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THE ANATOMY OF LABOR COST ADJUSTMENT TO DEMAND SHOCKS: GERMANY AND ITALY DURING THE GREAT RECESSION

by Francesco D'Amuri*, Salvatore Lattanzio* and Benjamin S. Smith**

Abstract

We shed light on the anatomy of labor cost adjustment in German and Italian manufacturing firms with more than 20 employees, leveraging matched employer employee-balance sheet data and an exogenous demand shifter that exploits the collapse in world trade during the Great Recession. Following a 1 per cent exogenous decrease in sales, the average German firm cuts wage growth by 0.19 per cent, twice as much as its Italian counterpart. The employment adjustment is gradual in both countries but more pronounced in Germany, where, however, firms in sectors hardest hit by the world trade collapse had been increasing employment in the run-up to the Great Recession. These results are not driven by differences in the response of hours per worker, in labor supply conditions, or in firms' exposure to the concurrent negative credit shock. Finally, we find that – in both countries – producer prices were reduced to a similar extent in response to the shock.

JEL Classification: J21, J23, J31.
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Contents

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1 Introduction[1]

The extent of wage rigidity and its implications for employment and firm's outcomes are central issues in macroeconomics (Abraham and Haltiwanger, 1995; Brandolini, 1995; Elsby and Solon, 2019). They become prominent in a currency area, as wage flexibility can ease relative price adjustment, the only way to achieve a terms of trade depreciation in presence of country-specific shocks (Mundell, 1961; Krugman, 2013; Schmitt-Grohé and Uribe, 2013).[2] Also in presence of a common shock, the ensuing adjustment is expected to take place more quickly in countries with more flexible wages. While an increasing number of papers are leveraging administrative data to quantify and characterize wage flexibility in *single* countries,[3] there are only a handful of papers comparing the extent of wage and employment flexibility across countries using comparable data and empirical strategy. A number of such analyses have been produced by the European System of Central Banks,[4] exploiting the results of ad-hoc cross-section business surveys collected through the so called Wage Dynamics Network (Babecký et al., 2010, 2012; Bertola et al., 2012; Druant et al., 2009; Fabiani et al., 2010). Such studies – descriptive in nature – find evidence of higher nominal wage rigidity in countries with higher collective bargaining coverage and employment protection of permanent contracts, and a varying degree in the pass-through of labor costs on prices, depending on the market structure and on the incidence of labor costs on total production costs.

In this paper, we leverage matched employed-employee-balance sheet administrative data

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[2]Galí and Monacelli (2016) highlight the risks entailed by a fall in wages following a negative demand shock in a currency area, as the common monetary policy cannot react to the ensuing, country-specific, deflationary pressures; Eggertsson et al. (2014) make a similar point for the case of positive supply shocks due to structural reforms, in particular when interest rates are at the zero lower bound.

[3]These include Bauer et al. (2007) and Stüber (2017) for Germany, Devicienti et al. (2007) and Adamopoulou et al. (2016) for Italy, Martins et al. (2012) for Portugal. Carluccio et al. (2015) exploit firm level data to evaluate the impact of trade and offshoring on firm level wages. Also Lucifora and Origo (2022) exploit a panel survey of Italian manufacturing firms to quantify the response of labor costs do an exogenous change in sales.

[4]Outside of Europe, Elsby et al. (2016) compare wage rigidity in the United States and in the United Kingdom using survey and administrative data, respectively. They find significant degrees of flexibility in both countries, concluding that "wage rigidity may be less binding and have lesser allocative consequences than is often supposed". Also Verdugo (2016), using harmonized workers' survey, downplays the role of downward nominal wage rigidity, once composition effects are fully taken into account. Recent studies for the US include Daly and Hobijn (2017), based on survey data and Gu et al. (2020), using payroll data. Elsby and Solon (2019) provide a survey of the evidence.

and an instrumental variable strategy to quantify the extent of wage and employment adjustment in the two largest euro area manufacturers: Germany and Italy. Labor market institutions in the two countries differ significantly, in particular in terms of the bargaining structure.[5] In Italy, national agreements between unions and employers set wages for occupations within narrow industry classifications. These agreements set a schedule of wage floors which Italian firms can undercut only in rare circumstances. Although Germany also has an industry-level wage bargaining system, firms can either set stand-alone plant level contracts or include 'opening clauses' which allow for bargaining below the national industry wage (Jäger et al., 2022). Dustmann et al. (2014) argue that a trend away from industry-level wage bargaining and towards firm-level bargaining brought wages in line with productivity, increasing competitiveness of German firms. Consistent with this line of argument, Boeri et al. (2021) find for Germany a closer link between productivity and wages at the geographical level compared to Italy.

Both countries endured a 28% drop in exports during the initial phase of the Great Recession between 2008 and 2009.[6] We exploit within-country between-sector variation from this event to develop an exogenous demand shock based on the predicted loss in export volumes faced by particular manufacturing industries in those years. We rely on the fact that industries establish consistent trading partners in particular countries over time and that it is costly to switch partners in the short run. As a result, demand shocks that disproportionately affect a given industry's trading partners will also disproportionately affect its product demand, without being correlated to local supply and demand conditions. We use this variation as an instrument for the change in sales between manufacturing sectors for a given country in order to measure the causal effect of a drop in product demand on labor market outcomes, such as wages and employment.

We find different wage responses to the demand shock in relatively large (20+ employees) firms in Germany and Italy. When facing a 1% exogenous decrease in sales, full-time equivalent daily wage growth decreases by 0.19% in Germany, twice the effect found for Italy. German wages thus have more flexibility over the cycle and not only across space, as found by Boeri et al. (2021). Moving to labor input, the intensive margin (hours per worker) behaves similarly in the two countries (a sign that our main results are not likely to be driven by a different use of subsidized reductions in working time as Cassa Integrazione or Kurzarbeit).

[5]Differences are also present in terms of employment protection that was lower in Germany than in Italy during the period analyzed here. The OECD index of employment protection (the higher the more restrictive) for permanent contracts was equal to 2.6 and 4 in Germany and Italy, respectively. It was equal to 1 and 2 for fixed term contracts. Moreover, expenditures in labor maket policies (both passive and active) were much higher in Germany than in Italy (respectively, 4.500 and 4.300 euros in PPS per person wanting to work in 2011.

[6]See Figure A.1 for import and export dynamics over time in the two countries.

In terms of employment, we find a muted contemporaneous response to the shock in both countries, and a more pronounced adjustment in Germany in the following two years, mostly driven by the separation margin; it has to be noted that the more marked contraction in Germany takes place even if, in the run up to the Great Recession, sectors that were going to be hit hardest by the shock were also increasing more their workforce compared to the others. Overall, the elasticity of total labor costs to volumes sold is higher in Germany than in Italy. We further show that the average wage adjustment is driven – in both countries – by a fall in stayers' wage dynamics rather than in hiring wages.[7] Looking across workers of different age, we find German firms adjusted labor costs more than Italian ones due to a more pronounced employment correction among young (aged 35 or less) workers and to a fall in wage growth across the board but larger for younger employees.

Our results would be biased if firms in sectors experiencing larger demand shocks were also more likely to face greater credit restrictions or greater changes in sector-specific labor supply (e.g., in presence of changes in the number of unemployed individuals in sectors that are more severely affected by the demand shock). We show that our main results are not driven by such potential bias and are quite robust across firms irrespective of their size or location in more or less developed areas (West versus East in Germany and Centre-North versus South in Italy).

Some differences do emerge, however, when looking at firms differing in the ex-ante margin of adjustment. In Germany, the reduction in wages is concentrated among firms paying more than the collectively agreed minimum and thus less constrained by a wage floor. In Italy, instead, the muted wage response is shared by all firms irrespective of the presence of wage payments above the national minima, but those at the wage floor had a more pronounced employment adjustment. Hence, the degree of downward nominal wage rigidity in Italy seems to only marginally differ across firms that apply national sectoral contracts and those that also apply firm-level contracts; this result confirms the fact that in Italy bargaining institutions provide less room for wage adjustment compared to Germany.[8]

Finally, we validate and extend our micro-level analysis with national accounts data (NACE, 2-digit level). Reduced-form results obtained at this level of aggregation confirm that in Germany *both* wages and employment react more to an exogenous demand shock.

This paper is most directly related to two recent studies of the effect of the Great Reces-

[7]This result could partly reflect the use of Short Time Work schemes, that subsidise time (and thus wage) reductions in face of temporary drops in demand. Higher wage flexibility among new hires (Pissarides, 2009, among others) has been recently put into question by analyses that take into account composition effects, and in particular the high cyclicality of job-to-job moves (Gertler et al., 2020).

[8]This result confirms the descriptive analysis carried out in D'Amuri and Giorgiantonio (2015), showing the high persistence of the portion of wage eventually defined by firm (second) level bargaining.

sion on labor market outcomes in Portugal and Italy. Garin and Silvério (2022) study the effect of product demand on labor market outcomes in Portugal through firm-specific export shocks from the initial wave of the Great Recession. Although they identify both firm-specific shocks and common industry shocks, while we only identify common industry shocks, we otherwise employ a similar identification strategy by relying on pre-recession export shares and country-specific demand responses to the recession. They find significant effects of common industry export shocks on wages and employment, with most of the adjustment coming through the employment response. Lucifora and Origo (2022) study the effect of demand shocks from the Great Recession on labor market outcomes in the Italian metal working industry. Instead of identifying demand shocks through exports, they instrument for revenue directly by using pre-recession, firm-specific, market shares multiplied by the realized change in industry revenue over the recessionary period from 2009 to 2015. Despite employing a different identification strategy and only studying the metal working industry, their results are similar to ours for Italy. They find non-significant effects on wages and significant, yet modest, employment responses.

Compared with previous work in the field, the strength of our analysis comes from the use of a common identification strategy to compare labor cost flexibility in the two largest European manufacturing countries, characterized by markedly different labor market institutions.

The remainder of the paper is organized as follows. Section 3 presents the data and some descriptive statistics. Section 4 illustrates the empirical strategy. Section 5 reports main results and robustness checks, while heterogeneity analyses are discussed in Section 6. Section 7 presents complementary results obtained on National Account data and, finally, Section 8 concludes.

2 Institutional Setting

Germany. Wages in Germany are bargained at the sectoral and regional level in general every two years; bargaining rounds have an informal coordination at the national level (Jäger et al., 2022). Usually an agreement is signed in a "pilot" region, and then followed in other areas with eventual adjustments in order to match local conditions. Wage tariffs set a scale of minimum wages, usually employers pay 10-20% above the minimum wage tariff. Employers need to apply the agreement set by the association they are registered with; the Ministry of Labor can extend a collective contract to all firms falling in the contract's industry-region perimeter, regardless of firms' affiliation status with an employer federation. Firms can either apply the contract signed by the employers' federation they are affiliated with or a firm-level

contract, but there are exceptions. Plant-level contracts are possible, even within a sectoral or regional collective contract; opening clauses can be activated, meaning the firm can pay less than the minimum wages, often in exchange for higher employment (commitment not to fire). Moving to employment protection, firms dismissing more than 10 workers have to set up a social plan, i.e., they have to prove that the firings are necessary, provide training, pay severance payments to those involved. Eighteen month fixed-term contracts[9] (with no firing costs at expiration) were introduced in 1985 with the Employment Promotion Act (their maximum duration was 6 months before then); at the end of the fixed-term contract, the firm could re-hire the worker only on a permanent basis. In the short-run, unemployment benefits are not high by international standards, but they become relatively generous in the long-run. Short time work schemes are relevant and prevent firings in case of negative labor demand shocks. During the Great Recession, when the maximum duration of the benefit was increased substantially, the widespread use of Short Time Work schemes greatly reduced employment losses and resulted in a contraction of labor input concentrated in the intensive margin (hours per worker) rather than on the number of workers.[10]

Italy. The bargaining system features collectively bargained contracts at the national and sectoral level, setting all employment aspects including a minimum national wage level for each occupation within a workers' collective agreement. Before 2009, the economic part of the contracts had a two year duration, the rest of the provisions lasted for 4 years; from 2009 on, both sections of the collective contracts have had a three year duration. A firm-level contract might be present on top of the national level one; such contracts can alter work arrangements if delegated to do so by the national contract and can increase, but not decrease, wages at the local level. As for employment protection, at the beginning of the 1990s agency work was prohibited while temporary work was allowed only for seasonal or occasional jobs or in case of replacement of a worker on leave; at the same time, the employment protection on open-ended contracts was considered to be the highest in the EU after Spain and Portugal Grubb and Wells (1993). Higher flexibility was introduced with the 1997 reform package (Pacchetto Treu), that increased the possibilities to use part-time, atypical or agency contracts; use of temporary or atypical contracts was further deregulated in the following years (Daruich et al., 2023). Income stabilizers were rather fragmented and biased towards the protection of existing matches (through Short Time Work schemes) rather than offering universal protection to all those who lost their jobs. Also in Italy,

[9]Extended to 24 under certain circumstances.

