalization on both the export and import sides.[14]

On the import side, we follow the methodology developed by Topalova (2010) and Kovak (2013).[15]

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[14] A notable exception is Dauth et al. (2014) who consider both the export and import shock on the German labor market.

[15] This methodology has been widely used by Edmonds et al. (2010); and Dix-Carneiro & Kovak (2017, 2019). Autor et al. (2013) also investigate the impact of trade liberalization at sub-national level using U.S. data. However, they study the effect of *import penetration* from China rather than a reduction in MFN tariffs as in our case.

We construct a region-specific measure of tariff liberalization. We allocate changes in two-digit industry-country level MFN tariff rates to each regional labor market using region-industry specific employment shares in 2002 – the first year for which SES region and industry data are available.[16] We therefore interact a time-invariant measure of the region's industrial specialization, identifying the industrial structure of each region, with changes in industry-country specific trade liberalization shocks. We focus on changes in the Eastern European applied MFN tariff rate to mitigate any endogeneity concern.

The applied MFN scheme that the EECs had to adopt following their accession is not affected by the burgeoning EU preferential trade agreements in the pre-enlargement period or by the (potentially endogenous) preferential import tariffs setting. In addition, the applied EU MFN tariff scheme was set well before the entry of the EECs and is plausibly exogenous to their specific labor market characteristics.[17] We use WTO data on applied MFN tariffs for Easter European countries for the 1997-2014 period. WTO tariff data are provided at HS 6-digit level. We aggregate tariff data at NACE level to consistently match the industry definition in the SES surveys.[18]

On the export side, we build a measure of region-specific change in foreign market access using the change in the scope of the Eastern European countries' preferential trade agreements implied by their accession to the common EU trade policy. By adopting the preferential rates of the European Union, Eastern European countries gained market access to new partner countries.

Our measures of import and export tariff liberalization for region r in country c, Lib_{rc}^{M} and Lib_{rc}^{X},

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[16] The use of two-digit aggregated tariff rates was dictated by the sectorial aggregation of SES data used to compute region-industry specific employment shares.

[17] By focusing on applied MFN import tariffs, when preferential trade agreements between the EU and a given non-EU country imply a full use of preferential rates, our measure of trade liberalization may underestimate the effective trade liberalization episode. However, the use of MFN tariffs strongly reduces the endogeneity concern that might arise if applied preferential rates were used.

[18] Namely, we compute the weighted average across HS 6-digit codes within each NACE industry and use HS 6-digit country-product import shares as weights.

are defined as follow:[19]

$$Lib_{rc}^l = -\sum_k \beta_{rck}\Delta ln(1+\tau_{ck}^l) \ \text{ with } \ \beta_{rck} = \frac{\lambda_{rck}\frac{1}{\phi_{ck}}}{\sum_k \lambda_{rck}\frac{1}{\phi_{ck}}} \ \text{ and } \ l = M, X \tag{1}$$

where superscript l indicates the nature of the shocks, i.e. import (M) or export (X) tariff respectively, and $\Delta ln(1+\tau_{ck}^l)$ is the difference in tariffs between the post- and pre-enlargement year (2008-1997) for a given sector k and country c. We take 1997 as our pre-enlargement year because this is the earliest available year in the WTO tariff dataset covering an exhaustive set of countries and industries. The base years for Slovakia and Romania are 1998 and 1999 due to a lack of data for these countries in 1997. τ_{ck}^l is our measure of import and export tariffs. As for the import tariffs, τ_{ck}^M, we use the applied MFN import tariffs that each new EU member c applies to its trade partners for a given sector k.

Over and above the broad MFN tariff liberalization towards non-EU countries, EECs experienced significant tariff liberalization *vis-à-vis* Western EU member states. So, we compute the weighted average of the applied MFN tariff across all EU and non-EU trade partner countries.[20] It is worth noting that Eastern European Countries imposed substantial MFN tariffs on Western EU member states before enlargement. This tariff protection was lifted following entry into the Customs Union. We consider EEC tariff liberalization *vis-à-vis* Western EU member states by computing the pre-*vs* post-accession change in import tariffs imposed on Western EU member states. Considering the zeroing of tariffs with EU members is an important feature of our identification strategy. Indeed, simply taking the applied MFN *vis-à-vis* non-EU partners would have omitted the major trade liberalization dynamic experienced by EECs with EU members

For the export tariffs, τ_{ck}^X, we use the average *effectively applied* tariff rate for each Eastern European

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[19]More details on the computation are given in the online Appendix section A.
[20]To reduce any endogeneity concerns, weights are the import shares in 1997.

country c on its exports in a given industry k. It is a weighted average across trade partners, based on 1997 export shares weights. The variation in the export liberalization variable $\Delta ln(1 + \tau_{ck}^X)$ is therefore due to the change in the applied MFN or preferential tariffs set by the EU's trade partners and fully reflects the market access shocks experienced by the EECs adopting the EU's Preferential Trade Agreements. Based on the assumption that tariff changes are (fully or partially) passed on to domestic prices, any variation in the applied MFN import (or effectively applied export) tariff is a good proxy for variations in domestic price and the level of competition (market access) in each industry.[21]

As discussed by Kovak (2013), the region-specific labor market response to a common (region-invariant and sector specific) tariff shock depends on two factors: each sector's share of employment (λ_{rck}) and the importance of non-labor factors in the sector-specific production technology ($1/\phi_{ck}$). These aspects are summarized by the weighting parameter β_{rck} in equation 1. Information on the cost-share of non-labor factors (ϕ_{ck}) is not available at regional level. As in Kovak (2013), we assume all regions in a country have access to the same technology. In order to compute β_{rck}, we need information on λ_{rck} and ϕ_{ck}. λ_{rck} is the share of region $r's$ workforce initially employed in sector k of country c. We use the 2002 SES data for Poland and Bulgaria, and the Eurostat Structural Business Survey at the regional level for Romania (in 2002) and Hungary (in 2001) to compute λ_{rck} as this information is not available in the SES dataset. Regional-level data are not available for the Czech Republic, Estonia, Lithuania, Latvia or Slovakia. We use the 2002 edition of the SES survey to compute *country*-specific labor shares λ_{ck} for these countries. Finally, the cost share of non-labor factors in industry k and country c, ϕ_{ck}, is obtained from Eurostat data for the years preceding enlargement (Eurostat Structural Business Survey).[22]

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[21] This assumption has been widely used in the literature on export supply elasticity (Romalis 2007, Fajgelbaum et al. 2020).

[22] See Appendices A.3 and A.1 for more details on the construction of the non-labor cost share and tariff shocks respectively.

Import and export tariff liberalization, Lib_{rc}^{M} and Lib_{rc}^{X} are normalized between 0 (minimum values) and 100 (maximum values). An increase in Lib_{rc}^{M} and Lib_{rc}^{X} represents respectively an import and export tariff cut – see equation 1.

3.3. Collective bargaining rates

The SES firm-level variable identifies whether workers are employed in a firm in which at least 50% of the workforce is covered by a collective bargaining agreement.[23] Taking the firm identifier, and the information on sector NACE and the location of the firms at NUTS-1 level, we compute for each region-sector the share of firms in which the majority of the workforce is covered by a collective agreement. We therefore take the growth in this share between 2014 and 2002 – the first and last available SES data years – as an approximation of the change in collective bargaining in each region and sector. Notice that the information on Hungarian and Romanian firm location and Polish collective bargaining coverage are missing for 2002. We use data from the 2001 and 2002 Structural Business Survey to impute the Hungarian and Romanian statistics on collective bargaining. For Poland, we predict the coverage rate based on information from the 2004 Polish survey described in Magda et al. (2016). Computational details and a careful discussion on how we built collective bargaining rates are in Appendix B. In Table A5 we show robustness check of our baseline results by excluding in turn Poland, Hungary and Romania.

3.4. Other controls

The EU enlargements in 2004 and 2007 had a number of economic repercussions. They not only promoted trade in goods and services, but also drove up foreign direct investment and other capital

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[23]The SES provides information on the existence and types of collective pay agreements covering the majority of employees in the firm. There are many different types of collective agreement (national, industrial, firm and individual agreements). We focus on whether an agreement exists or not, irrespective of its type, since bargaining frameworks are largely decentralized and heterogeneous across Eastern European countries.

flows, and increased labor mobility between EU countries. We therefore add country-level controls to our econometric specification to take into account various shocks that may correlate with both the tariff liberalization variable and the labor market outcomes. These shocks are computed as the log difference in the variable between 1997 and 2014. We account for productivity shocks by including the log-difference in per capita GDP.[24] The underlying data on GDP and population are taken from the World Bank's World Development Indicator (WDI) database. We also control for foreign labor supply shocks by including the net migration flows from 1997 to 2014 for the total population of Eastern European countries as provided by Eurostat. We use the Eurostat dataset on net foreign property income to GDP to compute foreign capital shocks in order to control for a change in the presence of multinational corporations between 1997 and 2014. Net foreign property income, as computed by the Eurostat national accounts, is the difference between the property income received by domestic agents from abroad and the income received by foreign agents from domestic agents (i.e. property income distributed abroad). Finally, we also control for price dynamics across countries based on the difference in the Consumer Price Index from 1997 to 2014. The information is taken from the World Development Indicator dataset. In a robustness check reported in Table 6, we also control for the initial (2002) average wage level in the region (from the SES Survey) to capture initial labor market characteristics. In Table 7 we use Eurostat data on regions' population growth to control for the demographic changes among EEC regions.

The other individual-level control variables are taken from the SES data. We include a dummy variable that takes the value of one for workers on short-term contracts. We also add an indicator which takes the value of one for female workers. We control for employer size by including a dummy variable equal to one for firms with more than 50 employees. Table 2 provides the descriptive statistics for the variables used in the econometric exercise.

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[24] As reported in Rogerson (2008), one of the main determinants of changes in labor demand over time (and the marked reduction in hours worked in rich EU countries) is productivity dynamics.

Table 2 – In-sample descriptive statistics

	Mean	Std. dev.
Hourly wage (log)	1.51	0.60
Shift, weekend, night work (1/0)	0.43	0.50
Overtime (1/0)	0.29	0.45
Import liberalization (Normalized)	55.40	25.05
Export liberalization (Normalized)	32.38	23.01
Collective bargaining	0.22	0.12
Female	0.44	0.50
Short-term contract	0.19	0.39
50+ employees	0.87	0.33
GDP/cap shock	0.52	0.14
Migration shock	0.06	3.98
FDI shock	-0.05	0.02
CPI shock	0.75	0.48
Relative pop. growth	0.003	0.02
Wage$_{rc}^{2002}$ (log)	6.05	0.35

Note: Authors' calculations on SES, World Bank WDI and Eurostat data.