[10]See Burda and Hunt (2011) and Dustmann et al. (2014).

during the Great Recession, the authorities greatly extended Short Time Work schemes in order to absorb the negative effects of the 2008-9 crisis on the labor market. The ordinary unemployment benefit had a minimal role, featuring low replacement rates (30%, increased to 40% in 2001) and extremely limited duration (6 months, increased to 9 in 2001, see Rosolia and Sestito (2012).

3 Data and Descriptive Statistics

3.1 Data

Both for Germany and Italy, we use matched employer-employee-balance sheet data for the manufacturing sector,[11] which was directly exposed to the trade shock (Autor et al., 2013).

Germany. We use labor market data form the German Social Security administration provided by the Institute for Employment Research (IAB) based on the Integrated Employment Biographies (IEB) datafile. Specifically, we use the Linked Employer-Employee-Data from the IAB (LIAB) Longitudinal Model 1993-2014. The LIAB is based on the IAB establishment panel, a survey which draws a stratified sample of establishments, and follows them over time. Participation to the survey is voluntary, but the response rate is around 80% (Baumgarten, 2013). The LIAB is obtained by merging IAB establishments with employment biographies from IEB. Information (including gender and age) is available on all employees who worked at least one day at an establishment included in the survey. The LIAB further collects their full employment biographies between 1993 and 2014. Since we focus on the period 2006-2011, we have the universe of employees working at these establishments over this period. The dataset contains information on the work and pay history of employees, such as job duration in days and earnings of each employment spell. Hours of work are not recorded, but employees are classified as part-time when working less than 30 hours per week. One shortcoming of IAB earnings data is that they are censored at the highest level of earnings subject to social security contributions. To overcome this problem, we apply a Tobit wage imputation procedure following Card et al. (2013) and Dustmann et al. (2009). Besides that, we compute full-time equivalent daily wages by halving the days worked by part-time employees; using the CPI, we convert all nominal variables in 2010 euros. We collapse relevant worker-level variables at the establishment level and retain only

[11] Mergers and acquisitions in the automotive sector in Germany determine outliers in wage and employment variations in the small number of firms sampled in that sector (40); as we do not have access to single observations for confidentiality reasons, we dropped this sector from the analysis both in Germany and in Italy.

establishments with more than 20 employees, in order to be consistent with the sampling strategy in the Italian data, described below. Larger firms also tend to be more connected to international trade (di Giovanni et al., 2020) and thus more exposed to foreign demand fluctuations that we exploit in order to construct our instrument.

Finally, we complement this information with variables drawn from the establishment survey: industry, district, revenues – measured as the annual business volume, which coincides with sales for firms in manufacturing – and a binary indicator equal to one if the establishment pays wages above the collectively agreed scale.

Italy. We use data from the INVIND survey,[12] which comprises approximately 4,000 firms a year over the period 2006-2011 (see, for example, Daruich et al., 2023). This survey is conducted annually by the Bank of Italy and contains self-reported information on average wages, employment and firm outcomes. We match these data with official balance sheet data collected by Cerved[13] on an annual basis: from these archives we use revenues, which equal total sales in any given year. From social security records, we have information on the work histories of the universe of workers ever employed in one of the firms surveyed in INVIND. On top of main socio-demographic characteristics, these data comprise information on gross annual compensation of workers, net of employer's social security contributions, the number of days worked in a given year, the type of contract (full- or part-time, permanent or temporary), tenure, date of beginning and end of the employment spell and short-time work status. We average relevant worker-level variables at the firm level. We do not have information on hours worked, hence we use daily wages, converted to full-time equivalent units[14] and expressed in 2010 real terms.

Trade data In order to construct the instrument presented in section 4, for both Germany and Italy we use the data of the United Nations Commodity Trade Statistics Database (Comtrade) on bilateral export/import *volumes* for 170 countries by 2-digit NACE Rev. 1.1 sector. Specifically, we use data on trade volumes in 2008 and 2009 from each trading partner of Germany and Italy.

3.2 Descriptive Statistics

From both samples we take only firms with at least 20 employees (as this is the size threshold for Italian data) and we focus on a balanced panel including all firms that were present in the

[12] *Indagine sulle imprese industriali e dei servizi.*

[13] Cerved is a private company that collects balance sheet data on the universe of incorporated businesses.

[14] We have information, directly provided in social security archives, on the number of full-time equivalent days worked for part-time workers, which we exploit to compute full-time equivalent daily wages.

sample in the time interval of the analysis 2006-2011.[15] We are thus left with 2544 firm-year observations for Germany and 5172 for Italy.[16] Table 1 reports descriptive statistics for all years in both German and Italian data, whereas Figures A.2-A.5 report averages of the main outcomes by year, either in levels or normalized with respect to a reference year. The drop in revenues faced by firms in both countries is strong and confined to the years between 2008 and 2009 (Figure A.2): by 2011 firms are almost back to the 2008 sales levels in both Germany and Italy. German and Italian firms have similar size (Figure A.3a of the appendix), while German firms pay about 10% higher average full time equivalent wages throughout the period (Figure A.3b of the appendix); nominal wages increase in both countries, and slightly more in Italy, while in Germany a slight fall is detected around year 2009. Looking at labor market flows by age class, hiring rates show similar dynamics over time (Figures A.4a, A.4b and A.4c of the appendix); separation rates increase more in response to the negative shock in Germany in all age classes except mature workers (55+, Figures A.5a, A.5b and A.5c of the appendix).[17]

4 Identification and Empirical Specification

We estimate the following first difference equation for each country k and separately for each year from 2006 to 2011:

$$\frac{\triangle y_{jkt}}{y_{jkt-1}} = \alpha_{kt} + \beta_{kt}\left(\frac{\triangle R_{jk2009}}{R_{jk2008}}\right) + \delta_{kt}X_{jk} + \epsilon_{jkt} \tag{1}$$

where y_{jkt-1} represents a labor market outcome for firm j, country k, and year $t-1$, and $\triangle y_{jkt}$ represents the change in labor market outcome from year $t-1$ to year t. R_{jk2008} is revenue of firm j in country k in 2008 while $\triangle R_{jk2009}$ is the change in revenue at firm j from 2008 to 2009. Note that the change in revenue is constant across equations while we estimate the effect on the change in outcomes both before and after the initial trade shock

[15] We do not go beyond 2011 in order to avoid possible confounding effects related to the sovereign debt crisis in Italy. We carried out the analysis also on the unbalanced sample, obtaining similar results.

[16] With respect to the original data, we loose around 4900 firms in Germany and 1300 firms in Italy when restricting to manufacturing only. In Germany we further drop around 600 firms with less than 20 employees, on which the Italian data lack information. Finally, we drop around 70 firms in Germany and 800 in Italy that are either not present in all years or with missing values in the outcomes/controls in one of the years. For more information on the data we refer to Ruf et al. (2019) for Germany and to Leandro and Giuseppina (2019) for Italy.

[17] Hiring and separation rates are computed as the number of hires and separations (total and by age group) at time t divided by total employment at time $t-1$.

from the Great Recession. X_{jk} includes time-invariant control variables:[18] average firm daily wages in 2008, sales net of intermediate input costs (a proxy for firm's value added) in 2008, firm size dummies (less than 50, 50-99, 100-499, 500 or more employees) and four macro-sector dummies (food products, beverages and tobacco; consumer products; industrial goods; capital goods).[19]

A perennial challenge in using changes in revenue as a proxy for demand shifts is that supply shocks will also directly affect equilibrium price and quantity. Below we devise an instrument to alleviate such concerns.

4.1 Instrument

The Great Recession induced a sharp drop in consumer demand with heterogeneous effects across countries and industries. In this context, we rely on the fact that industries establish consistent trading partners in particular countries over time and that it is costly to switch partners in the short run. As a result, demand shocks that disproportionately affect a given industry's trading partners will disproportionately affect product demand. For example, suppose the wood and rubber industries initially have a similar level of export volumes, yet have different trading partners. Suppose a recession reduces demand overall, but weakens demand in countries that buy wood (as opposed to rubber) more. Wood firms will not be able to instantaneously redirect trade to new markets and hence the wood industry will suffer a greater reduction in demand than the rubber industry, simply as a result of the composition of their trading partners.

We propose a shift-share instrument, leveraging sector-level exposure to shocks to foreign demand induced by the Great Recession between 2008 and 2009, and focusing on 2-digit sectors in manufacturing.[20] The instrument is constructed at the country-sector level for both Germany and Italy. For each sector in Germany (Italy) it is defined as the sum of the demand shocks taking place in any foreign trading partner country l – equal to the change in export volumes to l from the rest of the world (i.e., excluding Germany or Italy) – weighted by the shares of pre-recession export trade between Germany (Italy) and country l.[21] More formally, let E denote export volume, s denote industry (or *sector*), and t denote year.

[18]The inclusion of controls mainly affects the precision of the first stage relationship, but neither the first nor the second stage point estimates are substantially affected by their inclusion. Results with unconditional regressions are available upon request.

[19]We group sectors according to the following Ateco 2002 codes (equivalent of NACE Rev. 1.1): 15-16 (food products, beverages and tobacco); 17-19, 22 and 36 (consumer products); 20-21 and 23-28 (industrial goods); 29-35 (capital goods); identification thus leverages within macro-sector variation.

[20]Specifically, we exploit variation in sectors 15 to 36 of NACE Rev. 1.1.

[21]This approach was employed, among others, by Autor et al. (2013); also Garin and Silvério (2022), a paper closely related to ours, adopts a similar identification strategy.

Then, let $E_s^{k\to l}$ represent the volume of exports shipped from origin country k to destination country l in sector s in 2008 and $\triangle E_s^{k\to l}$ represent the change in export volumes from 2008 to 2009. Also, in a slight abuse of notation, let $\tilde{K}$ represent the set of all countries except country k. Our measure of predicted percentage change in export volumes is defined as:

$$\underbrace{\frac{\triangle \hat{E}_{ks}}{E_{ks}}}_{\substack{\text{predicted percentage}\\ \text{change in exports}}} \equiv \sum_{l\in\tilde{K}} \underbrace{\frac{E_s^{k\to l}}{E_{ks}}}_{\substack{\text{inital share of}\\ \text{exports to } l \text{ from } k}} \underbrace{\left(\frac{\sum_{q\in\tilde{K}} \triangle E_s^{q\to l}}{\sum_{q\in\tilde{K}} E_s^{q\to l}}\right)}_{\substack{\text{\% change in exports}\\ \text{to } l \text{ from world excluding } k}}, \tag{2}$$

where E_{ks} are total export volumes in country k and sector s; $\frac{E_s^{k\to l}}{E_{ks}}$ is the share of export volumes from country k to country l in 2008 and $\frac{\sum_{q\in\tilde{K}} \triangle E_s^{q\to l}}{\sum_{q\in\tilde{K}} E_s^{q\to l}}$ is the percentage change is export volumes to each country l from all countries excluding country k.

Figure 1 reports a scatter plot of the predicted change in export volumes in Italy versus Germany by sector. The points cluster around the 45 degrees line and display larger values for capital and industrial goods, and lower values for food products, beverages and tobacco, for both countries. We exploit this variation across sectors to instrument the firm-level change in sales. Our exclusion restriction is that $\frac{\triangle \hat{E}_{ks}}{E_{ks}}$ affects labor market outcomes in industry s through product demand and not through other channels such as credit or labor supply.