4.   Empirical Specification

We use the changes in import and export tariffs, and in collective bargaining rates across EEC regions to identify the effects of trade and labor market liberalization on workers' wages and working conditions. We examine whether workers' outcomes in regions with large reductions in tariffs and collective bargaining rates are significantly different than observationally equivalent workers in regions with lower reductions in tariffs and collective bargaining rates. The estimation equation is as follows:

$$y_{ir} = \alpha_0 + \alpha_1 Lib_{rc(i)}^M + \alpha_2 Lib_{rc(i)}^X + \alpha_3 ColB_{rck(i)} + \mathbf{\Phi}'_i \mathbf{ff} + \mathbf{X}'_{c(i)} \mathbf{fl} + \epsilon_{ir}, \tag{2}$$

where the dependent variable y_{ir} indicates the labor market outcomes of individual i in region r in 2014. Namely, we focus on workers' likelihood of working "atypical" hours (shift, weekend and night work), overtime, and (log) hourly wage. $Lib^M_{rc(i)}$, $Lib^X_{rc(i)}$ and $ColB_{crk(i)}$ are our main explanatory variables. $Lib^M_{rc(i)}$, $Lib^X_{rc(i)}$ describe the tariff liberalization on both the import (M) and export (X) side for region r (country c) in which individual i works. $ColB_{crk(i)}$ is our proxy for the change in the labor market institution and specifically measures changes in the collective bargaining rates of individual i's region and sector of work. For the sake of interpretation, $ColB_{crk(i)}$ has a positive (negative) value for decrease (increase) in the collective bargaining rate.[25]

The wages and working conditions of Eastern European workers in region r (country c) do not depend solely on changes in tariffs and labor market regulations. Worker-specific characteristics and country-specific shocks may have an impact on individual wage and working conditions. Hence, in equation (2), we include a set of worker- ($\mathbf{\Phi}'_i$) and country-specific controls ($\mathbf{X}'_c$). The set of worker-specific controls ($\mathbf{\Phi}'_i$) includes a dummy for the size of the employing company taking the value of one when firms are larger than 50 employees, an indicator for the type of contract taking the value of one if the worker has a short-term contract, and a gender dummy variable taking the value of one for women. We also include four sets of worker-attribute fixed effects: (i) worker-firm match-specific factors (i.e. length of employment fixed effects), (ii) worker age interacted with worker level of education (education $\times$ age fixed effects), (iii) 2-digit occupation-specific fixed effects, and (iv) a fixed effect for the employing company's sector.

In order to isolate the effect of trade liberalization from other globalization-related factors such as

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[25]The regional collective bargaining rate variable is computed as (minus) the difference in 2014 and 2002 in the shares of firms where the majority of workers are covered by a collective agreement:

$$\Delta Col_{rck(i)} = -\left(\frac{Covered^{2014}_{rck}}{Firms^{2014}_{rck}} - \frac{Covered^{2002}_{rck}}{Firms^{2002}_{rck}} \right)$$

with $Covered^t_{rck}$ being the number of firms considered as covered by a collective agreement in year t in sector k in region r of country c, and $Firms^t_{rck}$ the corresponding total number of firms in the region-sector in year t. See more details on the construction of this variable in Appendix B.

migration and capital flows, we systematically control for a change in the country's net international migration and capital flows. Since working conditions might reflect changes in productivity and/or prices, we also control for productivity shocks approximated by changes in the country's per capita GDP and changes in the country-specific CPI index. All these controls are computed as log differences between 1997 and 2014. ϵ_{ir} is the error term. The baseline equation is estimated using OLS on a sample of 2,765,815 workers. The standard errors are adjusted for clustering at the country and NUTS regional level to account for heteroskedasticity and non-independence across repeated observations within countries and regions. In Appendix A3, we present the results using the procedure developed by Conley (1999) to address the potential spatial correlation of the error term.

5. Results

5.1. Baseline Results

Table 3 shows the results of the baseline specification. The first two columns report results regarding workers' likelihood of working nights, weekends, shifts and overtime. The last column presents the results for the worker's hourly wages. Each specification includes country-specific shocks, specific worker characteristics and sector fixed effects. We therefore use the variation within sectors and across regions between workers with similar characteristics to identify the effects of trade and labor market liberalization. The estimation results including coefficients for the control variables are reported in A6 of the Appendix.

The erosion of collective bargaining has a pervasive impact across workers' outcomes. Workers employed in region-sector marked by a sharper decline in collective bargaining are more likely to work on "atypical" hours and earn lower wages than observationally equivalent workers in regions with less of a decrease in the use of collective bargaining. This result is in line with previous literature. In

particular, Magda et al. (2012) use individual level data for The Czech Republic, Hungary and Poland and find that industry-level collective agreements are correlated with higher wages for low-skilled workers, while firm-level agreements are correlated with higher wages for medium- and high-skilled workers. Accordingly, our results show that the reduction in the share of workers covered by collective agreements impacted negatively on the wages of workers in the region: a one-standard-deviation decrease in the share of workers covered by a collective agreement implies a 1.7% lower wage per hour in 2014 than observationally equivalent workers in other regions. Interestingly, the erosion of collective agreements has also increased the likelihood of working atypical hours. In particular, a one-standard-deviation decrease in the share of workers covered by a collective agreement implies a 2.9-percentage-point increase in the probability of working "atypical" hours.

The effects of tariff liberalization on workers' outcomes are not quite as clear cut. In columns (1) and (2), we show that import and export tariff liberalization impacts on the margins of employment, in particular on the likelihood of working atypical hours (shifts, weekends and nights) and the probability of working overtime. We find that a reduction in MFN import tariffs *vis-à-vis* the rest of the world reduces the likelihood of working atypical hours, but does not influence the probability of working overtime. However, adoption of EU PTAs and the subsequent increase in foreign market access for EEC firms increases the likelihood of working atypical hours and overtime. Interestingly, the positive effect of export tariff liberalization is greater and more than offsets the negative impact of import tariff liberalization on the likelihood of working atypical hours and overtime. Overall, our results suggest a positive effect of tariff liberalization on the deterioration in workers' conditions. This finding suggests an increase in labor demand induced by the export tariff liberalization, which translates into many more workers working atypical hours – and overtime.

MFN import tariff liberalization has had a negative and highly significant impact on hourly wages. Conditional on worker, firm and country characteristics, our results suggest that workers in regions

Table 3 – Baseline Results

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001*	0.000	-0.004***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001***	0.000
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.245***	-0.016	-0.161**
	(0.064)	(0.064)	(0.075)
Female	-0.056***	-0.048***	-0.183***
	(0.007)	(0.007)	(0.011)
Short-term contract	0.000	0.008*	-0.128***
	(0.016)	(0.005)	(0.017)
50+ employees	0.133***	0.086***	0.245***
	(0.020)	(0.008)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.417	0.228	0.597
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

with larger import tariff reductions have lower relative wages. This finding is in line with the results of Dix-Carneiro & Kovak (2017, 2019) who find a negative effect of trade liberalization on Brazilian

workers' wages. The coefficient estimate of -0.004 in column (3) indicates that the average worker in regions with one standard deviation more in weighted tariff reductions earned approximately 10% less per hour in 2014 than observationally equivalent workers in other regions.

We do not find significant impacts from export MFN tariff liberalization on hourly wages. This result suggests that the induced earnings gains from firms' access to new markets might have been offset by competition effects from new PTA members. Indeed, if the EU's preferential trade agreements granted a symmetrical increase in market access to/from preferential partners, the competition effect of the EU preferential trade agreement (PTAs) is not captured by our import competition variable (based on the applied MFN tariff variation). An alternative explanation for the lack of any significant wage effect may be related to the fact that wage adjustments following the adoption of new PTAs may take many more years.

The results concerning the other covariates are in line with the findings of previous studies. Women are paid less than male workers with similar characteristics in the same industry. This result is in line with the existence of a gender wage gap found by Blau & Kahn (1994) in the case of the US and Brainerd (2000) using data on Eastern European countries. We find evidence of a wage penalty for individuals working on short-term contracts. This result is in line with Blanchard & Landier (2002), Booth et al. (2002) and Perugini & Pompei (2017) respectively for French, UK and Eastern European workers.[26]

However, we do not find worse working conditions for individuals employed on short-term contracts. They are not likely to work more atypical hours (column 1), but more likely to work overtime (column 2). Finally, in line with expectations, workers in large firms are paid higher wages than workers with similar characteristics employed in smaller firms. Also, workers in large firms are more likely to work

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[26]Perugini & Pompei (2017) investigate the determinants of wage inequality in Central-Eastern European countries using EU-SILC microdata over the 2007-2012 period, and show that workers with short-term contracts suffer from a statistically significant wage penalty compared to workers on long-term contracts.

atypical hours and overtime.

5.2. Counterfactual labor market outcomes.

What would the levels of wages and the likelihood of working atypical hours be if Eastern European countries had kept their MFN tariffs and preferential trade agreements as in 1997, the first year in our data? Answering this question is a way to single out the contribution of trade liberalization to the 1997-2014 change in trade liberalization. We compare the predicted labor market outcomes assuming the EU-induced tariff liberalization did not occur (i.e. counterfactual scenario) with the predicted labor market outcomes found by the baseline model in equation 2. The counterfactual import tariff shock bases on the idea that, in absence of EU-enlargements, the EECs would have kept their MFN import tariff scheme unchanged. The counterfactual export tariff shock considers a scenario in which, in absence of EU-enlargements, EECs would have seen only changes in the MFN tariff at destination (i.e. no-change in preferential rate at destination in absence of EU-enlargements). This comparison is computed as follows:

$$
\begin{aligned}
\widehat{\Delta y_{ir}} \quad = \quad & \left(\widehat{y_{ir}^{1997}} \middle| Lib_{rc(i)}^{M_{1997}}, Lib_{rc(i)}^{X_{1997}}, \widehat{ColB}_{rck(i)}^{1997}, \mathbf{X}_{c(i)}^{2014} \right) \\
- \quad & \left(\widehat{y_{ir}^{2014}} \middle| Lib_{rc(i)}^{M_{2014}}, Lib_{rc(i)}^{X_{2014}}, ColB_{rck(i)}^{2014}, \mathbf{X}_{c(i)}^{2014} \right)
\end{aligned}
\tag{3}
$$

where $\widehat{y_{ir}^{2014}}$ are the predicted outcomes (wages, atypical hours, and overtime) using the baseline specification, and $\widehat{y_{ir}^{1997}}$ are the predicted outcomes using: (i) the counterfactual tariff shocks (i.e. $Lib_{rc(i)}^{M_{1997}}$ and $Lib_{rc(i)}^{X_{1997}}$), and (ii) the share of firms covered by collective bargaining as if trade liberalization never happened (i.e. $\widehat{ColB}_{rck(i)}^{1997}$).[27] Indeed, the change in collective bargaining rates are intrinsically correlated with the EU-enlargement process and hence with the overall process

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[27]This is obtained from a regression fit of $ColB_{rck}$ on $Lib_{rc(i)}^{M}$ and $Lib_{rc(i)}^{X}$ (see Table A4), after imposing the trade liberalization variables as in the counterfactual scenario.

of trade liberalization. Table A4 shows the strong correlation between the change in collective bargaining rates and the trade liberalization variables $Lib_{rc(i)}^M$ and $Lib_{rc(i)}^X$. Note that we implicitly assume all other factors and shocks that occurred over the period to be unaffected by the tariff shocks.

We also produce a counterfactual analysis that reports the levels of wages and the likelihood of working atypical hours if Eastern European countries had kept their level of collective agreements as in 2002 (and tariff liberalization shocks as observed). We proceed as above and compare the predicted labor outcomes assuming the collective agreement coverage rates in 2002 with the predicted labor market outcomes found by the baseline model in equation 2. Table 4 reports the results of the counterfactual analysis by region. Regarding tariff liberalization, we note a small spread of effects within countries and across regions, but a large spread of effects between countries. This finding confirms differential effects of tariff liberalization within sector across countries.

In columns (1) and (2), we report the percentage change in atypical hours and overtime in the counterfactual scenario. For almost all regions, working conditions would have been better in absence of EU-enlargement. We find stronger impacts of trade liberalization on working conditions and overtime hours in Baltic countries, The Czech Republic and Slovakia. Workers in Lithuania and Slovakia had the highest probability of working atypical hours and overtime following EU enlargement. In 2004, these two countries posted the highest level of export trade liberalization – and therefore the largest increase in foreign market access, while import tariff liberalization was moderate. In other countries, the negative effect of competition due to import tariff liberalization was almost offset by the positive effect of trade-induced labor demand.