4.2 First Stage

We estimate the following first stage equation separately for both German and Italian firms j, which measures the effect of the exogenous change in export volumes on total firm-level revenue:

$$\frac{\triangle R_{jk2009}}{R_{jk2008}} = \tilde{\alpha}_k + \gamma_k \left(\frac{\triangle \hat{E}_{s(j)k2009}}{E_{s(j)k2008}}\right) + \tilde{\delta}_k X_{jk} + \tilde{\epsilon}_{jk}. \tag{3}$$

In Table 2 we report the estimate of equation 3 in which the firm-level year on year change in sales in 2009 is regressed on the predicted export shock in volumes for the same year. The instrument is strong and has the expected negative sign; the point estimates are higher in absolute value for Italy and entail an elasticity equal to -0.92 between predicted change in exports volumes and sales; the impact is smaller in Germany (-0.77) but the two estimates are not statistically different from each other. The F-test is sufficiently high for both countries, respectively at 29 and 140 for Germany and Italy. In principle, a reduction in export demand may lead to import substitution to offset the loss in revenue. However,

the strong first stage coefficients suggest that firms were unable to increase domestic sales in response to the fall in export demand.

In Figure 2, we further assess the instrument in terms of exogeneity and validity, by regressing up to three lags (2008, 2007, 2006 YoY changes) and up to two leads of the instrumented variable (2010 and 2011 YoY changes in sales) on the IV. In our empirical setting, we are leveraging the 2009 change in predicted exports as an exogenous shock for firm-level demand; for a given country, the turnover pattern should be independent of the size of the shock in the years preceding or following it. We do find some evidence that, in Germany, firms in sectors that were hit hardest by the 2009 shock were increasing sales relative to those less hit in 2007-8. Nevertheless, if those firms were on a positive trend before the shock took place, this would imply a downward bias in the measurement of the effects of the shock itself. Apart from that specific data point, when comparing Germany and Italy, we are reassured by the fact that the coefficients for lags and leads of the dependent variable are similar; this means that relative dynamics in different sectors were comparable before and after the shock took place. This is a welcome result, given that we want to study not only the contemporaneous effect of the shock on labor input and labor costs but also the subsequent short term adjustment; we could not consistently do so if the shock would have led to a divergence in sales in the following years. Figure A.6 in the Appendix shows that the first stage relationship between the change in revenues and the instrument is monotonic. The figure displays the average drop in revenues against the quartiles of the drop in export volumes between 2008 and 2009 (more positive values indicate larger negative changes). In both countries higher drops in revenues correspond to higher drops in export volumes.

Finally, we investigate whether the shock we use as an instrument simply reflects different historical volatility across sectors. To do so, we compare a measure of output volatility by sector with the change in predicted export volumes. Specifically, we measure output volatility as the coefficient of variation of gross value added, measured in 2005 chain linked volumes from annual National Accounts, over the period 1995-2007. We report in Figure A.8 in the Appendix the relationship between this variable and the instrument across both Italian and German sectors. The relationship is either null in Germany or slightly negative in Italy, indicating that sectors with larger changes in predicted export volumes during the Great Recession are those with lower output volatility in the preceding years. The relationship is however small and only marginally significant at 10% level. Overall, we conclude that the instrument does not simply capture higher historical volatility of some sectors relative to others.

Most of the results of the paper will be based on the estimate of the following structural equation for both Germany and Italy (denoted as country k) for each year from 2006 to

2011:

$$\frac{\triangle y_{jkt}}{y_{jkt-1}} = \alpha_{kt} + \beta_{kt}\left(\frac{\widehat{\triangle R_{jk2009}}}{R_{jk2008}}\right) + \delta_{kt}X_{jk} + \epsilon_{jkt}. \tag{4}$$

In the next section we will further discuss the main threats to identification in this empirical setting.

4.3 Threats to Identification and Measurement Issues

Credit and labor supply shocks Given the formulation of our instrument, the exclusion restriction would fail if those industries whose trading partners experienced a greater change in demand for exported goods from 2008 to 2009 were also more likely to face greater credit restrictions.[22] Such restrictions increase the cost and reduce the availability of liquidity and can result in a reduction in investment and/or employment, as documented in a number of papers focusing on the Great Recession (Adamopoulou et al., 2021; Amiti and Weinstein, 2018; Benmelech et al., 2019; Bentolila et al., 2017; Berton et al., 2018; Caggese et al., 2019; Cingano et al., 2016; Chodorow-Reich, 2013; Barrot et al., 2020). Our exclusion restriction would also fail if those industries whose trading partners experienced a greater change in demand also witnessed greater changes in sector-specific labor supply. A reduction in the number of unemployed looking for a job in a sector hardest hit by the exogenous fall in demand would – if anything – entail a downward bias in our estimates of its effect on wages. On the contrary, hiring rates would tend to be lower if the pool of candidates for a position decreases over time due to reduced job-seekers availability.[23]

In order to check whether falls in demand and credit restrictions are uncorrelated at the 2-digit NACE level, we create a dataset based on European Commission (2021), in which each observation is equal to the share of firms declaring that financing conditions represented a limit to production, in triplets defined by country, year[24] and 2-digit sector of economic activity. Given the few available observations, and the fact that we do not have sales data at this level of aggregation, we estimate a reduced form model, in which we regress the change in percentage points in the dependent variable on the shock measure interacted by year.[25] Figure 3a shows that – in both countries – sectors that were more exposed to the exogenous

[22] A widespread reduction in credit supply affecting one country relatively more than the other would not have an impact on our estimates, since we are comparing firms between sectors but within the same country.

[23] Also in this case, a widespread reduction in labor supply would not affect our estimates as we are comparing firms across sectors but within country.

[24] We mean collapse European Commission (2021) quarterly data into yearly data.

[25] Specifically, we build a longitudinal dataset at the sector-year level for each country. We then regress the per cent variation of the dependent variable directly on the instrument (predicted change in exports in

fall in demand were not hit harder by credit restrictions. Using the same data, we run a similar regression using as dependent variable the incidence of firms declaring that labor shortages were restricting production in any given year. Also in this case, we find no link between the dependent variable and the shock both in Germany and in Italy (Figure 3b).

Going back to matched employer-employee data for both countries, we also verify that the shock is uncorrelated with firm exit from the sample. If firms more exposed to the shock are more likely to exit the market, our results could be biased also in the *balanced* panel we use in our main estimates. We therefore regress a binary indicator equal to one if we observe the firm in a given year and not observe it in the next one on the predicted change in exports in each year 2006-2011. The estimates from such regressions, reported in Figure A.7, are not statistically significant for both Germany and Italy, indicating little evidence of higher exit probability for firms more exposed to the 2009 trade shock.

Intensive margin adjustment. The dataset at hand covers virtually all information about the work relationship, with the exception of hours worked; this is a limitation that becomes more relevant once we consider that both countries have established short time work programs that subsidize temporary reductions in the number of hours worked (Carta et al., 2022). In Italy, the government provides a subsidy for partial or full-time hour reductions, replacing approximately 80% of the earnings forgone by the worker due to hours not worked.[26] Firms covered by the program pay a fixed percentage of each worker's wage, which varies according to the sector. Moreover, firms cofund the treatments when they activate such programs. The duration of the program is up to 12 months, with limited possibilities of extension (Arpaia et al., 2010; Giupponi and Landais, 2022). In the time interval analyzed here, all firms in the sample were covered by the scheme, that applied to establishments employing 15 and more workers in the manufacturing sector.

In Germany, the government provides a subsidy that is equal to approximately 60% of the earnings forgone by the worker due to hours not worked. The duration of the program was temporarily increased from 12 to 18 months in November 2008. In May 2009 this period was extended to 24 months; however, this applied to short-time work which had started in 2009 (Arpaia et al., 2010; Brenke et al., 2013). Virtually all firms are covered by the scheme,

volumes), interacted by year and including sector dummies:

$$\frac{\triangle y_{kst}}{y_{kst-1}} = \alpha + \eta_t + \beta_s + \gamma_{kt} \left(\frac{\triangle \hat{E}_{ks2009}}{E_{ks2008}} \right) + \varepsilon_{kst}, \tag{5}$$

where again k indexes countries (Italy or Germany, separately); s indexes 2-digit manufacturing sectors; t index years from 2006 to 2011.

[26] Caps on the maximum treatment apply, so the replacement rate falls significantly for above-the-average wages.

who is funded by a fixed rate on total labor costs paid for by employers and that finances the unemployment benefit fund as well.

Between 2008 and 2009, the scheme had similar characteristics in the two countries. Unfortunately, comparable data on short-time use are not available for the two countries at the NACE 2-digit level. Nevertheless, we can check whether the variation in the intensive margin was similar in Germany and Italy for a given exogenous fall in sales. To this aim, we estimate the reduced form equation (already employed in the previous paragraph of this section, see footnote 25) using hours worked per employee taken from the National Accounts (NACE 2-digit level) as the dependent variable (Figure 4). Specifically, we regress the percentage point variation in hours worked per employee on the instrument, interacted by year and including sector dummies. We find that the elasticity of the intensive margin to an exogenous reduction in sales is remarkably similar in both countries in 2009 (0.85% reduction for each 1% exogenous reduction in sales); in the years preceding and following 2009 we do not find any relationship between the variation in the intensive margin and the 2009 shock.

5 Results

Adjustment in average full-time equivalent wages and employment Moving to the core results of the paper, we present here the effects of the shock in predicted export volumes on firm-level Full Time Equivalent (FTE) wages (expressed in 2010 euros) and employment changes (Figure 5 and 6, respectively). We find that, before 2009 and in both countries, wage growth did not vary systematically across sectors that, later on, would have been differently exposed to the exogenous fall in export volumes. As for wages, we find a small but significant negative effect in 2009; such effect is definitely larger for Germany than for Italy (respectively -0.19% and -0.09% for a 1% fall in sales), with the two coefficients being significantly different at the 10 per cent level. Falls in wage growth experienced in 2009 were broadly confirmed in the subsequent year (2010). A partial – and not statistically different from zero – recovery in full time equivalent wages takes place in 2011, in both Germany (+0.05%) and Italy (+0.04%). Wage dynamics by age and for new hires, stayers and leavers are analyzed in the next paragraph. Higher wage elasticities to demand in Germany than in Italy could be determined by a variety of factors, such as different employment protection, unemployment benefits and bargaining institutions; our empirical analysis is not suited to distinguish the relative importance of each of these elements.

Moving to employment, we find evidence for the fact that – in Germany – firms in sectors that were hardest hit by the collapse in world trade were expanding employment relative to

other sectors in the run up to the Great Recession (2006-8). In 2008, employment growth was 0.2% higher for each 1% exogenous fall in sales to be experienced one year later (2009).[27] Such employment growth comes to an abrupt halt in 2009 and is fully reverted in 2010, when we estimate a 0.2% decrease in employment for each 1% decrease in sales in 2009. The contraction in employment continues in 2011, albeit at a slower pace. In Italy, the pattern of employment is much smoother, and points to a slight reduction (0.07% following a 1% fall in sales) that starts already in 2008 and continues in the three following years.

When focusing on the adjustment taking place in 2010 and 2011, it is worth keeping in mind that in those years – if anything – a very mild recovery was taking place in sectors most hit by the collapse in world trade (Figure 2). As a consequence, negative developments in wages and employment taking place after 2009 likely reflect a delayed adjustment to the negative shock occurring in that year and not to the presence of additional falls in sales.

Wages and employment by age group. We further analyze the patterns of wage adjustment by looking at average wage changes by age class (15-34, 35-54 and 55+ workers; Figure A.9). In Italy, we find only mild decreases in wage growth for age groups 15-34 and 35-54, both in 2009 and in the following years. In Germany, instead, the wage to sales elasticities are more pronounced and negative, and similar in magnitude across ages. Its value, though, is slightly larger for young (15-34) workers.

Results on employment mirror those on wages. In Figure A.10 we report the evolution in the employment shares by age class in the considered interval. In Italy we do not detect any employment pattern by age, except for a mild increase in the employment share of older workers in 2009; in Germany, instead, there is a clear fall in the share of young (35-54) workers in 2010, with no clear sign of recovery in the following year.

Hiring and separation flows. We gain additional insights on employment dynamics by looking separately at changes in total hirings and separations (Figure 7). In Italy, hirings and separations move little in reaction to the drop in sales. In Germany, on the contrary, separations show a clear spike in 2009, when they increase by 0.26% for a 1% exogenous drop in sales. The point estimate remains above zero (0.05%) also in the following year, but it is not statistically different from zero. Such broad patterns are confirmed when we look at inflows and outflows changes by age class (Figures A.11 and A.12); in particular, the increase in separations in Germany seems to be driven by young (15-34) workers.

[27] According to Burda and Hunt (2011), in the run-up to the Great Recession employment growth in Germany fell short of what would have been predicted based on the historical relationship between employment and GDP dynamics; employers were reluctant to hire given their uncertainty about the length of the expansion.

Wage dynamics for new hires, stayers. Higher cylicality among new hires (Pissarides, 2009, among others) has been recently put into question by analyses that take into account composition effects, and in particular the high cyclicality of job to job moves (Gertler et al., 2020). We find that the moderate wage adjustment taking place in both countries is fully accounted for by the reduction in stayers' wages (Figure 8a), while wages for new hires (Figure 8b) do not show a clear pattern in response to the 2009 negative demand shock.[28] The result on stayers' wage needs to be interpreted with caution, as the fall certainly reflects also the extended use of Short Time Work schemes; nevertheless we have shown in paragraph 4.3 that the impact of the exogenous change in exports on the intensive margin (hours per worker) was very similar in Germany and Italy. As a consequence, relative wage dynamics in the two countries should not be affected.

Total labor costs. Finally, we analyze the evolution of total labor costs. Before 2009, in Germany, labor costs were increasing more in sectors that would have been subsequently hit more by the 2009 fall in sales, while no pattern is clearly evident in Italy (Figure 9). In 2009, a large correction takes place, with the main coefficient estimate that goes from +0.21 to -0.19, a 400 basis point fall. In Italy, the change is less pronounced (from -0.06 to -0.4) and short lived, as the fall in total labor costs terminates already in the following year (2010). In Germany, instead, the fall deepens by an additional 0.29% in 2010 and the total labor costs stabilize on this new lower level only in 2011.[29]

6 Heterogeneity

In this section, we explore whether the patterns of adjustment are different in specific subgroups of firms. In particular, we differentiate the analysis between: i) smaller and larger firms (below and above 100 employees), ii) firms adopting a collective contract featuring more or less downward nominal wage rigidity, iii) firms belonging to more/less developed areas (West vs East in Germany; Center-North vs South in Italy).

Firm size. Looking at the main results by firm size, no particular diverging pattern emerges in terms of wages or employment (Figure A.13), confirming average results.

[28] Using worker level administrative data similar to those employed in this paper between 2005-13, also Adamopoulou and Villanueva (2022) find that "all changes in the wage structure along the business cycle happen among job stayers".

[29] Table A.1 reports all the point estimates and standard errors for each outcome from equation (4).

Area. Another dimension we look at is the area, as West in Germany and Centre-North in Italy clearly have an advantage in terms of productivity compared to East and South, respectively (Boeri et al., 2021). Results on both wages and employment remain very similar to the average ones in all of the four different areas (Figure A.14).

Collective agreement. Finally, we look at the collective agreement applied at the firm level and, exploiting a specific question present in both German and Italian survey data, we differentiate between firms that pay wages exactly in line with the collectively bargained minima or firms that pay above the minimum pay scale defined by such contract. Specifically, we exploit a question present in surveys for both countries (INVIND and IAB) that asks firms whether employees are paid a wage that is equal to or higher than the minimum pay scale, set at the sector level. In Italy, the variable generated from this question is continuous (how far average wages are from the minimum). In Germany, the variable is binary (at or above the minimum). Hence, we convert the variable in the Italian data to be binary as well.[30] The latter could cut wages in case of demand shocks without going below the collectively set level and, as such, face lower downward nominal wage rigidity. In Germany, we find evidence for the fact that firms paying above the wage floor are able to decrease wage growth slightly more when hit by the shock (Figure A.15) while – at the same time – showing more favorable employment dynamics; such difference in the effects on wages is instead not present in Italy.[31] However, Italian firms at the wage floor display a stronger employment adjustment, especially in 2010.

7 Validation on National Account Data

In this section, we validate our main results by exploiting our instrument on more aggregate National Account (NACE, 2-digit) data. While implying that the statistical analysis has to rely on the reduced form regression, as in Section 4.3 (see footnote 25), moving to industry-level data has the advantage of providing additional insights on the reaction of firms to the demand shock, as we have information on hours and producer prices. First of all, we confirm that the exogenous trade shock defined in section 4.2 has a remarkably similar effect on output both in Germany and in Italy (Figure 10); moreover the estimates are very similar

[30] We classify 66% of firms in Italy and 28% of firms in Germany as being above the wage floor in 2008 (however, due to missing data, we are unable to classify 50% of German firms). In both countries firms paying more than the wage floor are larger, are less likely to be in the food and beverage macro-sector, and have higher wages and sales.

[31] The fall in wage growth in Germany takes place at the expenses of incumbent workers and is not a simple product of workforce composition adjustment. Additional results are available upon request.

to those obtained at the firm level, and point to an elasticity between sales and the 2009 trade shock in volumes that is equal to 1 in the relevant year. The industry-level analysis also confirms that wage (here defined as hourly compensation) and employment adjustment in Germany are more pronounced than in Italy (Figures 11a and 11b).

Finally, we do not find evidence for the fact that a higher labor costs elasticity to the shock in Germany translates into different output price dynamics with respect to Italy. In both countries, a 1% exogenous fall in predicted export change in volumes causes a contemporaneous 0.2% reduction in producer prices, that remain on this lower level in the two following years (Figure 12). Based on this evidence, we can conclude that – in the short run – the higher labor cost elasticity to sales in Germany does not determine an improvement in relative prices compared to Italy. Ceteris paribus, it rather contains the decrease in profits.

8 Conclusions

Using matched employer-employee-balance sheet data and exploiting an exogenous demand shifter based on the collapse in world trade during the Great Recession, we quantify the ensuing labor cost adjustment in Germany and Italy, the two largest manufacturers in Europe characterized by markedly different labor market institutions (Carta et al., 2022).

Our results show that in Germany wages react more to demand shocks and not only to local labor market conditions, as found by Boeri et al. (2021). Also employment adjustment is more pronounced in Germany than in Italy and it happens through an instant increase in separations when the negative demand shock hits, followed by a slight decrease in hirings. These patterns help containing somewhat the increase in labor costs taking place in Germany compared to Italy for a given fall in demand. Higher labor cost elasticities to demand in Germany than in Italy could have been favoured by a variety of factors, such as different employment protection, unemployment benefits and bargaining institutions; our empirical analysis is not suited to distinguish the relative importance of each of these elements. Analyzing more aggregate output price data, we do not find evidence for the fact that such higher labor cost flexibility in Germany is translated into an improvement in relative prices compared to Italy, suggesting that the containment in payroll expenditures implies rather a less marked decrease in profits.

References

Abraham, K. G. and J. C. Haltiwanger (1995). Real wages and the business cycle. *Journal of Economic Literature 33*(3), 1215–1264.

Adamopoulou, E., E. Bobbio, M. D. Philippis, and F. Giorgi (2016). Wage rigidities and business cycle fluctuations: a linked employer-employee analysis. *IZA Journal of Labor Policy 5*(22).

Adamopoulou, E., M. D. Philippis, E. Sette, and E. Viviano (2021). The Long Run Earnings Effects of a Credit Market Disruption. *Bank of Italy, mimeo*.

Adamopoulou, E. and E. Villanueva (2022). Wage determination and the bite of collective contracts in Italy and Spain. *Labour Economics 76*, 102147.

Amiti, M. and E. Weinstein (2018). How Much Do Idiosyncratic Bank Shocks Affect Investment? Evidence from Matched Bank-Firm Loan Data. *Journal of Political Economy 126*(2), 525–587.

Arpaia, A., N. Curci, E. Meyermans, J. Peschner, and F. Pierini (2010). Short time working arrangements as response to cyclical fluctuations. Occasional papers n. 64, European Commission, Economic and Financial Affairs.

Autor, D. H., D. Dorn, and G. H. Hanson (2013). The China Syndrome: Local Labor Market Effects of Import Competition in the United States. *American Economic Review 103*(6), 2121–68.

Babecký, J., P. D. Caju, T. Kosma, M. Lawless, J. Messina, and T. Rõõm (2010). Downward Nominal and Real Wage Rigidity: Survey Evidence from European Firms. *The Scandinavian Journal of Economics 112*(4), 884–910.

Babecký, J., P. Du Caju, T. Kosma, M. Lawless, J. Messina, and T. Rõõm (2012). How do European firms adjust their labour costs when nominal wages are rigid? *Labour Economics 19*(5), 792–801.

Barrot, J.-N., T. Martin, J. Sauvagnat, and B. Vallée (2020). Employment effects of alleviating financing frictions: Worker-level evidence from a loan guarantee program. Working paper.

Bauer, T., H. Bonin, L. Goette, and U. Sunde (2007). Real and nominal wage rigidities and the rate of inflation: Evidence from west german micro data. *The Economic Journal 117*(524), F508–F529.

Baumgarten, D. (2013). Exporters and the rise in wage inequality: Evidence from German linked employer–employee data. *Journal of International Economics 90*(1), 201–217.

Benmelech, E., C. Frydman, and D. Papanikolaou (2019). Financial frictions and employment during the Great Depression. *Journal of Financial Economics 133*(3), 541–563.

Bentolila, S., M. Jansen, and G. Jiménez (2017). When Credit Dries Up: Job Losses in the Great Recession. *Journal of the European Economic Association 16*(3), 650–695.

Bertola, G., A. Dabusinskas, M. Hoeberichts, M. Izquierdo, C. Kwapil, J. Montornès, and D. Radowski (2012). Price, wage and employment response to shocks: evidence from the WDN survey. *Labour Economics 19*(5), 783–791.

Berton, F., S. Mocetti, A. F. Presbitero, and M. Richiardi (2018). Banks, Firms, and Jobs. *The Review of Financial Studies 31*(6), 2113–2156.

Boeri, T., A. Ichino, E. Moretti, and J. Posch (2021). Wage Equalization and Regional Misallocation: Evidence from Italian and German Provinces. *Journal of the European Economic Association 19*(6), 3249–3292.

Brandolini, A. (1995). In Search of a Stylised Fact: Do Real Wages Exhibit a Consistent Pattern of Cyclical Variability? *Journal of Economic Surveys 9*(2), 103–163.

Brenke, K., U. Rinne, and K. F. Zimmermann (2013). Short-time work: The German answer to the Great Recession. *International Labour Review 152*(2), 287–305.

Burda, M. and J. Hunt (2011). What Explains the German Labor Market Miracle in the Great Recession? *Brookings Papers on Economic Activity*, 273–335.

Caggese, A., V. Cuñat, and D. Metzger (2019). Firing the wrong workers: Financing constraints and labor misallocation. *Journal of Financial Economics 133*(3), 589–607.

Card, D., J. Heining, and P. Kline (2013). Workplace Heterogeneity and the Rise of West German Wage Inequality. *The Quarterly Journal of Economics 128*(3), 967–1015.

Carluccio, J., D. Fougère, and E. Gautier (2015). Trade, Wages and Collective Bargaining: Evidence from France. *The Economic Journal 125*(584), 803–837.

Carta, F., A. D. Zuanna, S. Lattanzio, and S. L. Bello (2022). Social shock absorbers in Italy: a comparison with the main European countries. Questioni di Economia e Finanza (Occasional Papers) 698, Bank of Italy, Economic Research and International Relations Area.

Chodorow-Reich, G. (2013). The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008–9 Financial Crisis. *The Quarterly Journal of Economics 129*(1), 1–59.

Cingano, F., F. Manaresi, and E. Sette (2016). Does Credit Crunch Investment Down? New Evidence on the Real Effects of the Bank-Lending Channel. *The Review of Financial Studies 29*(10), 2737–2773.