In column (3), we report the counterfactual change in hourly wages (in %). For almost all regions, wages would have been higher, as the negative effect of import liberalization dominates the positive influence of increased market access. In the absence of trade liberalization, workers' hourly wages

would be about 10% to 45% higher. Estonian workers would have earned less without trade liberalization because tariffs increased in 2004 and the effects of import tariff liberalization outweigh the impacts of export tariff liberalization. The effect of EU-enlargement on hourly wage is strong because combines the direct import competition effect (see column 3 in table 3), and the negative wage effect of reductions in collective bargaining rates induced by the EU-enlargement liberalization.

In columns (4) and (5), we report the percentage change in atypical and overtime hours under the counterfactual scenario of unchanged collective bargaining rates (i.e. cutting-off the tariff liberalization channel). Compared to the previous counterfactual scenario, we find stronger impacts on working conditions in Bulgaria, Hungary and Poland. Workers in Hungary and the South, West and Central regions of Bulgaria are found to have the largest increase in the probability of working atypical hours due to the change of coverage rate. Interestingly, the difference in the working conditions effect is quite large in the two Bulgarian regions. The South, West and Central regions had a substantially higher share of covered firms in 2002, due to the prevalence of highly unionized industries (such as oil) and public companies (10 p.p. more public company in that region in 2002). These regional differences attenuated over the following years.

In column (6), we report the counterfactual change in hourly wages (in %) if collective agreement coverage rates had remained at their 2002 levels. Wages would have been higher in most regions. In the absence of a downturn in collective bargaining, the hourly wages of workers would have been about 1% to 5% higher. Lithuanian and Latvian workers would have been paid less without a change in coverage rates. Coverage rates for both countries, increased through to 2014 as most labor market liberalization had already occurred in the early 1990s.

Table 4 – Counterfactual changes in outcomes

Counterfactual scenario :		Tariff liberalization index as in 1997			Coverage rate of collective agreements as in 2002		
Outcome variable :		Nights, weekends or shift work (p.p.)	Overtime work (p.p.)	Wages (%)	Nights, weekends or shift work (p.p.)	Overtime work (p.p.)	Wages (%)
Country	Region (NUTS1)	(1)	(2)	(3)	(4)	(5)	(6)
Bulgaria	North and East	-0.1	-6.8	43.6	-3.2	0.2	2.1
	South West and Central	-4.2	-5.4	42.9	-8.2	0.5	5.4
Czech Republic	-	-12.0	-7.3	20.6	-6.5	0.4	4.3
Estonia	-	-7.8	-5.4	-1.1	-0.5	0.0	0.3
Hungary	Central Hungary	-1.4	-5.0	25.6	-2.5	0.2	1.6
	Transdanubia	-2.0	-4.6	27.0	-3.7	0.2	2.4
	Great Plain and North	-2.9	-5.7	29.0	-3.5	0.2	2.3
Lithuania	-	-13.0	-12.9	11.2	3.0	-0.2	-2.0
Latvia	-	-5.5	-7.8	9.9	1.6	-0.1	-1.0
Poland	Centralny	-2.0	-6.1	44.7	-5.7	0.4	3.7
	Południowy	-1.0	-4.6	40.7	-5.9	0.4	3.9
	Wschodni	-2.2	-5.9	44.7	-5.9	0.4	3.9
	Północno-Zachodni	-2.2	-6.1	45.4	-5.8	0.4	3.8
	Południowo-zachodni	0.1	-4.6	39.0	-4.7	0.3	3.1
	Północny	-0.9	-5.7	43.3	-4.8	0.3	3.2
Romania	Macroregion one	5.4	-4.6	40.9	-0.8	0.1	0.5
	Macroregion two	4.8	-5.0	42.9	-1.2	0.1	0.8
	Macroregion three	2.6	-5.4	42.3	-2.3	0.1	1.5
	Macroregion four	4.3	-5.0	41.2	-1.2	0.1	0.8
Slovakia	-	-21.6	-13.4	20.3	-5.9	0.4	3.9

Note: This table presents the change in outcomes under the two counterfactual scenarios. In columns 1 to 3, we assume that the EECs keep their tariffs at the 1997 level, that market access is not affected by the application of the EU preferential agreement to EECs, and the share of firms covered by collective bargaining as if trade liberalization never happened. In columns 4 to 6, we assume that the coverage rate of collective agreements stays identical throughout the period. Changes are expressed in % changes for wages and in percentage points for the probabilities of working atypical hours or overtime.

5.3. Sector-specific results

We estimate the effect of trade and labor market liberalization shocks on the probability of working "atypical" hours across different industries.[28] Equation (2) is estimated using NACE 2-digit industry data.[29] We report the effects of trade and labor market liberalization on the likelihood of working atypical hours at the 95% confidence interval in Figures 3 and 4.
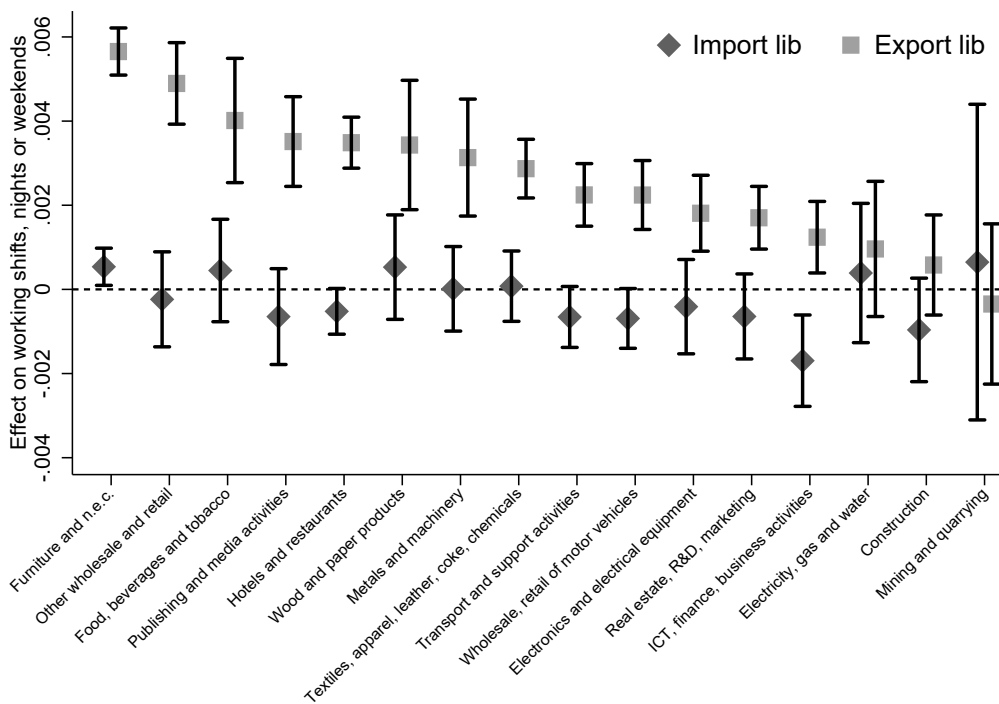
Figure 3 – Effect of trade liberalization on probability of working shifts, nights or weekends by sector

In line with baseline results, import tariff liberalization (dark diamond) has a small negative effect on the probability of working atypical hours. The effects are significant in the hotels and restaurants, wholesale, transport, and financial and business industries. As highlighted by Dix-Carneiro & Kovak (2019), a general equilibrium mechanism explains why import tariff liberalization may affect non-

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[28] Results for hourly wages are reported in the Online Appendix, Figures A2 and A3.
[29] We strictly adopted the sector classification used in the original SES data.
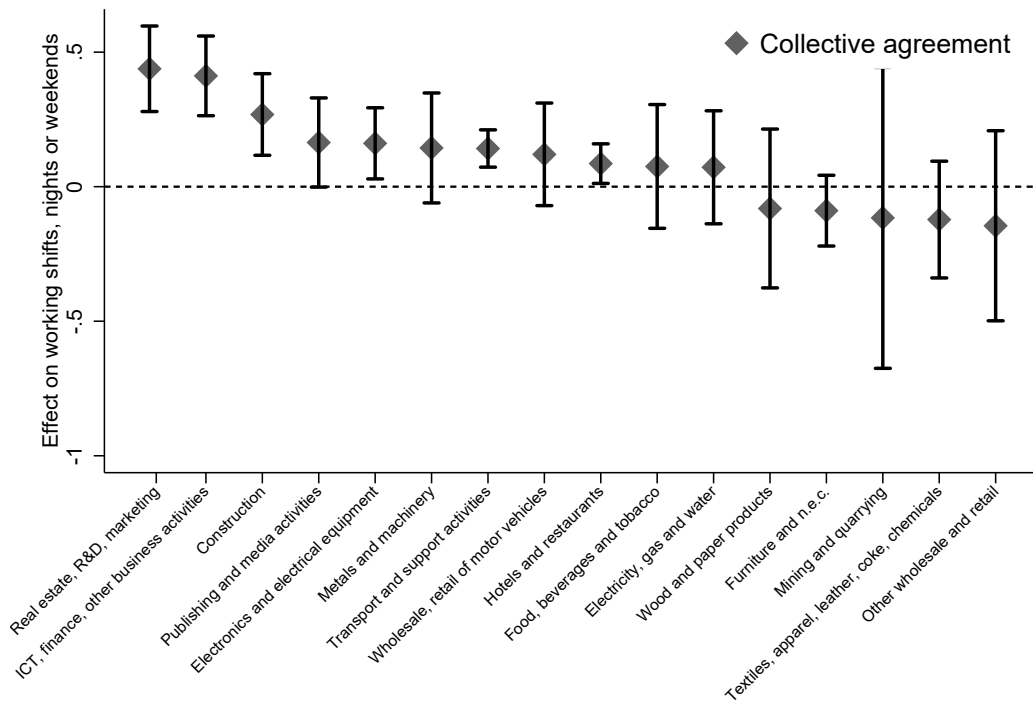
Figure 4 – Effect of collective bargaining decrease on probability of working shifts, night or weekends by sector

traded (service) sectors. The negative income effect on traded sectors induced by import tariff liberalization (see Figure A2), translates into a negative demand shock for non-traded service sectors, and hence reduces labor demand in the service sectors. The effect of export liberalization (light gray squares) is greater in magnitude and statistically significant in almost all industries, with a larger effect in the wholesale and retail, food and beverages, publishing and media, hotels and restaurants, and wood and paper industries. In these sectors, workers in regions with one standard deviation more in weighted export tariffs (Lib_{rc}^{X}) have a 7-to-9-percentage-points higher probability of working atypical hours. The erosion of collective bargaining positively impacts on the probability of working atypical hours in the majority sectors – see Figure 4 – but to a greater extent in some service-oriented sectors such as ICT, finance, business activities, construction and real estate.

5.4.   Robustness checks

This section presents various robustness checks. We control for a different timing of adjustment of labor market outcomes in the post-EU enlargement period (section 5.4.1). We add a control for the level of wages in the pre-enlargement period (section 5.4.2) and for demographic changes in EEC regions (section 5.4.3). We also test the robustness of our results to several sample stratifications based on employer characteristics (i.e. large vs small firms, or private companies only) – section 5.4.4. Further checks are reported in the Online Appendix.[30]

5.4.1.   Post-EU enlargement adjustment

In the baseline estimations, we use 2014 SES data to capture the long-run equilibrium wages and working conditions of EEC workers in the post-enlargement period. This enables us to test the long-run consequences of trade and labor market liberalization shocks (almost ten years after EU enlargement). In this section, we check whether labor market outcomes adjusted before, using 2010 SES data for the outcome variables in equation (2).

Although in 2010 the conclusion of the EEC EU-accession process was recent (Bulgaria and Romania joined the EU in 2007), there was already a significant impact on labor market outcomes. Results reported in Table 5 show a significant effects of import and export tariff liberalization on Eastern European workers' labor market outcomes: negative wage effect from import competition, and the worsening of working conditions from foreign market access. Coherently, labor market institution erosion, approximated here by the decrease in the proportion of firms with a majority of workers covered by collective bargaining agreements, was already proving to have its own impact on Eastern European workers' wages (negative) and labor market conditions (worsening). Erosion of EEC labor

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[30]Online Appendix includes results regarding the impact of tariff liberalization on final vs intermediate goods (Tables B5 and B6 respectively), the collective agreement variable constructed at country level (Table B7), the use of trade liberalization shocks between 1997 and 2004 (Table B8), a control for the concentration of economic activity in the region (Table B9), and differentiation by type of occupation (Table B10).

market institutions started with the collapse of the Iron Curtain, and the consequences of this process could already be seen in 2010.

Table 5 – Using the 2010 SES

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	0.001	0.001*	-0.003**
	(0.001)	(0.001)	(0.002)
Export liberalization	0.003***	0.001**	-0.001
	(0.001)	(0.001)	(0.001)
Collective bargaining	0.193***	-0.044	-0.337**
	(0.063)	(0.077)	(0.129)
Female (1/0)	-0.052***	-0.047***	-0.179***
	(0.007)	(0.012)	(0.013)
Short-term contract (1/0)	0.003	0.012**	-0.120***
	(0.010)	(0.004)	(0.020)
50+ employees (1/0)	0.135***	0.084***	0.252***
	(0.022)	(0.006)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.41	0.244	0.611
Observations	2,647,554	2,647,554	2,647,554
Countries	9	9	9
Region	20	20	20

Note: The 2010 SES is used instead of the 2014 SES here. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * are significantly different from 0 at the 1%, 5%, and 10% levels respectively.

5.4.2. Initial labor market conditions

Our identification strategy is based on the *change* in import/export tariffs and collective bargaining rates in the *pre-* vs *post-* EU enlargement period. The magnitude of these trade and labor institution shocks depends not only on the post-enlargement conditions, but also on the initial labor market conditions across EEC regions. In this section, we explicitly control for initial local labor market conditions by including in the set of controls in equation 2 average worker wages in region r in 2002 (from the 2002 SES survey). Our baseline results reported in Table 6 remain qualitatively identical, with the exception of the effect of collective bargaining shock on wages, now imprecisely estimated.

5.4.3. Demographic change in the EECs

In all specifications, we control for *international* migration shocks as part of the liberalization process experienced by EECs (i.e. confounding factors). However, the liberalization process may well have affected *internal* worker migration from rural to urban areas, and therefore workers' labor market outcomes across regions. Moreover, regional labor market outcomes also depend on demographic change (i.e. labor supply shocks). To account for both demographic change and internal migration flows among EEC regions, Table 7 controls for each region's population growth relative to that of its country.[31] Our results remain qualitatively unchanged. The positive coefficient of relative population growth to hourly wages could reveal an endogeneity concern (reverse causality) regarding the population growth variable. Therefore, these results should be considered with caution.

5.4.4. Other robustness checks

This section performs two stratification sample exercises based on the employer's characteristics. The results tables associated with this last set of checks are reported in the Appendix.

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[31] The purpose of this is to capture whether a given region presents a demographic shock larger or smaller than that of its country.

Table 6 – Controlling for average initial wage levels

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001*	0.000	-0.004***
	(0.000)	(0.000)	(0.000)
Export liberalization	0.002***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Collective bargaining	0.252***	-0.020	-0.064
	(0.070)	(0.062)	(0.038)
Wage_{rc}^{2002}	0.020	-0.013	0.284***
	(0.035)	(0.027)	(0.029)
Female (1/0)	-0.056***	-0.048***	-0.183***
	(0.007)	(0.007)	(0.012)
Short-term contract (1/0)	0.000	0.008	-0.125***
	(0.017)	(0.005)	(0.016)
50+ employees (1/0)	0.133***	0.086***	0.244***
	(0.020)	(0.008)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.418	0.228	0.601
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Wage_{rc}^{2002} corresponds to the regional average wage in 2002 taken from the SES, excepting Romania and Hungary. 2002 Structural Business Survey. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * are significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table 7 – Controlling for regional demographic change

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001**	0.000	-0.004***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001***	0.000
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.252***	-0.025	-0.217**
	(0.062)	(0.066)	(0.083)
Relative pop growth	-0.194	0.249	1.501***
	(0.163)	(0.272)	(0.378)
Female (1/0)	-0.056***	-0.048***	-0.183***
	(0.007)	(0.007)	(0.012)
Short-term contract (1/0)	-0.000	0.008*	-0.127***
	(0.016)	(0.005)	(0.017)
50+ employees (1/0)	0.133***	0.085***	0.241***
	(0.019)	(0.007)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.418	0.228	0.599
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Relative population growth corresponds to the differential of population growth for each region compared with that of its country. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * are significantly different from 0 at the 1%, 5%, and 10% levels respectively.

In Table A7 we exclude workers in state-owned enterprises, and show estimation results based on the sample of workers in private firms only. Our results do not change, suggesting that the presence of workers in state-owned enterprises does not bias our baseline results. In Table A8 we use region (rather than region-sector) specific collective bargaining variable, and the results remain unchanged. In Table A9 we differentiate between workers in large vs small firms. While baseline results are are on the whole unchanged, we find some interesting heterogeneity in the effect of import tariff liberalization on the probability of working atypical hours: this is negative but slightly bigger for workers in large enterprises. In addition, the reduction in the collective bargaining rate has worsened the most the working conditions of workers in large firms.

Further checks are reported in the Online Appendix. These show the robustness of our results to: (i) the use of final vs intermediate goods tariff liberalization (tables B5 and B6 respectively), (ii) the use of the collective agreement variable constructed at country level (Table B7), (iii) the use of trade liberalization shocks between 1997 and 2004 (Table B8), (iv) controlling for the concentration of economic activity in the region (Table B9), and (v) different types of occupations (Table B10).

6.   Conclusion

We use a novel worker-level Eurostat dataset with precise information on earnings and individual characteristics to study the impact on wages and working conditions of both the import and export tariff liberalization that accompanied the accession of Eastern European countries to the European Union. We also make use of the multi-country aspect of our dataset to understand the link between the de-unionization process in Eastern European countries over the same period and workers' welfare. We find that tariff liberalization had a significant negative effect on hourly wages, while increases in foreign market access increased the probability of working overtime and atypical hours. In particular, in regions with one standard deviation more in tariff liberalization, workers earn 10% lower hourly

wages. Similarly, in regions presenting one standard deviation more in market access liberalization, workers have a 4.6% greater probability of poor working conditions. The process of labor market liberalization, approximated here by the reduction in the proportion of workers covered by collective agreements, exacerbated this loss of wages and deterioration in working conditions.

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Appendix

Appendix

1. Tables and Figures
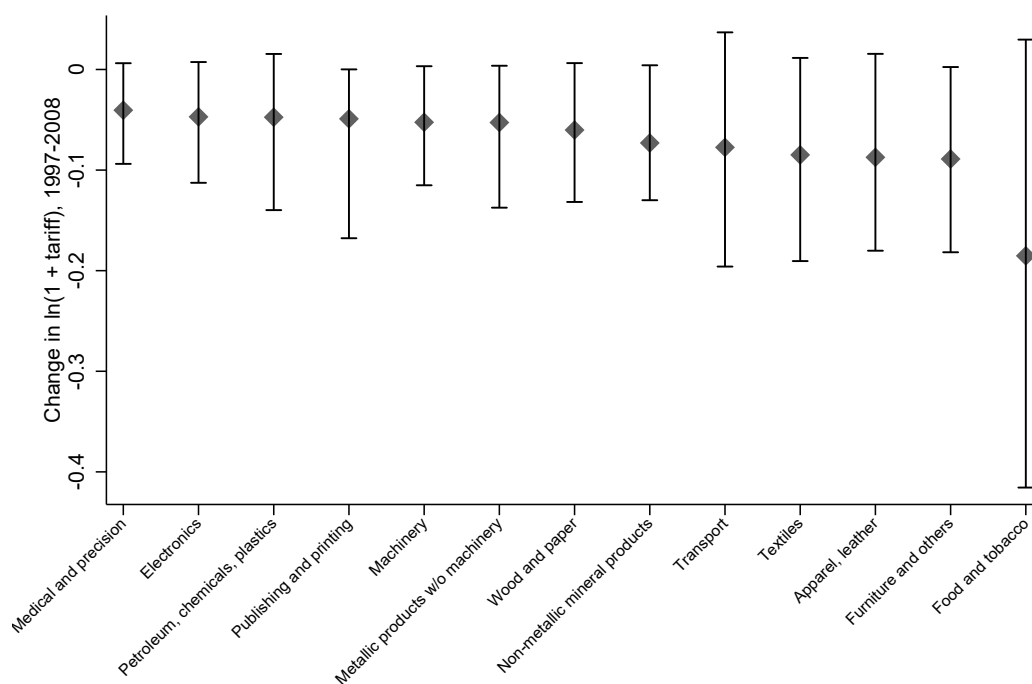
Figure A1 − Change in applied MFN tariffs between 1997 and 2008: average, minimum and maximum country values

Table A1 – Eastern European Countries' share of total imports originating from non-EU 15 countries. Years 1997, 2014 and percentage change

Country	Import Share 1997 (in %)	Import Share 2014 (in %)	% Change
Bulgaria	65	60	-8
Czech Republic	39	53	35
Estonia	42	60	43
Hungary	39	50	29
Lithuania	55	65	16
Latvia	55	67	23
Poland	39	51	32
Romania	48	50	3
Slovakia	58	66	14

Source: Authors' calculation on BACI (CEPII) data.

Table A2 – Selected reforms in the period 2002-2014 involving the collective bargaining or the regulation of overtime hours.

Country	Year	Policy
3*Bulgaria	2008	Admissibility of overtime when the commenced work cannot be finished during the regular working time.
	2012	Employment contract deemed a full-time employment contract if the performance of work is conducted outside of the agreed working time without the existence of conditions for overtime work.
	2012	New stringent criteria for the recognition of representative employee organizations (for example a trade union must have at least 75,000 members instead of 50,000 before, and have organizations in more than a quarter of NACE code-defined economic activities with at least five members).
7*Czech Rep.	2003	The Constitutional Court declared void the Act on Collective Bargaining which included provision for the Minister of Labour to unilaterally decree administrative extensions of collective agreements.
	2006	Introducing flexible working-time accounts, regulating working hours and rest periods.
	2007	A rest period between two shifts of seasonally working employees in agriculture might be drawn during the following three weeks since the rest period was shortened
	2007	A collective agreement might be preferred to the Labour Code arrangement in the field of a premium for night work and a premium for work on Saturdays and Sundays.
	2008	Eliminating trade union organizations' right to carry out inspections of companies' observance of the Labour Code, the Employment Act, other industrial regulations, internal regulations and obligations ensuing from collective agreements.
	2011	A trade union may operate in a company only if at least three of its members are employed by the company.
	2013	The employer is obliged to distribute the working hours so that the employee can rest without interruption for at least 12 hours within 24 consecutive hours between the end of one shift and the beginning of the next shift.
2*Estonia	2008	Payment for night work between 10 pm and 6 am to be increased from 1.2 to 1.25 times the regular wage, unless an additional salary for night work is already included in total wages. Moreover, evening work between the hours of 6 pm and 10 pm will no longer be assessed on the same basis as night work and will be paid as regular working hours.