Daly, M. C. and B. Hobijn (2017). Composition and aggregate real wage growth. *American Economic Review 107*(5), 349–52.

D'Amuri, F. and C. Giorgiantonio (2015). Diffusione e prospettive della contrattazione collettiva aziendale in Italia. *Diritto delle Relazioni Industriali*.

Daruich, D., S. Di Addario, and R. Saggio (2023). The Effects of Partial Employment Protection Reforms: Evidence from Italy. *The Review of Economic Studies*. rdad012.

Devicienti, F., A. Maida, and P. Sestito (2007). Downward Wage Rigidity in Italy: Micro-Based Measures and Implications. *The Economic Journal 117*(524), F530–F552.

di Giovanni, J., A. A. Levchenko, and I. Mejean (2020). Foreign Shocks as Granular Fluctuations. Working Paper 28123, National Bureau of Economic Research.

Druant, M., F. Martins, S. Fabiani, G. Kezdi, A. Lamo, and R. Sabbatini (2009). How are Firms' Wages and Prices Linked: Survey Evidence in Europe. Working papers 1084, European Central Bank.

Dustmann, C., B. Fitzenberger, U. Schönberg, and A. Spitz-Oener (2014). From Sick Man of Europe to Economic Superstar: Germany's Resurgent Economy. *Journal of Economic Perspectives 28*(1), 167–88.

Dustmann, C., J. Ludsteck, and U. Schönberg (2009). Revisiting the German Wage Structure. *The Quarterly Journal of Economics 124*(2), 843–881.

Eggertsson, G., A. Ferrero, and A. Raffo (2014). Can structural reforms help Europe? *Journal of Monetary Economics 61*, 2–22.

Elsby, M. W. L., D. Shin, and G. Solon (2016). Wage Adjustment in the Great Recession and Other Downturns: Evidence from the United States and Great Britain. *Journal of Labor Economics 34*(S1), S249–S291.

Elsby, M. W. L. and G. Solon (2019). How Prevalent Is Downward Rigidity in Nominal Wages? International Evidence from Payroll Records and Pay Slips. *Journal of Economic Perspectives 33*(3), 185–201.

European Commission (2021). Business and consumer survey data. Technical report.

Fabiani, S., C. Kwapil, T. Rõõm, K. Galuscak, and A. Lamo (2010). Wage Rigidities and Labor Market Adjustment in Europe. *Journal of the European Economic Association 8*(2-3), 497–505.

Galí, J. and T. Monacelli (2016). Understanding the Gains from Wage Flexibility: The Exchange Rate Connection. *American Economic Review 106*(12), 3829–68.

Garin, A. and F. Silvério (2022). How Responsive are Wages to Demand within the Firm? Evidence from Idiosyncratic Export Demand Shocks. *The Review of Economic Studies* (forthcoming).

Gertler, M., C. Huckfeldt, and A. Trigari (2020). Unemployment Fluctuations, Match Quality, and the Wage Cyclicality of New Hires. *The Review of Economic Studies 87*(4), 1876–1914.

Giupponi, G. and C. Landais (2022). Subsidizing Labour Hoarding in Recessions: The Employment and Welfare Effects of Short-time Work. *The Review of Economic Studies*. rdac069.

Grubb, D. and W. Wells (1993). Employment regulations and patterns of work in OECD countries. *OECD Employment Studies 21*(24).

Gu, G. W., E. Prasad, and T. Moehrle (2020). New Evidence on Cyclical Variation in Average Labor Costs in the United States. *The Review of Economics and Statistics 102*(5), 966–979.

Jäger, S., S. Noy, and B. Schoefer (2022). The german model of industrial relations: Balancing flexibility and collective action. *Journal of Economic Perspectives 36*(4), 53–80.

Krugman, P. (2013). Revenge of the optimum currency area. *NBER Macroeconomics Annual 27*, 439–448.

Leandro, D. and P. Giuseppina (2019). Using Administrative Data to Evaluate Sampling Bias in a Business Panel Survey. *Journal of Official Statistics 35*(1), 67–92.

Lucifora, C. and F. Origo (2022). Firms' margins of adjustment to demand shocks in regulated labour markets. Working papers n. 10, Università degli Studi di Bergamo.

Martins, P. S., G. Solon, and J. P. Thomas (2012). Measuring What Employers Do about Entry Wages over the Business Cycle: A New Approach. *American Economic Journal: Macroeconomics 4*(4), 36–55.

Mundell, R. A. (1961). A Theory of Optimum Currency Areas. *American Economic Review 51*(4), 657–665.

Pissarides, C. A. (2009). The Unemployment Volatility Puzzle: Is Wage Stickiness the Answer? *Econometrica 77*(5), 1339–1369.

Rosolia, A. and P. Sestito (2012). The effects of unemployment benefits in Italy: evidence from an institutional change. Working Papers 7, Department of the Treasury, Ministry of the Economy and of Finance.

Ruf, K., L. Schmidtlein, S. Seth, H. Stüber, and M. Umkehrer (2019). Linked Employer-Employee Data from the IAB: LIAB Longitudinal Model (LIAB LM) 1975–2019. *FDZ-datenreport 6-21*.

Schmitt-Grohé, S. and M. Uribe (2013). Downward Nominal Wage Rigidity and the Case for Temporary Inflation in the Eurozone. *Journal of Economic Perspectives 27*(3), 193–212.

Stüber, H. (2017). The Real Wage Cyclicality of Newly Hired and Incumbent Workers in Germany. *The Economic Journal 127*(600), 522–546.

Verdugo, G. (2016). Real wage cyclicality in the eurozone before and during the great recession: Evidence from micro data. *European Economic Review 82*, 46–69.

Table 1: Descriptive statistics

	Mean	SD	P10	P50	P90	Obs
			Panel A: Italy			
Employment	235.18	452.30	30	92	521	5172
Daily wage	96.98	24.03	69.64	93.13	127.98	5172
Daily wage, 15-34	80.61	15.70	61.79	78.94	101.37	5142
Daily wage, 35-54	99.95	25.33	71.43	95.91	133.26	5170
Daily wage, 55+	124.26	52.59	69.17	113.79	187.36	5027
Total labor costs	8717.03	19820.15	694.11	2489.64	18525.64	5172
Hiring rate	0.13	0.22	0	0.07	0.28	5172
Hiring rate, 15-34	0.07	0.11	0	0.03	0.16	5172
Hiring rate, 35-54	0.06	0.11	0	0.02	0.12	5172
Hiring rate, 55+	0.01	0.02	0	0	0.02	5172
Separation rate	0.13	0.21	0.02	0.07	0.26	5172
Separation rate, 15-34	0.05	0.10	0	0.02	0.12	5172
Separation rate, 35-54	0.06	0.11	0	0.03	0.12	5172
Separation rate, 55+	0.02	0.03	0	0.02	0.06	5172
			Panel B: Germany			
Employment	196.84	315.92	30	92	442	2544
Daily wage	114.91	39.04	67.87	110.67	167.11	2544
Daily wage, 15-34	85.78	27.62	52.60	83.17	122.46	2529
Daily wage, 35-54	125.90	40.68	75.07	121.61	180.99	2544
Daily wage, 55+	126.94	53.72	64.09	118.77	203.71	2528
Total labor costs	7110.61	13643.76	634.91	2609.93	16771.88	2544
Hiring rate	0.11	0.09	0.03	0.09	0.22	2544
Hiring rate, 15-34	0.06	0.05	0.01	0.05	0.13	2544
Hiring rate, 35-54	0.04	0.04	0	0.03	0.09	2544
Hiring rate, 55+	0.01	0.01	0	0	0.03	2544
Separation rate	0.10	0.06	0.04	0.08	0.18	2544
Separation rate, 15-34	0.04	0.04	0	0.03	0.09	2544
Separation rate, 35-54	0.03	0.03	0	0.03	0.08	2544
Separation rate, 55+	0.02	0.02	0	0.02	0.05	2544

Notes. IAB data for Germany and Invind-INPS-Cerved for Italy. See text, section 3, for details.

Table 2: First stage estimates

	(1) Italy	(2) Germany
Predicted change in exports volumes	-0.915***	-0.773***
	(0.077)	(0.144)
Kleibergen-Paap F-stat	140.4	28.7
Obs.	862	424

Notes. The table reports first stage estimates of the relationship between the firm-level change in sales and sector-level change in predicted export volumes between 2009 and 2008 (equation 3). See text for details on the construction of variables. Standard errors clustered at the sector-level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

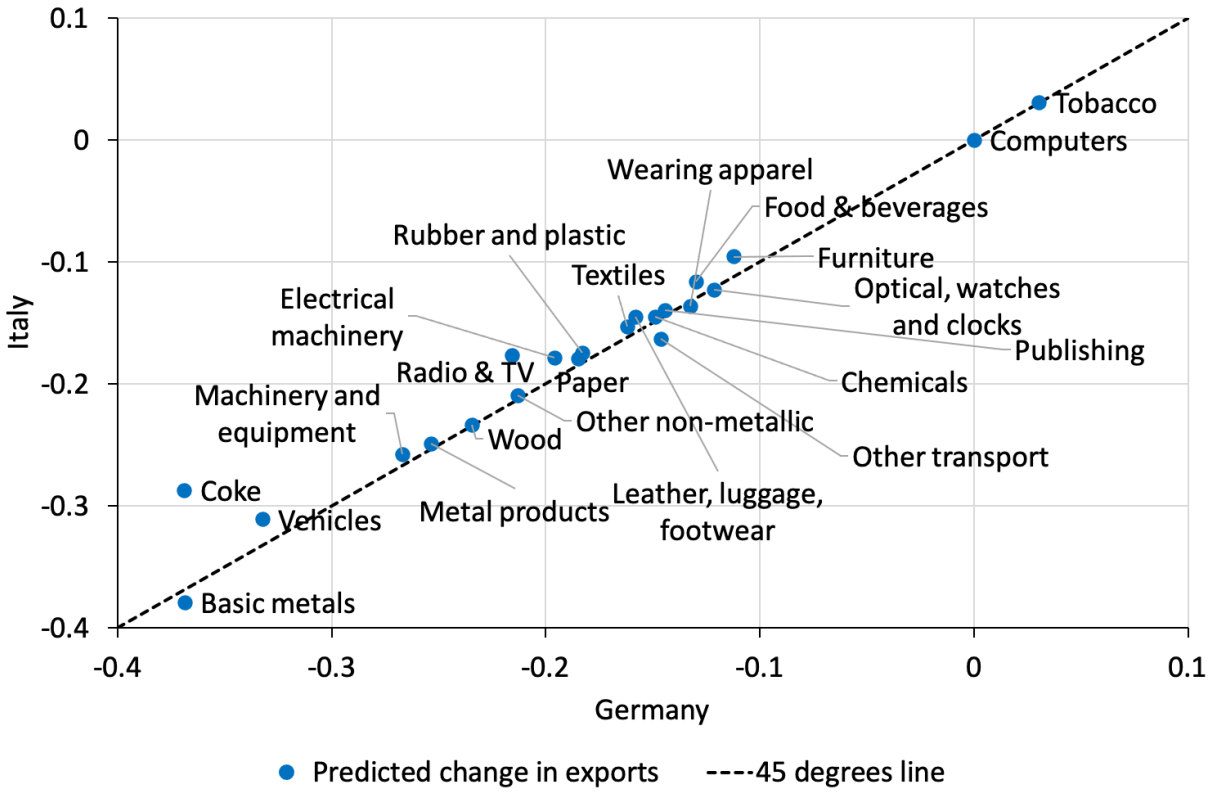


Figure 1: Predicted change in exports

Notes: The figure reports a scatter of the predicted change in exports by NACE Rev. 1.1 activity, computed as in equation (2), in Germany and Italy.