Table A2 – *Continued from previous page*

Country	Year	Policy
	2012	Facilitating the termination of a collective agreement: each party has the right to unilaterally cancel the collective agreement once its term has expanded, after a period of notice of 6 months.
5*Hungary	2002	1) Introduction of the 40 hours weekly working time; 2) 50% work pay premium for people working on a Sunday; 3) afternoon-shift or night-work premium if any of the working time is between 14.00 to 22.00 or from 22.00 to 06.00 respectively.
	2011	Collective agreements and individual work contracts regulating working conditions differently to what is stipulated in the law. Example: the employer can reduce weekly working hours for a period and then increase it by the same amount later without changing wages (the employer decides how to compensate for overtime).
	2011	Right to conclude collective agreements for works councils, provided that there is no trade union at company level whose membership covers at last 10% of the employees.
	2012	Limitations to the unions' rights of veto and control over the living and working conditions of employees.
	2012	Permission for employers to change the working time regime with four days' notice (previously seven days). The Labour Code stipulates a one-shift 30% supplement (not a two-shift supplement of 30% for afternoons and 50% for nights as before).
3*Latvia	2002	Possibility to agree on flexible working time arrangements not only by collective agreement but also by individual employment contracts.
	2014	1) Affirming the right not to join a union; 2) Differentiating between company-level trade unions and those formed outside a company(non-company unions must have at least 50 founding members).
1*Lithuania	2009	Removal of restrictions to flexible work arrangements (part-time, temporary employment, overtime, night work).
2*Poland	2002	Reduction of premiums on overtime. Each hour of overtime on weekends is remunerated at a premium of 50% on top of normal pay. Overtime at nights, on Sundays and holidays which are normally free, are remunerated with a premium of 100%. Previously the first two hours of overtime were remunerated at a premium of 150% and subsequent hours on weekdays were remunerated with a premium of 200%.

Table A2 – *Continued from previous page*

Country	Year	Policy
	2003	The minimum membership for a union organization operating within an entity required for entitlement to special employment protection increased to 10 people.
4*Romania	2005	Extending the reference period for calculating the maximum number of working hours per week (48 hours) - beyond which limit overtime is officially acknowledged.
	2006	Overtime pay of 100% of the basic wage to be provided any additional working hours (previously granted for a maximum of 120 additional hours per year)
	2011	Increased working time flexibility by extending the reference period from 3 to 4 months for an expanded working week of more than 48 hours. Extended the period over which overtime can be compensated with hours off from 30 to 60 days.
	2011	More stringent criteria for establishing trade unions at firm level.

Table A3 – Robustness check addressing the potential spatial correlation of the error term.

Dep. Variable	Wages	Hours	Likelihood of working	
			Night, Weekends or Shift	Overtime
	(1)	(2)	(3)	(4)
Import liberalization	-0.004***	0.000	-0.001**	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)
Export liberalization	0.001	-0.001	0.002***	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
Collective bargaining	-0.342***	0.191***	0.200***	0.185***
	(0.132)	(0.072)	(0.059)	(0.042)
Female	-0.175***	-0.017***	-0.050***	-0.046***
	(0.013)	(0.001)	(0.008)	(0.008)
Short-term contract	-0.127***	-0.013**	-0.003	0.008
	(0.016)	(0.006)	(0.016)	(0.005)
50+ employees	0.247***	0.058***	0.133***	0.083***
	(0.016)	(0.016)	(0.021)	(0.007)
Shocks:				
Productivity	Yes	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes	Yes
CPI index	Yes	Yes	Yes	Yes
Fixed effects:				
Education x Age	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes	Yes
R^2	0.463	0.040	0.308	0.229
Obs.	2,765,815	2,765,815	2,765,815	2,765,815
Countries	9	9	9	9
Regions	20	20	20	20

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table A4 – Correlation between the trade shocks and the drop in collective bargaining.

Dep. Variable	Collective bargaining			
	(1)	(2)	(3)	(4)
Import liberalization	0.002***		0.001***	0.001***
	(0.000)		(0.000)	(0.000)
Export liberalization		-0.002***	-0.001**	-0.001**
		(0.000)	(0.000)	(0.000)
Fixed effects:				
Sector	Yes	Yes	Yes	No
Adj. R^2	0.0914	0.064	0.1	0.106
Observations	320	320	320	320

Note: Standard errors are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table A5 – Removing Poland from the sample or Hungary and Romania.

Sample	Without Poland			Without Hungary and Romania		
Dep. Variable	Likelihood of working Nights, Weekends or Shift	Overtime	Wages	Likelihood of working Nights, Weekends or Shift	Overtime	Wages
	(1)	(2)	(3)	(4)	(5)	(6)
Import liberalization	-0.002***	0.000	-0.007***	-0.001***	0.000	-0.004***
	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)
Export liberalization	0.003***	0.002***	0.001*	0.002***	0.001***	0.001***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Collective bargaining	0.274***	-0.055	-0.140**	0.275**	-0.073	-0.032
	(0.026)	(0.087)	(0.061)	(0.094)	(0.076)	(0.052)
Φ'_i	Yes	Yes	Yes	Yes	Yes	Yes
Shocks:						
Productivity	Yes	Yes	Yes	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes	Yes	Yes	Yes
CPI index	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Education × Age	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.411	0.239	0.614	0.415	0.228	0.582
Observations	2,336,041	2,336,041	2,336,041	2,456,225	2,456,225	2,456,225
Countries	8	8	8	7	7	7
Region	14	14	14	13	13	13

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively. Worker-specific controls Φ'_i included but not reported.

Table A6 – Baseline specification with estimated coefficients for control variables.

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001*	0.000	-0.004***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001***	0.000
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.245***	-0.016	-0.161**
	(0.064)	(0.064)	(0.075)
Female	-0.056***	-0.048***	-0.183***
	(0.007)	(0.007)	(0.011)
Short-term contract	0.000	0.008*	-0.128***
	(0.016)	(0.005)	(0.017)
50+ employees	0.133***	0.086***	0.245***
	(0.020)	(0.008)	(0.017)
GDP/cap shock	-1.260***	-0.530***	2.001***
	(0.081)	(0.083)	(0.229)
Migration shock	-0.021***	-0.004	0.082***
	(0.003)	(0.003)	(0.008)
FDI shock	-4.737***	-3.565***	-5.631***
	(0.253)	(0.359)	(0.982)
CPI shock	0.005	0.013	0.075
	(0.013)	(0.014)	(0.053)
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.417	0.228	0.597
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table A7 – Restricting the sample to private companies

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001*	0.000	-0.005***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.002***	0.000
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.239***	-0.049	-0.154*
	(0.072)	(0.059)	(0.079)
Female (1/0)	-0.055***	-0.043***	-0.184***
	(0.007)	(0.006)	(0.012)
Short-term contract (1/0)	0.004	0.016***	-0.120***
	(0.017)	(0.005)	(0.017)
50+ employees (1/0)	0.134***	0.090***	0.255***
	(0.023)	(0.008)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.428	0.233	0.604
Observations	2,442,747	2,442,747	2,442,747
Countries	9	9	9
Region	20	20	20

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table A8 – Using the regional level change in collective bargaining

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001**	-0.000	-0.004***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001**	0.001
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.191***	0.181***	-0.357**
	(0.064)	(0.045)	(0.138)
Female (1/0)	-0.055***	-0.049***	-0.184***
	(0.007)	(0.008)	(0.011)
Short-term contract (1/0)	-0.002	0.008	-0.126***
	(0.016)	(0.005)	(0.017)
50+ employees (1/0)	0.133***	0.083***	0.248***
	(0.021)	(0.007)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.416	0.229	0.597
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: The collective bargaining variable is the regional change in the share of firms with a collective pay agreement between 2002 and 2014. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table A9 – Small versus Large firms

Sample	Small companies			Large companies		
Dep. Variable	Likelihood of working Nights, Weekends or Shift	Overtime	Wages	Likelihood of working Nights, Weekends or Shift	Overtime	Wages
	(1)	(2)	(3)	(4)	(5)	(6)
Import liberalization	-0.000*	-0.000	-0.005***	-0.001*	0.000	-0.004***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001***	0.001	0.002***	0.001***	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Collective bargaining	0.101***	0.103***	-0.191**	0.231***	-0.058	-0.144*
	(0.027)	(0.031)	(0.085)	(0.075)	(0.076)	(0.072)
Female (1/0)	-0.016***	-0.015***	-0.086***	-0.064***	-0.054***	-0.196***
	(0.004)	(0.003)	(0.013)	(0.006)	(0.006)	(0.008)
Short-term contract (1/0)	0.005	0.014***	-0.078***	-0.000	0.006	-0.126***
	(0.008)	(0.004)	(0.020)	(0.018)	(0.006)	(0.019)
Shocks:						
Productivity	Yes	Yes	Yes	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes	Yes	Yes	Yes
CPI index	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Education x Age	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.159	0.0771	0.551	0.39	0.212	0.58
Observations	352690	352690	352690	2415782	2415782	2415782
Countries	9	9	9	9	9	9
Region	20	20	20	20	20	20

Note: The cut-off level between small and large companies is 50 employees. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.
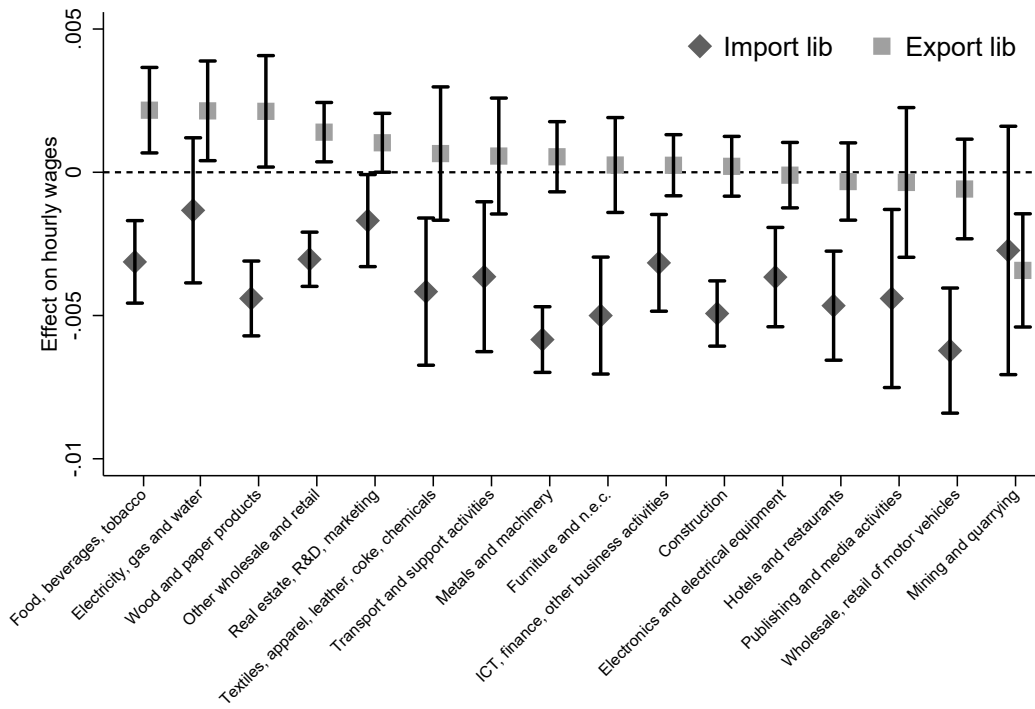
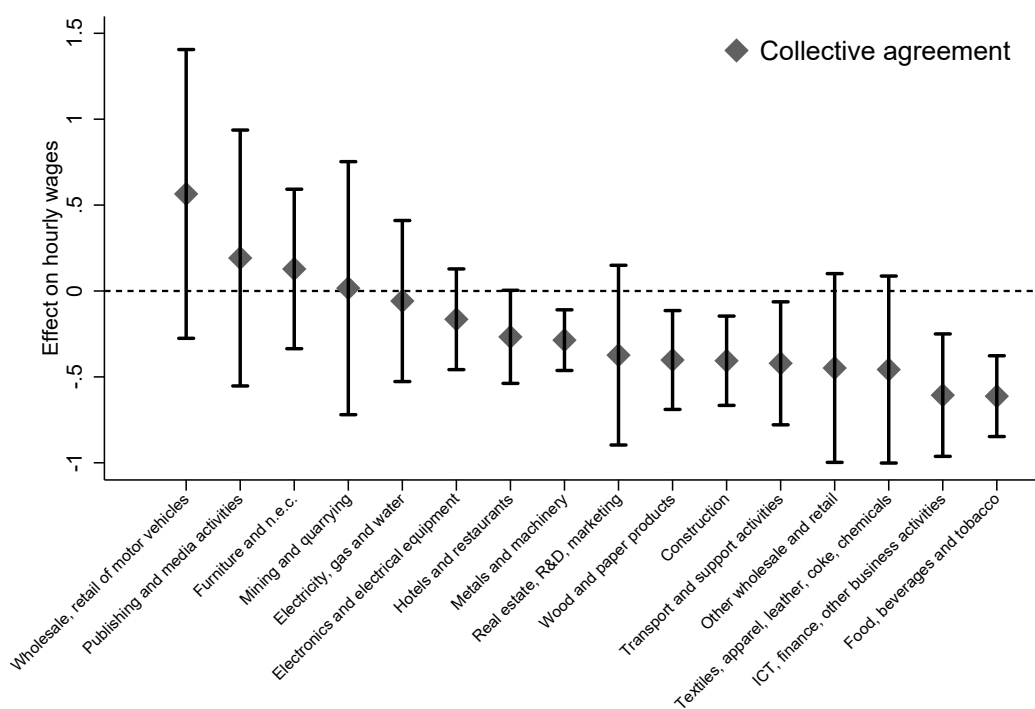**Figure A2 − Effect of trade liberalization on hourly wages by sector**

Figure A3 – Effect of collective bargaining decrease on hourly wages by sector

2.　Main Variables Construction

A.　Import and export liberalization variables

Following Dix-Carneiro & Kovak (2017), we build the tariff liberalization variable of each region by combining countries' industry-level tariffs and region-industry weights β_{rck}:

$$Lib_{rc}^l = -\sum_k \beta_{rck} \Delta ln(1 + \tau_{ck}^l) \ \ with \ \ \beta_{rck} = \frac{\lambda_{rck}\frac{1}{\phi_{ck}}}{\sum_k \lambda_{rck}\frac{1}{\phi_{ck}}} \ \ and \ \ l = M, X \tag{4}$$

the superscript l indicate the nature of the shocks, i.e. import (M) or export (X) tariff respectively. $\Delta ln(1 + \tau_{ck}^M)$ is the difference in the tariffs between the pre-enlargement year 1997 and 2008 for a given sector k and country c. The cost share of non-labor factors ϕ_{ck} and tariff changes τ_{ck} are at the sector-country level.[32] In contrast, the labor shares λ_{rck} are at the sector-region level and obtained from two different sources. For most countries and regions, we can extract that information from the 2002 wave of the Structure of Earnings Survey.[33] For Poland and Bulgaria, regional indicator had been removed by national authorities in 2002 in the anonymization process. We were able to retrieve indication on Polish Voivoideships and Bulgaria NUTS-1 regions in the local unit and employee identifiers contained in the survey.[34] For Hungary and Romania, regional information is not available in 2002 wave of the SES. Instead, we use the regional level Structural Business Survey of 2001 and 2002, respectively, to compute the regional share of workers in each industry.

The sector classification used in the construction of the tariff liberalization variables is based on the one furnished by Eurostat to harmonize SES data for different years. It is slightly more aggregated than the 2-digit level NACE Rev. 1 and is available in Table B1 of the Online Appendix.

We obtain our tariff liberalization variable expressed in percentage points.[35] Finally, we standardize that variable to be between 0 (lowest value) and 100 (highest value). The final regional tariff liberalization variables span over 20 regions in 9 countries.

As a robustness check, we use a country-level tariff liberalization variable. The only difference is that the labor share is at country-level and is obtained for all countries from the SES 2002. Results are not affected.

The construction of the sector-level change in import and export tariffs and of the cost-share of non-labor factors of production are explained in the following sub-sections.

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[32] See sections A.1, A.2 and A.3 for additional details on their construction.

[33] The Czech Republic, Estonia, Latvia, Lithuania and Slovakia do not have any NUTS 1-digit regional decomposition. Therefore, their tariff liberalization shocks are computed at the country-level. We have 6 regions in Poland, 4 in Romania, 3 in Hungary and 2 in Bulgaria.

[34] For Bulgaria in both 2002 and 2014 SES, about 5% of the observations are dropped as we cannot allocate them to a specific region.

[35] Only Estonia has a negative value for the import liberalization variable, since it had to increase its MFN tariffs when joining the EU.

A.1. Change in MFN tariffs on imports

The main component of the import liberalization variable is the industry-level change in applied MFN tariff from 1997 to 2008. We choose 1997 as base year for two reasons. First, looking at the trade policy evolution over the entire accession process helps to avoid any anticipation effect of trade to the perspective of the European integration. Second, the product-level tariff data availability is limited before 1997.[36] As we are only interested in the EU enlargement induced drop tariff liberalization, we use 2008 as ending date, once the 2007 enlargement in completed.

In any given year, sector-level tariffs on imports are a weighted sum of all product-level tariff lines belonging to the same sector, weighted by imports:

$$\tau_{ck}^M = \sum_p \sum_o \omega_{ocpk}^{1997} \tau_{ocpk} \quad with \quad \omega_{ocpk}^{1997} = \frac{Imp_{ocpk}^{1997}}{\sum_p \sum_o Imp_{ocpk}^{1997}} \tag{5}$$

where τ_{ocpk} are tariffs applied by country c on product p and sector k originating from country o. We obtain these data from the WTO. Weights ω_{ocpk}^{1997} correspond to the share of product p originating from country o in the total imports of a given sector k in a given country c in 1997 and are built using the BACI database. We keep the weighting scheme of 1997 to build 2008 sector level tariffs in order to remove the issue of trade being endogenous to tariffs reduction. For the post-accession year 2008, although formally higher than zero, we set the *MFN* applied towards EU partners to zero and took the weighted average rate across EU and non-EU partners (with import share in 1997 used as a weight). It allows to account for the huge tariff liberalization implied by the zeroing of tariffs towards EU-partners after accession to the common EU market. Ignoring this aspect of the heterogeneity in the drop in tariff would understate the extent of the liberalization.

Three technical aspects related to the classification of products should be underlined. First, years 1997 and 2008 of our WTO data on tariffs are not aggregated at the same level of detail. The former is at the HS 6-digit level while the latter is at the 8-digit level. This raises the difficulty of choosing which of the several 8-digits line corresponding to each 6-digit line is to be kept. We decide on the one with the highest tariff rate.[37] Second, to allocate each product line to a sector, we use a conversion table from HS96 to ISIC Rev. 3 classification.[38] No observation is lost in that process. Finally, we need to have the exact same sectors as for the other components of the tariff liberalization variable. Therefore we use the classification available in the SES 2002.[39]

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[36] For Slovakia and Romania we use respectively 1998 and 1999 due to a lack of information before.

[37] The year 2011 is present in both datasets, so it can be taken as a point of comparison to choose the adequate method of aggregation. Ultimately, the average difference between our reconstructed tariffs and the original 6-digit tariffs is only 0.05% for all products and 0.005% for non-agricultural products in 2011.

[38] ISIC Rev. 3 is the UN equivalent to the NACE rev1 classification. They are fully comparable at the 2-digits level.

[39] See section A.3. We use a slightly different decomposition for Slovakia and Latvia, but the final variable being aggregated over the industry-level it does not constitute an issue.

A.2. Change in tariffs on exports

We also construct an export liberalization shock based on tariffs encountered by exports of our 9 Eastern European economies. That variable is conceptually very close to the import liberalization shock and we use the same data sources. Again, the main component of the tariff liberalization variable is the sector-level change in tariffs from 1997 to 2008. However, instead of aggregating product-level tariffs of the destination country, we focus on tariffs applied by trade partners of Eastern European countries. Moreover, we use applied tariffs rather than MFN tariffs to reflect better actual tariff changes. Indeed, endogeneity is less of a concern for exports as tariffs are not set by countries of the sample. Since we consider tariffs from all countries of the world, data availability becomes a bigger issue. The base year for most countries of destination is 1997 but depending on tariff data availability alternative years going from 1996 to 2003 are used.[40]

In any given year, sector-level tariffs on exports are a weighted sum of all product-level tariff lines of other countries belonging to the same sector, weighted by exports:

$$\tau_{ck}^X = \sum_p \sum_d \omega_{dcpk}^{1997} \tau_{dcpk} \quad with \quad \omega_{dcpk}^{1997} = \frac{Exp_{dcpk}^{1997}}{\sum_p \sum_d Exp_{dcpk}^{1997}} \tag{6}$$

where τ_{ocpk} are tariffs applied by country c on product p and sector k originating from country o. We obtain these data from the WTO. Weights ω_{ocpk}^{1997} correspond to the share of product p originating from country o in the total imports of a given sector k in a given country c in 1997 and are built using the BACI database. We keep the weighting scheme of 1997 to build 2008 sector level tariffs in order to remove the issue of trade being endogenous to tariffs reduction.

Going from product level data in 1997 and 2008 to a change in sector-level tariffs involves several steps of aggregation, which are similar to the one described above in Section A.1. The only difference involves the choice of tariff to use. For each tariff line, we use the minimum between preferential tariff and MFN tariff, that is the applied tariff. The final export liberalization variable is built following the equation described in Section A.

A.3. Cost share of non-labor factors of production

In Dix-Carneiro & Kovak (2019), the cost-share of non-labor factors ϕ_{ck} allows to weight industry-level share of workers by the importance of the labor factor in each industry. It is computed using the average 2000-2003 gross operating surplus and total remuneration. For each sector k:

$$\phi_{ck} = \frac{gos_{ck}}{gos_{ck} + rem_{ck}} \tag{7}$$

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[40]A large majority of tariffs and in particular the main countries of destination are for 1997 and surrounding years.

with gos_{ck} the gross operating surplus of sector k in country c and rem_{ck} the total amount of remuneration paid in the same sector.[41] Associated with the labor share λ_{rck}, it allows to account for the importance of the labor factor in the production function of each sector k.

We obtain the two components of ϕ_{ck} from Eurostat's Structural Business Survey (SBS). Optimally, we would only use 2002 data, to match the year of the labor share λ_{rck}. However, they are several missing values for 2002 and surrounding years at the 2-digit level . Therefore, we compute an average of gos_{ck} and rem_{ck} over existing data from 2000 to 2003, for each 2-digits NACE Rev. 1 sector.