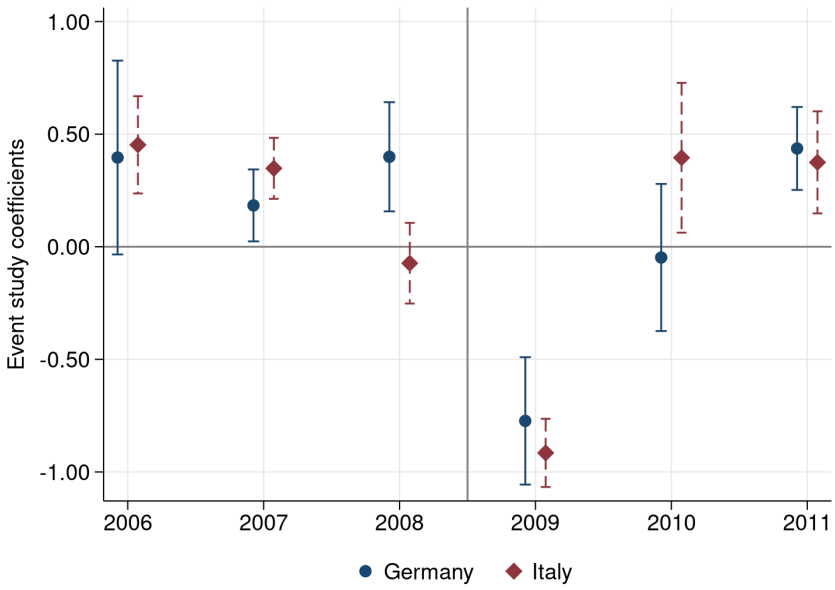
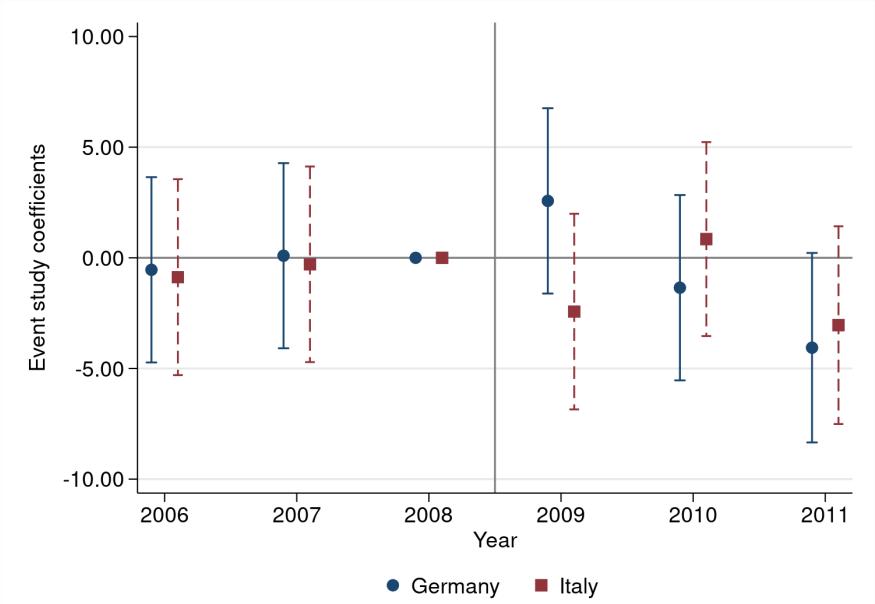
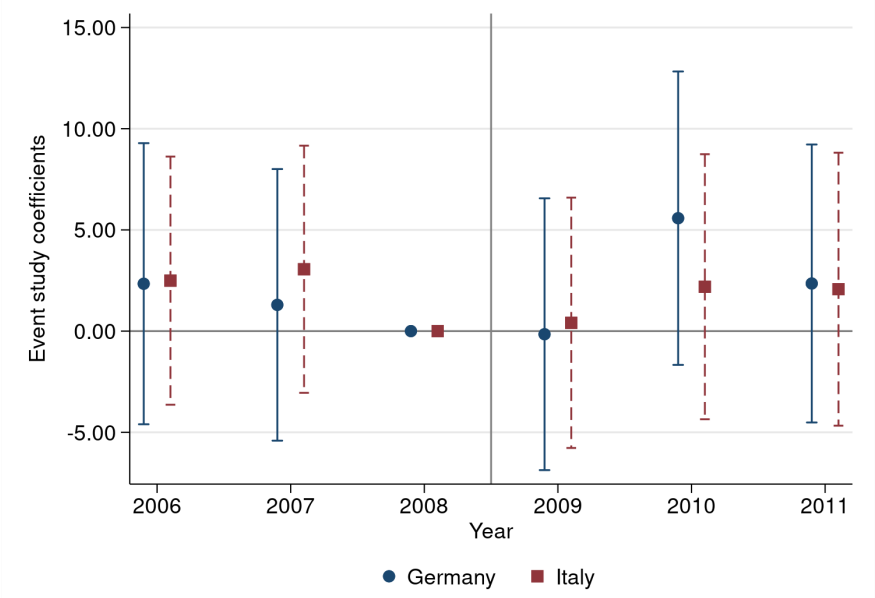


Figure 2: First stage

Notes: The figure reports point estimates for the first stage regression in which the firm-level year on year change in sales in 2009 is regressed on the predicted export shock for the same year (equation 3; see table 2 for details on the first stage regression); but also for up to three lags (2008, 2007 and 2006) and two leads (2010, 2011) of the dependent variable and keeping constant the shock at its 2009 value. Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) Credit limiting production



(b) Labor limiting production

Figure 3: Credit and labor limiting production

Notes: The figure reports estimates for an event study in which the percentage point variation in the fraction of firms declaring that production is hindered either by credit restrictions (top panel) or by labor shortages (bottom panel) is regressed on the instrumented change in exports. Vertical bars identify 95% confidence intervals.

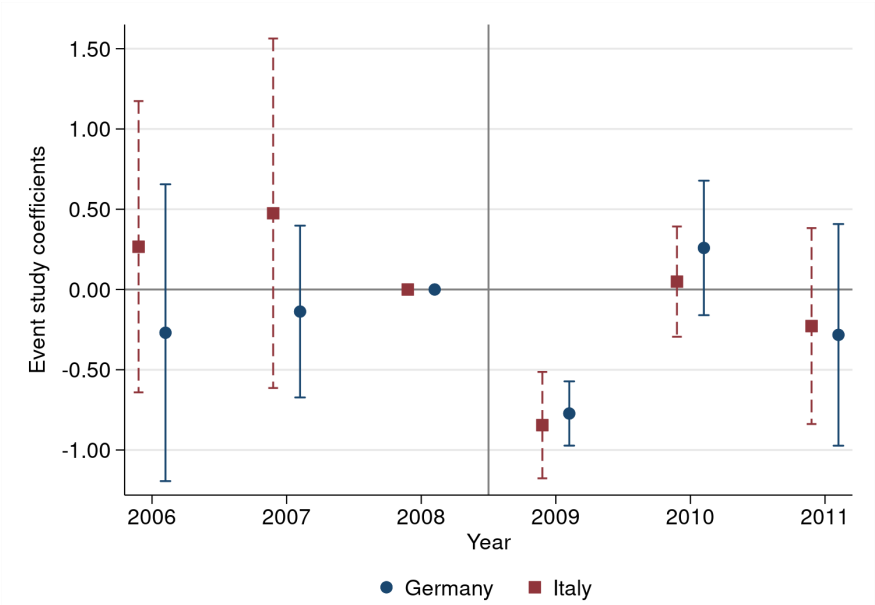


Figure 4: Hours worked per employee

Notes: The figure reports estimates for an event study in which the percentage variation in hours worked per employee is regressed on the instrumented change in exports. Vertical bars identify 95% confidence intervals.

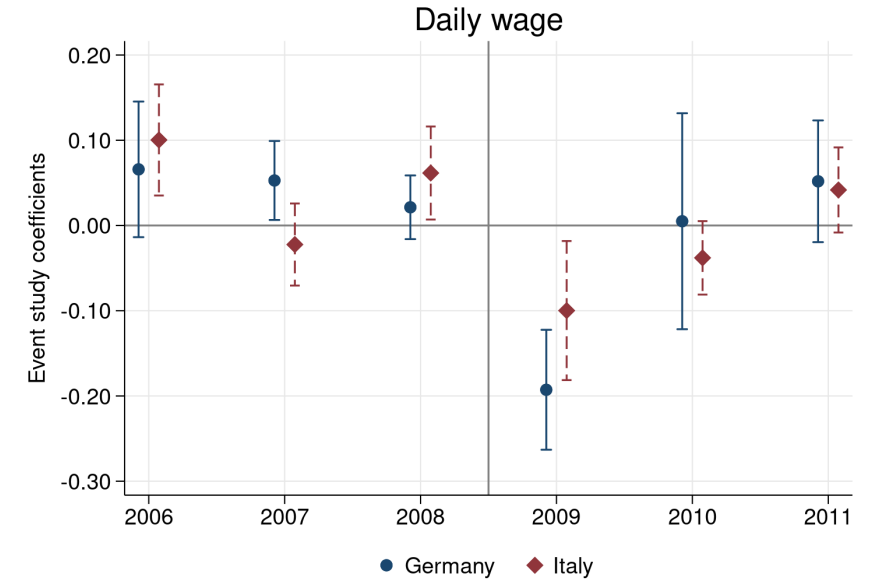


Figure 5: Daily wage

Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.

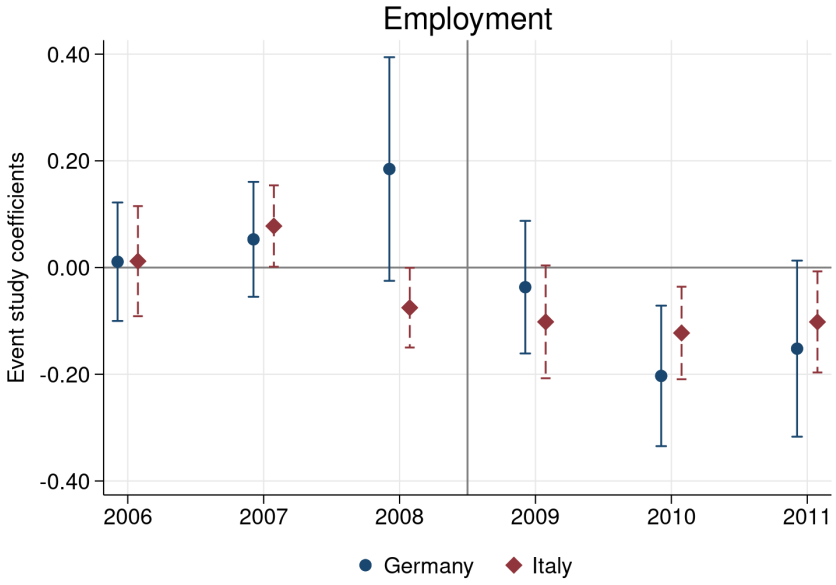


Figure 6: Employment

Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.