B. Collective bargaining variable

The collective bargaining variable is based on region-sector coverage rates: it is the difference between the shares of firms where the majority of workers is covered in 2014 and 2002 in each region-sector cell:

$$\Delta Col_{rck} = -\left(\frac{Covered_{rck}^{2014}}{Firms_{rck}^{2014}} - \frac{Covered_{rck}^{2002}}{Firms_{rck}^{2002}}\right) \tag{8}$$

with $Covered_{rck}^{t}$ being the number of firms considered as covered by a collective agreement in year t in sector k of region r, country c and $Firms_{rc}^{t}$ the corresponding total number of firms in the region in year t. To construct this regional level labor market liberalization variable, we use a SES variable on the existence of a collective pay agreement in a firm. We are able to identify the type of pay agreement (national, sector or firm-level) covering the majority of the workforce of any local unit or if no such collective agreement exists. Bargaining frameworks differ largely between countries, so we focus on the main distinction, its existence, rather than its scope. The data does not allow us to separate covered and uncovered workers of the same local unit: if a most workers are covered, the entire workforce is coded as being covered by the collective pay agreement in the SES. Therefore, we look at the change in the share of "covered" firms rather than the share of covered workers.[42]

Equation 8 can be readily applied for the six countries for which we can directly compute the share of covered firms in each sector and region in both 2002 and 2014. For the three remaining countries, two issues need to be dealt with before computing ΔCol_{rck} . First, the SES 2002 does not contain information about the region where Hungarian and Romanian firms are located.[43] We can only construct the share $Covered_{ck}^{2002}$. To regionalize the coverage rate, we compute for each region the difference between the country-sector coverage rate and the country-region-sector coverage rate

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[41] An alternative measure could use the wage-bill of the sector instead of the remunerations, but we try to be as close to possible to Dix-Carneiro & Kovak (2019) who used "Remuneracoes" from Brazilian data sources.

[42] All workers of a firm with a majority of covered workers are coded as covered in the SES, including workers who are potentially uncovered. Constructing our coverage rate as the share of "covered workers" would entail a large amount of double counting.

[43] Section A also delves on that issue

using the Structural Business Surveys of 2006:

$$Col_{rck}^{Corrective} = Col_{rck}^{2006} - Col_{ck}^{2006} \qquad (9)$$

with Col_{rck}^{2006} the share of firms with a collective agreement in sector k, region r of country c in 2006. Then, $Col_{rck}^{Corrective}$ is added to the country-sector coverage rate of 2002 Col_{ck}^{2002} to obtain a country-region-sector coverage rate for that year. The validity of this method requires the regional heterogeneity in sector-level coverage rate to be identical in 2002 and 2006.

Another limitation has to be tackled in the case of Poland's 2002 SES: the firm-level variable on collective agreements is missing.[44] However, as reported in Magda et al. (2016), the share of covered male workers in private firms of the manufacturing sector is 54.4% in Poland in 2004. Knowing how coverage rates of the different sectors and of private and public companies relate to each other, we can construct a corrective to apply to that 2004 private manufacturing coverage rate. We proceed in two steps. First, we look at the relationship between sector-ownership-region-year coverage rates cells by estimating the following specification for Poland only using the SES 2010 and 2014:

$$Col_{k,o,r,t} = \alpha_0 + \mu_{rk} + \mu_{ok} + \mu_t + \xi_{k,o,r,t} \qquad (10)$$

where μ_{rk}, μ_{ok}, and μ_t are fixed effects for the region-sectors dimension rk, ownership status and sector dimension ok and years t. They capture the difference from the average coverage rate for each region-sector and for public firms of each sector. We use those estimates to compute a corrective coverage rate $Col_{rok}^{Corrective}$ to the number we have for the year 2004: it is the average difference in the coverage rate of each region-sector-ownership status cell and the coverage rate of private manufacturing firms. We then add the corrective to the 2004 collective bargaining ratio from Magda et al. (2016) to obtain the reconstructed coverage rate : $\widehat{Col}_{rok} = 0.544 + Col_{rok}^{Corrective}$. In a second step, we aggregate those coverage rates at the regional-sector level based on the weight of each cell in regional firm demography in Poland $\lambda_{rok}^{f,2002}$, taken from the 2002 SES.

$$\widehat{Col}_{rk} = \sum_o \lambda_{rok}^{f,2002} \widehat{Col}_{rok} \qquad (11)$$

The validity of this approach relies on the necessary condition that average differences in coverage rate between industries and public and private firms are identical in 2002 and on the 2010-2014 period on which they are estimated. It also requires the worker level coverage rate described in Magda et al. (2016) for Poland to be a good approximation of the firm-level one.

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[44]The variable is also missing from the 2006 version of the SES.

Appendix

"Trade Liberalization, Collective Bargaining and Workers: Wages and Working Conditions"
Additional Material not for Publication

1.   Data and Definitions

A.   Overview of Variables

Dependent variables:

- Log of hourly wage: average gross hourly earnings in the reference month. It is expressed in euro and contains the wage of both regular and overtime hours. Source : SES.
- Night-Weekend-Shift work: a dummy equal to 1 if the worker received premium payments during the reference month for shift work, night work or weekend work where these are not treated as overtime. Source: SES.
- Overtime hours: a dummy equal to 1 if the observation worked overtime during the reference month. Source: SES.

Explanatory variables:

- Import liberalization: we follow Dix-Carneiro & Kovak (2017) in constructing a regional index of tariff liberalization over the 1997-2008 period. It is the mean of the country-sector-level drops in MFN tariffs of Eastern European countries between 1997 and 2008 weighted by the sectoral distribution of workers in each region. Tariff data comes from the WTO and is aggregated at the sectoral level using BACI data. Regional weights are computed using Eurostat's Structural Business Survey and the Structure of Earnings Survey. The construction of that variable is presented in more detail in Section 2.
- Export liberalization: in addition to the import liberalization variable, we construct on index of export liberalization in a similar fashion. We replace the drop of in MFN of Eastern European countries by the fall in the applied tariffs encountered by these countries' exports. The construction of that variable is presented in more detail in Section 2.
- Collective bargaining: this variable is the drop in the share of firms with a majority of workers covered by collective wage agreements between 2002 and 2014 in each sector and region. The underlying data is from the Structure of Earnings Survey. Special treatment in the case of Poland, Romania and Hungary are described in Section B.
- NB: in the estimations, the export and import tariff liberalization variables are re-scaled to be

comprised between 0 (minimum value) and 100 (maximum value). In specifications where they are interacted with another variable, they were additionally centered on their sample average value in order to easily interpret the direct effect as an average sample effect.

Individual and firm-level controls from the Structure of Earnings Survey:

- Female (1/0): a dummy equal to 1 if the worker is a woman, 0 if a man.
- Short-term contract (1/0): a dummy equal 1 if the worker has a temporary work contract.
- 50+ employees (1/0): a dummy equal to 1 if the worker's company has more than 50 employees.

Country-level shocks :

- Productivity: we use the log-difference of GDP/capita between 1997 and 2014, from the WDI database, to control for productivity shocks that hit Eastern European countries in the course of their EU integration.
- Labor supply: to control for migration shocks that could affect wages and labor supply, we compute the net migration flow of Eastern European countries from 1997 to 2014 as a share of their 1997 population, based on Eurostat data.
- Foreign capital supply: some Eastern European countries became production hub in European value chains in the last decades, hence we measure the exposure to multinational using the 1997-2014 log-difference in the ratio of net foreign property income over GDP, from Eurostat national accounts.
- CPI index: to control for price evolution due to the fall in tariffs, we use the 1997-2014 log-difference of the consumer price index, taken from the WDI database.
- Relative population growth: to control for regional demographic dynamics, such as internal migrations, we compute the log-difference between regional and national population growth on the 1997-2014 period, using Eurostat data.
- Wage_{rc}^{2002}: we use the log of average regional wages in 2002, extracted from the Structure of Earnings Survey, to control for initial condition. In the SES 2002, there is no regional information for Romania and Hungary. Hence, we compute the national average wage from this data source and regionalize it by applying the same regional deviation to the national average wage from Eurostat's Structural Business Survey to the SES data.

Other Structure of Earnings Survey information used as fixed-effects or by-sample esimations:

- Sector: 14 categories based on NACE rev2 classification for the fixed-effects and 2 categories (manufacturing and mining and quarrying versus all other sectors) for the table presenting results

by sector.

- Age: individuals are split in 3 categories (20-29, 30-49 and 50-59). Individuals over 59 and under 20 are excluded altogether from the sample.

- Occupation: we use the occupations based on ISCO-08 at the 1-digit level as a fixed-effect. We aggregate in 3 groups when looking at the role of occupations.

- Length of employment: workers are identified as being in the company for less than year, in the company from 1 to 4 years or 5 years or more.

- Education: 4 categories based on the ISCED 2011 classification. It is used as fixed-effects.

- Ownership: dummy equal to 1 if the company is publicly-owned. It is used for the regression by sample where we only keep workers from privately-owned companies.

- Part-time or full-time: dummy equal to 1 if the observation works part-time (that is less than 100% of the full-time hours).

B.   Classifications used for education, sectors and occupations

This sub-section presents the sector, education and occupation classifications used in our study. Due to the timespan of our data and the number of different data sources, some degree of harmonization was necessary. The SES data spans over a period of 12 years during which many international classifications were updated and transformed substantially. In particular, the ISCED classification for education attainment was modified in 2011 while the sectoral NACE classification was updated to its second revision (Rev. 2) in 2008.[45] This issue was partially dealt with by Eurostat, which decided to keep a certain level of comparability between the different SES waves and created their own versions of sectoral and educational classifications by aggregating different 2-digits sectors and detailed education categories. These aggregations are presented below in Table B1 for sectors in 2002 and Table B4 for education in 2014. On top of that, Eurostat required national statistical agency to ensure the anonymity of survey participants by aggregating some sector together. Merging different sectors where very few firms exists in a given year, country and region in a unique sector removes the possibility to identify said firms. However, the anonymization process was conducted at the national level and, as a result, sector classifications are country-specific in each SES wave. Therefore, a harmonization is necessary in to be able to use sector fixed-effects and construct sector-level variables. The one that we use in this study is presented below in Table B2.

Sectors

Two correspondences were designed for the sector dimension. The first one, in Table B1, is matching sectors from the SES 2002 with the Structural Business Survey and is used in the construction of import and export liberalization variables. Only Slovakia and Latvia use a different classification due

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[45]Regarding the occupation dimension, ISCO classification for occupation went from ISCO-88 to ISCO-08 in 2008 but we could keep the ISCO-08 classification used in the SES 2014. However, we removed some specific occupation, as can be seen in Table B3.

to the missing values in the Structural Business Survey. Because these two shocks are ultimately at the regional level, it is not required for the sector classification used to aggregate tariffs lines to be same in all countries.

Table B1 – Sector correspondence between SBS and SES

Nace Rev1	Most countries	Slovakia and Latvia
15	DA	DA
16	DA	DA
17	17	17
18	18, 19	18, 19, DF to DH
19	18, 20	18, 19, DF to DH
20	20, 21	20, 21
21	20, 21	20, 21
22	22	22
23	DF to DH	18 19 DF to DH
24	DF to DH	18 19 DF to DH
25	DF to DH	18 19 DF to DH
26	DI	DI
27	DJ	DJ
28	DJ	DJ
29	DK	DK
30	30 to 32	30 to 32
31	30 to 32	30 to 32
32	30 to 32	30 to 32
33	33	33
34	DM	DM
35	DM	DM
36	DN	DN
37	DN	DN

The second correspondence is used as basis for the sector fixed-effects present in our baseline specification and for the construction of the collective bargaining variable. As the difference between region-sector coverage rate in 2002 and 2014, it requires a sectoral classification valid from 2002 to 2014 and for all nine countries of our sample. As explained above, Eurostat devised a sectoral classification intermediate between 1 and 2 digits of NACE Rev. 2. It allows to encompass the change of NACE classification in 2008, but is country-specific. We create an harmonized correspondence spanning over the 4 waves of the SES and the nine countries of our sample containing 16 sectors, including both manufacturing and private services, and presented in Table B2.

Table B2 – Sector harmonization used in the study

Industry codes	Composition
B	Mining and quarrying
Manufacturing:	
10 to 12	Food, beverages and tobacco
13 to 15, 19 to 23, 29, 30	Textiles, app., leather, coke, chemicals, rubber, plastic, transport equi.
16, 17	Wood and paper products
18, 58 to 60	Publishing and media activities
24, 25, 28	Metals and machinery
26, 27, 33	Electronics and electrical equipment
31, 32	Furniture and not elsewhere classified
35, 36	Electricity, gas and watetr
F	Construction
45, 46	Wholesale and retail trade of motor vehicles
47	Other wholesale and retail trade
I	Hotels and restaurants
49 to 52	Transport and support activities
53, 61 to 66, 69 to 71, 78, 80 to 82	Telecommunication, ICT, financial services, other business activities
68, 72 to 74, 77, 95	Real estate, R&D, marketing

Occupations

The SES data provides information on individual occupation at the 2 and 3-digits levels of the ISCO classification, depending on the country and the year. We provide in Table B3 the two classification we use. First, the aggregated 1-digit level classification employed as fixed-effects in the baseline specification. Discrepancies and country specificities in the original occupation information makes it difficult to use the 2-digit level. Moreover, we drop the occupation corresponding to drivers due to the mobile nature of the job, and also professors and other educators, agriculture-related workers and army personnel due to the absence of the corresponding sectors in our survey (education, agriculture and government employees). We therefore have 8 occupation categories that are going to be used as fixed-effects in our estimations.

Second, three aggregate categories are created to be used in the estimation on different occupation samples (see Table B10). High-skill occupations (ISCO 1) are gathering managers (7.9% of the full sample). Medium-skill occupations (ISCO 2-8) are professionals, associate professionals, clerks, service workers and salespersons, craft and trade workers and plant and machine operators (85.7% of the full sample). Low-skill workers (ISCO 9) are elementary occupations (6.5% of the full sample).

Table B3 – Occupation classification

Detailed ISCO-08 occupation	Sample regression classification	Occupation description
1	High	Managers
2		Professionals
3		Technicians and associate professionals
4	Medium	Clerical support workers
5		Service and sales workers
7		Craft and related trades workers
8		Plant and machine operators, and assembler
9	Low	Elementary occupations

Occupations removed from the sample:

0		Army personnel
6		Agricultural occupations
23		Teaching professionals
83		Drivers

Education

We keep the 4 education categories provided by the SES 2014 as they are and use them as fixed effects. The classification is based on ISCED-2011.

2.   Supplemental Empirical Results

This section presents additional results, that were not included in the main text of the paper, due to limitations of space.

In Tables B5 and B6 we modify the import liberalization variable by restricting it to measuring the liberalization of MFN tariffs of, respectively, final and intermediate goods, based on the BEC classification. No substantial differences are observed in comparison to our baseline results.

In Table B7, we use an alternative collective bargaining variable constructed at the country-level. The sectoral dimension of the variable is removed. We find similar results as in table A8.

The import and export liberalization variable are constructed to reflect the fall in tariffs from 1997 to 2008, that is over the accession period. Table B8 uses an alternative period ranging from 1997 to 2004.

In Table B9, we introduce an new variable, the herfindahl index, understand the role of concentration in our results. It is constructed as the sum of squared share of workers working in each sector in

Table B4 – Education classification

High, medium and low	SES 2014	ISCED-2011	Education category
Low	1	0-1	Primary education
		2	Lower secondary education
Medium	2	3	Upper secondary education
		4	Post-secondary education
	3	5	Short-cycle tertiary education
		6	Bachelor or equivalent
High	4	7	Master or equivalent
		8	PhD or equivalent

a given region. These results show that concentration only interacts with the import liberalization shock by reinforcing its effect on wages while weakening the increase in shift work.

In Table B10, we split the sample by occupation group. We estimate our baseline specification separately on managers, elementary occupation and all other workers. We find low occupation workers are the most affect in terms of wage by the import liberalization shock and in terms of working condition by the export liberalization shock. We also find that most of the effect of drop in collective bargaining falls on low occupation workers.

Table B5 – Using the import liberalization shocks on final goods only

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001**	0.000	-0.005***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001***	0.000
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.258***	-0.018	-0.132**
	(0.064)	(0.066)	(0.063)
Female (1/0)	-0.056***	-0.048***	-0.183***
	(0.007)	(0.007)	(0.011)
Short-term contract (1/0)	0.000	0.008	-0.128***
	(0.016)	(0.005)	(0.018)
50+ employees (1/0)	0.133***	0.086***	0.246***
	(0.020)	(0.008)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.418	0.228	0.597
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table B6 – Using the import liberalization shocks on intermediate goods only

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001*	0.000	-0.004***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001***	-0.000
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.243***	-0.016	-0.173**
	(0.063)	(0.065)	(0.075)
Female (1/0)	-0.056***	-0.048***	-0.183***
	(0.007)	(0.007)	(0.012)
Short-term contract (1/0)	-0.000	0.008*	-0.128***
	(0.016)	(0.005)	(0.018)
50+ employees (1/0)	0.133***	0.086***	0.245***
	(0.020)	(0.008)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.417	0.228	0.596
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table B7 – Using country-level change in collective bargaining

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001*	-0.001	-0.002***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001	0.002***
	(0.001)	(0.000)	(0.000)
Collective bargaining	0.270**	0.258***	-0.834***
	(0.126)	(0.089)	(0.181)
Female (1/0)	-0.055***	-0.049***	-0.184***
	(0.007)	(0.008)	(0.012)
Short-term contract (1/0)	-0.002	0.008	-0.125***
	(0.016)	(0.005)	(0.017)
50+ employees (1/0)	0.134***	0.084***	0.250***
	(0.021)	(0.007)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.416	0.229	0.599
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Collective bargaining is here computed at the country level. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table B8 – Using the trade liberalization shocks between 1997 and 2004

Dep. Variable	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)
Import liberalization	-0.001**	0.000	-0.004***
	(0.000)	(0.000)	(0.001)
Export liberalization	0.002***	0.001***	0.000
	(0.000)	(0.000)	(0.001)
Collective bargaining	0.259***	-0.005	-0.171**
	(0.059)	(0.066)	(0.074)
Female (1/0)	-0.056***	-0.048***	-0.183***
	(0.007)	(0.007)	(0.011)
Short-term contract (1/0)	0.001	0.009*	-0.128***
	(0.016)	(0.005)	(0.018)
50+ employees (1/0)	0.134***	0.087***	0.244***
	(0.019)	(0.008)	(0.017)
Shocks:			
Productivity	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes
CPI index	Yes	Yes	Yes
Fixed effects:			
Education x Age	Yes	Yes	Yes
Occupation	Yes	Yes	Yes
Sector	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes
Adj. R^2	0.417	0.228	0.596
Observations	2,768,472	2,768,472	2,768,472
Countries	9	9	9
Region	20	20	20

Note: Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table B9 – Controlling for sectoral concentration levels

Dep. Variable	Likelihood of working		Wages	Likelihood of working		Wages
	Nights, Weekends or Shift	Overtime		Nights, Weekends or Shift	Overtime	
	(1)	(2)	(3)	(4)	(5)	(6)
Import liberalization	-0.001*	0.000	-0.004***	-0.001***	0.000	-0.003***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Export liberalization	0.002***	0.001***	0.001	0.003***	0.001***	0.001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Collective bargaining	0.263***	-0.010	-0.105*	0.289***	-0.035	-0.074
	(0.064)	(0.065)	(0.052)	(0.084)	(0.062)	(0.055)
Import liberalization x $Herfindahl_{rc}$				0.000*	0.000**	-0.001***
				(0.000)	(0.000)	(0.000)
Export liberalization x $Herfindahl_{rc}$				0.000	0.000	-0.001
				(0.000)	(0.000)	(0.001)
Collective bargaining x $Herfindahl_{rc}$				-0.035	0.024	-0.027
				(0.037)	(0.027)	(0.028)
$Herfindahl_{rc}$	-0.013**	-0.004	-0.040***	-0.021**	-0.003	-0.040***
	(0.005)	(0.005)	(0.012)	(0.007)	(0.008)	(0.006)
Female (1/0)	-0.056***	-0.048***	-0.184***	-0.056***	-0.048***	-0.184***
	(0.007)	(0.007)	(0.011)	(0.007)	(0.007)	(0.011)
Short-term contract (1/0)	-0.000	0.008	-0.129***	-0.001	0.007	-0.127***
	(0.016)	(0.005)	(0.018)	(0.017)	(0.005)	(0.017)
50+ employees (1/0)	0.132***	0.086***	0.244***	0.132***	0.085***	0.246***
	(0.020)	(0.008)	(0.017)	(0.020)	(0.008)	(0.017)
Shocks:						
Productivity	Yes	Yes	Yes	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes	Yes	Yes	Yes
CPI index	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:						
Education x Age	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.418	0.228	0.599	0.418	0.228	0.6
Observations	2,768,472	2,768,472	2,768,472	2,768,472	2,768,472	2,768,472
Countries	9	9	9	9	9	9
Region	20	20	20	20	20	20

Note: $Herfindahl_{rc}$ corresponds to the regional herfindahl index of concentration computed on the different economic sectors. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.

Table B10 – By occupation

Sample	Low occupation			Medium occupation			High occupation		
Dep. Variable	Likelihood of working Nights, Weekends or Shift	Overtime	Wages	Likelihood of working Nights, Weekends or Shift	Overtime	Wages	Likelihood of working Nights, Weekends or Shift	Overtime	Wages
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Import liberalization	-0.000	0.000	-0.005***	-0.001*	0.000	-0.005***	-0.001**	0.000	-0.002**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Export liberalization	0.003***	0.002***	-0.001	0.002***	0.001***	-0.000	0.001***	0.000*	0.001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Collective bargaining	0.121**	-0.037	-0.272*	0.255***	-0.012	-0.149**	0.248**	-0.052	-0.108
	(0.050)	(0.046)	(0.152)	(0.070)	(0.071)	(0.069)	(0.112)	(0.041)	(0.080)
Female (1/0)	-0.048***	-0.061***	-0.139***	-0.064***	-0.053***	-0.183***	0.016***	0.006	-0.222***
	(0.010)	(0.015)	(0.017)	(0.007)	(0.007)	(0.009)	(0.004)	(0.006)	(0.038)
Short-term contract (1/0)	0.029	0.024***	-0.011	-0.007	0.002	-0.126***	-0.006	0.007	-0.237***
	(0.017)	(0.008)	(0.024)	(0.016)	(0.005)	(0.015)	(0.007)	(0.006)	(0.044)
50+ employees (1/0)	0.148***	0.118***	0.153***	0.142***	0.089***	0.230***	0.049***	0.038***	0.460***
	(0.022)	(0.017)	(0.015)	(0.021)	(0.008)	(0.017)	(0.007)	(0.004)	(0.031)
Shocks:									
Productivity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Labor supply	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Foreign capital supply	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CPI index	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects:									
Education x Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Length of employment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.409	0.238	0.578	0.415	0.225	0.565	0.288	0.0656	0.39
Observations	218,411	218,411	218,411	2,370,476	2,370,476	2,370,476	179,585	179,585	179,585
Countries	9	9	9	9	9	9	9	9	9
Region	20	20	20	20	20	20	20	20	20

Note: See table B3 for the precise composition of each occupation group. Standard errors adjusted for clustering by NUTS-1 regions and country are in parentheses. ***, **, * significantly different from 0 at the 1%, 5%, and 10% levels respectively.