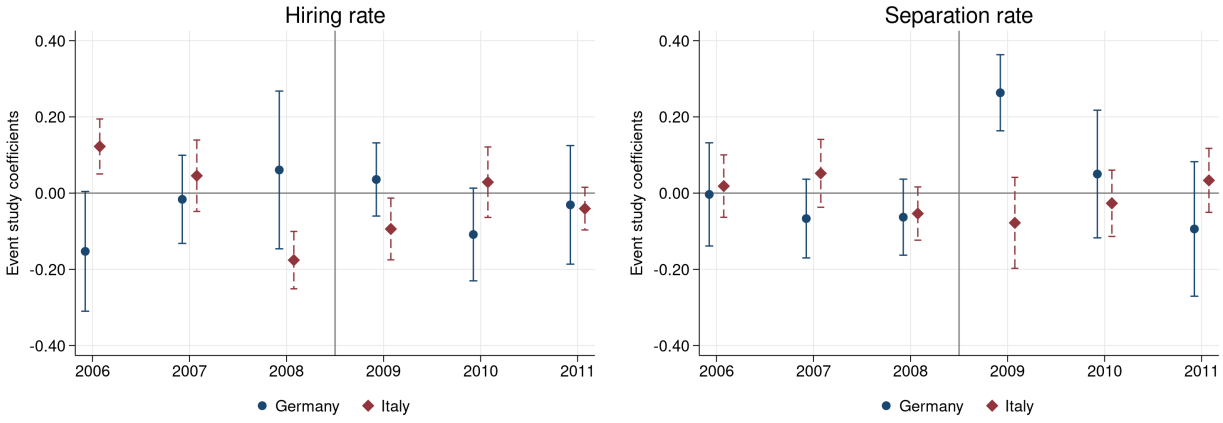
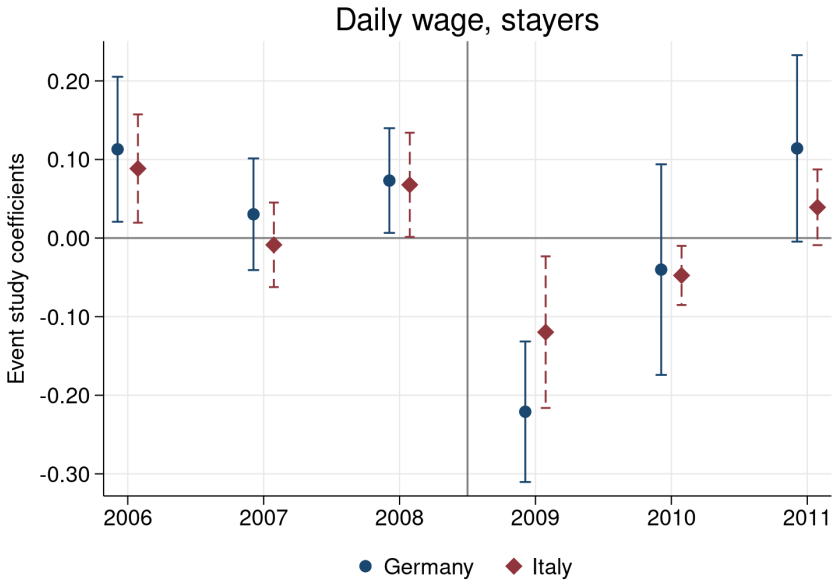
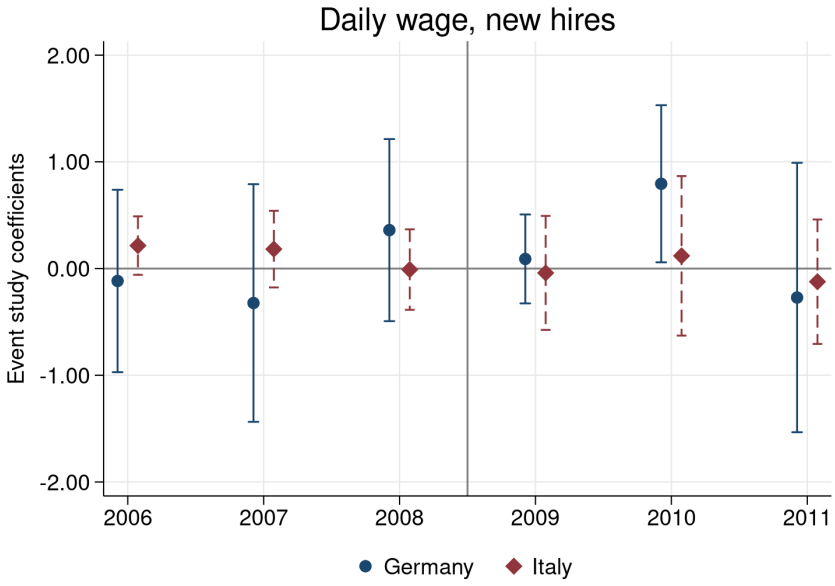


Figure 7: Change in hirings and separations

Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) Stayers



(b) New hires

Figure 8: Daily wage of stayers and new hires

Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.

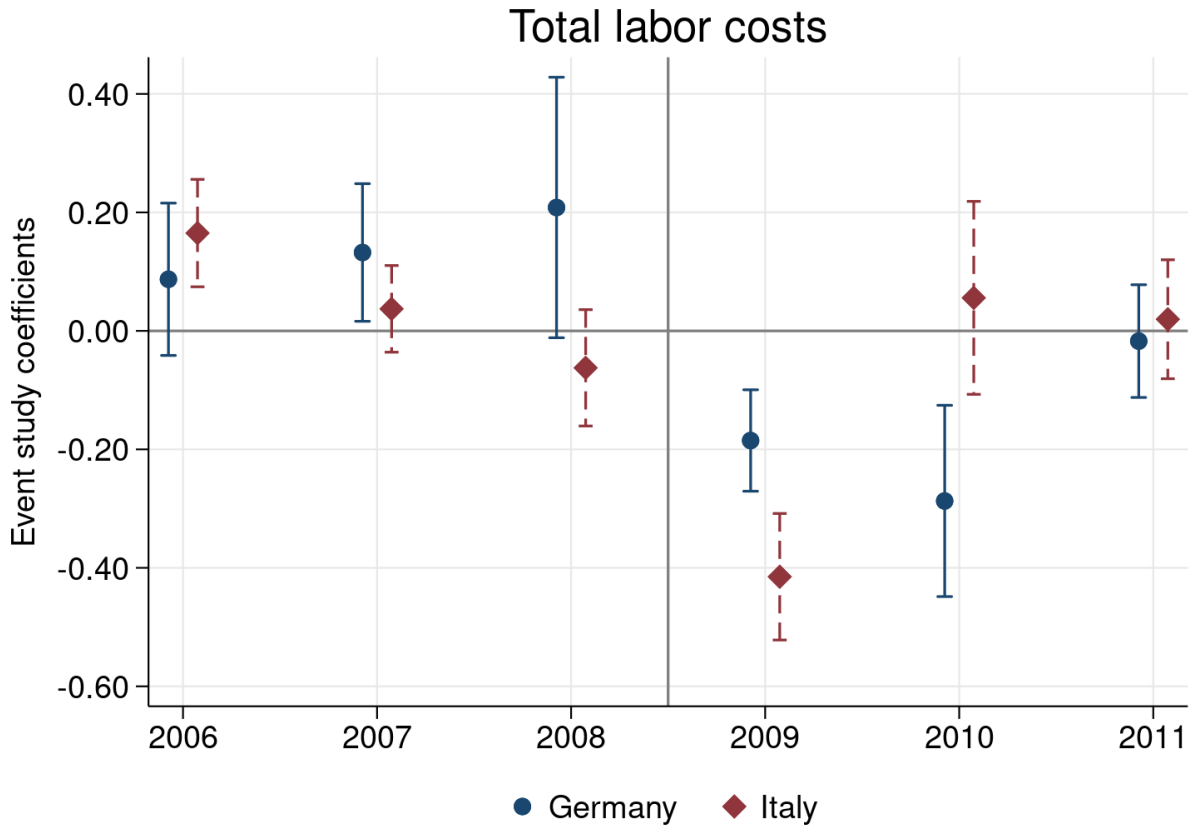


Figure 9: Payroll

Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.

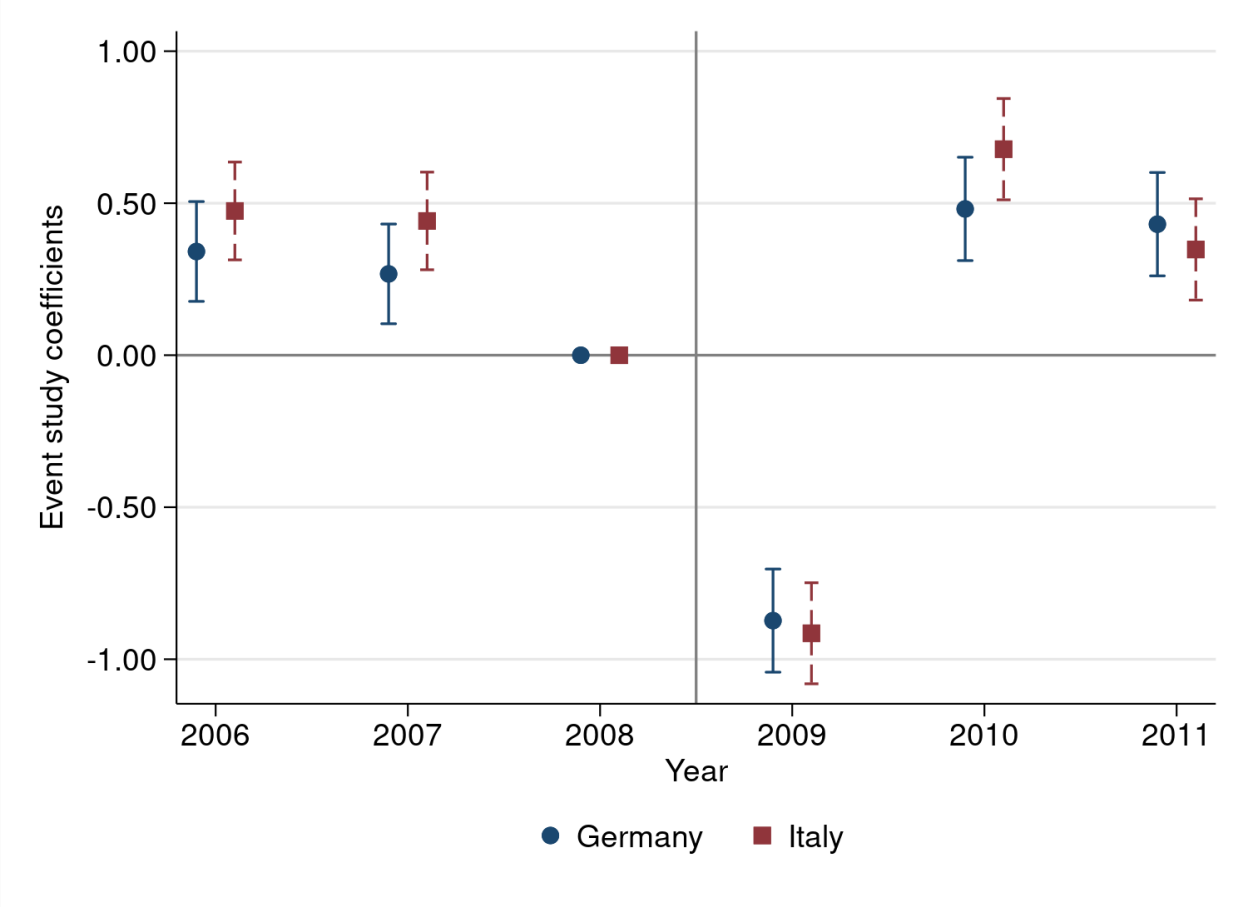
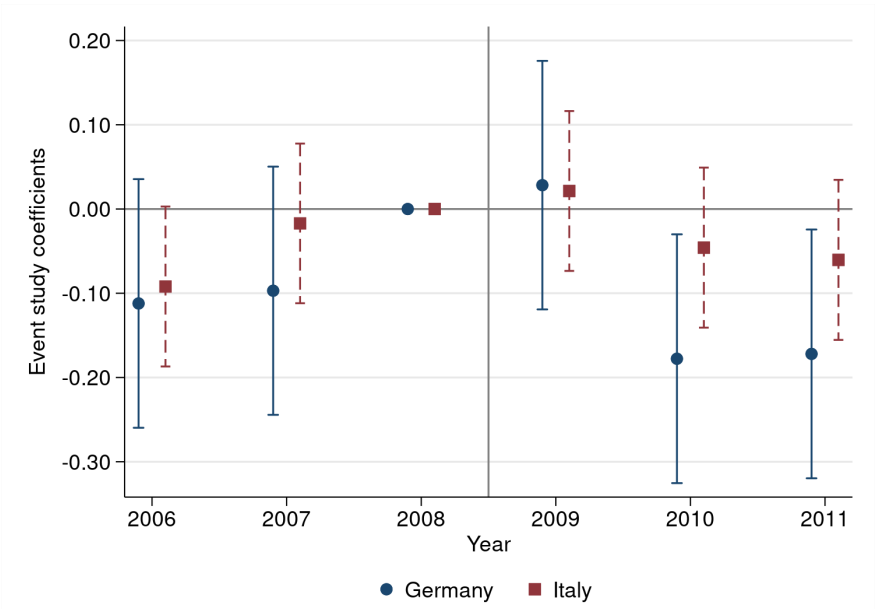
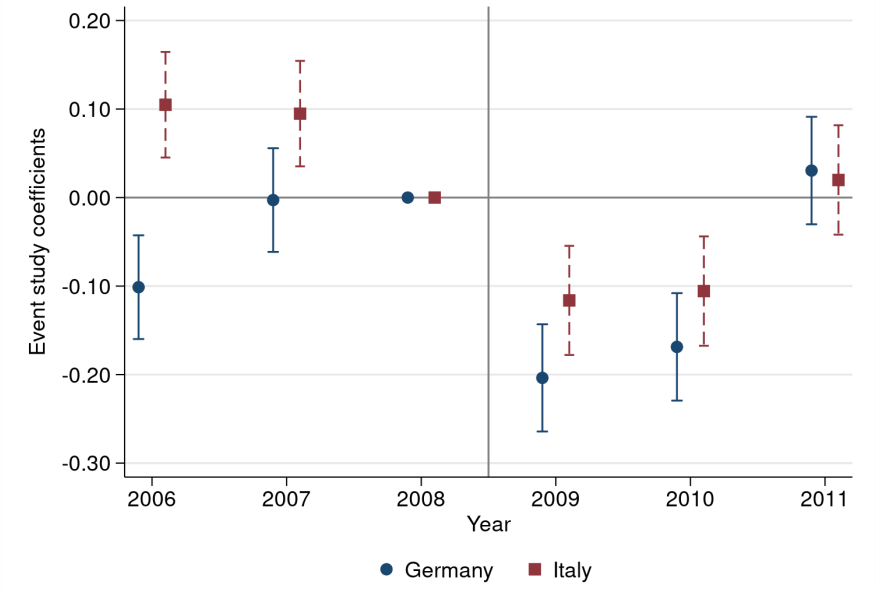


Figure 10: Output (National Accounts)

Notes: The figure reports estimates for an event study in which the percentage variation in output is regressed on the instrument. Vertical bars identify 95% confidence intervals.



(a) Hourly compensation (National Accounts)



(b) Employment heads (National Accounts)

Figure 11: Hourly compensation and employment heads from National Accounts data

Notes: The figure reports estimates for an event study in which the percentage variation in the dependent variable (either hourly compensation or employment heads) is regressed on the instrument. Vertical bars identify 95% confidence intervals.

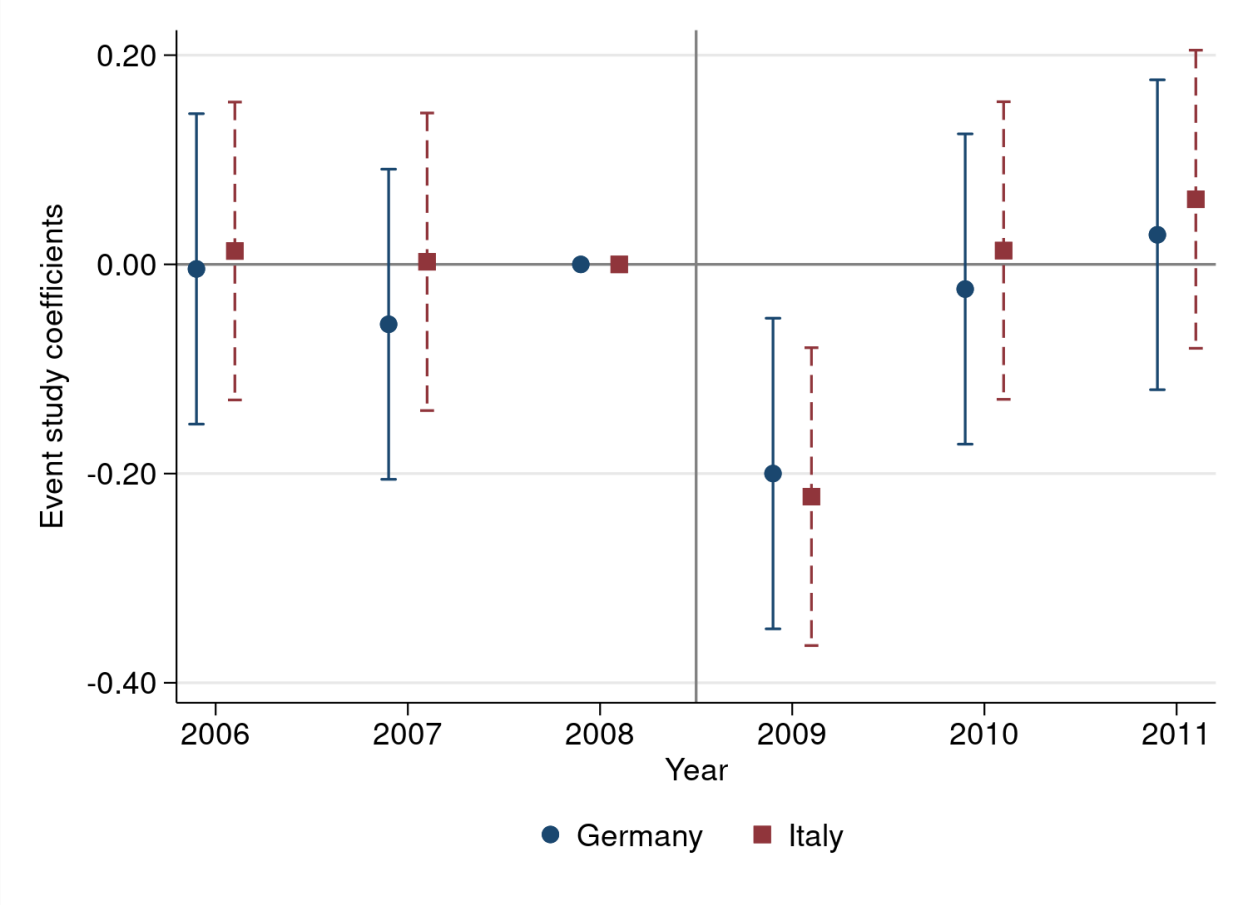


Figure 12: Producer prices

Notes: The figure reports estimates for an event study in which the percentage variation in the dependent variable (either producer prices or intermediate consumption) is regressed on the instrument. Vertical bars identify 95% confidence intervals.

A Additional Figures and Tables

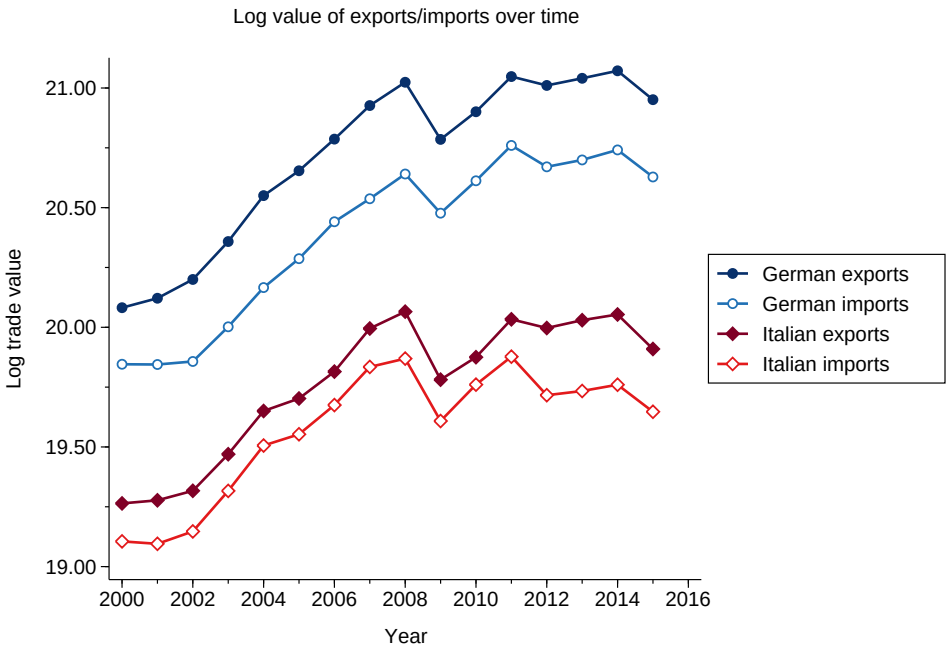


Figure A.1: Trade flows

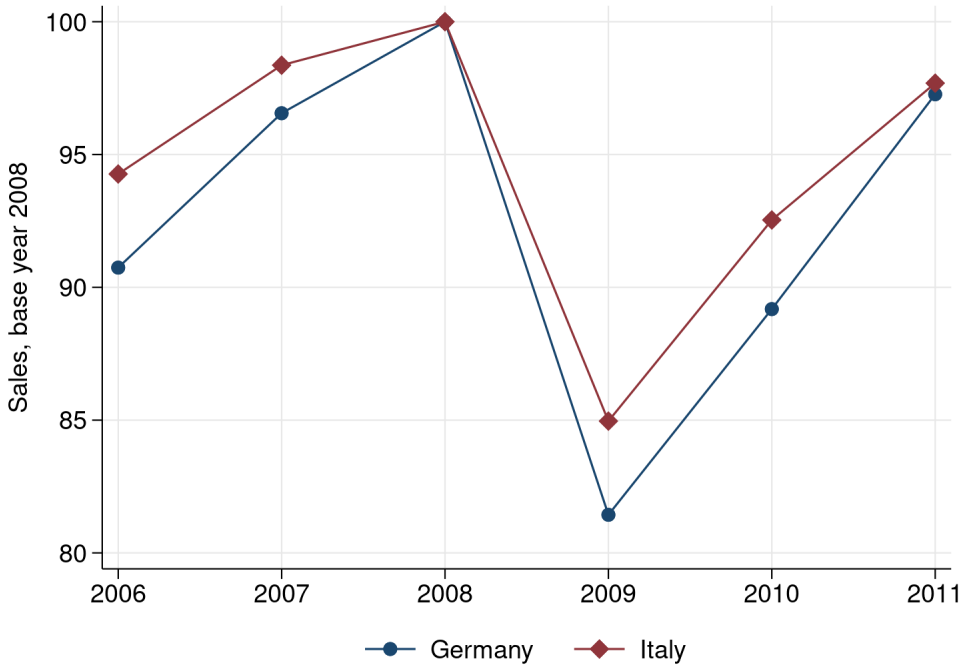
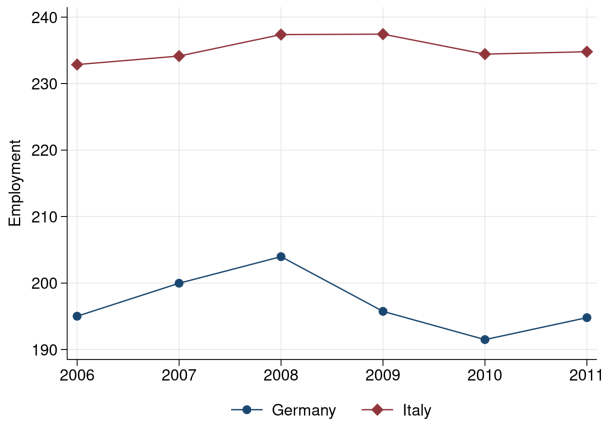
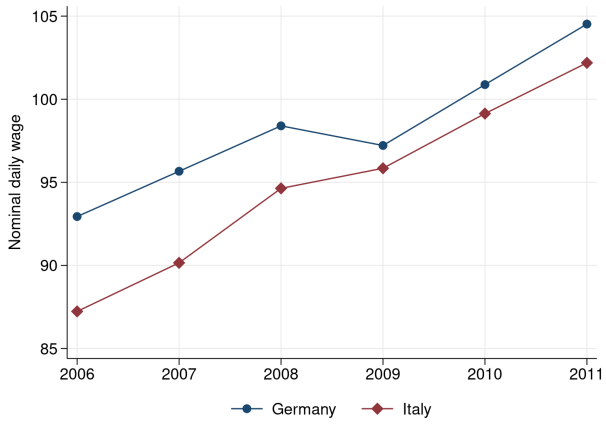


Figure A.2: Sales, base year 2008

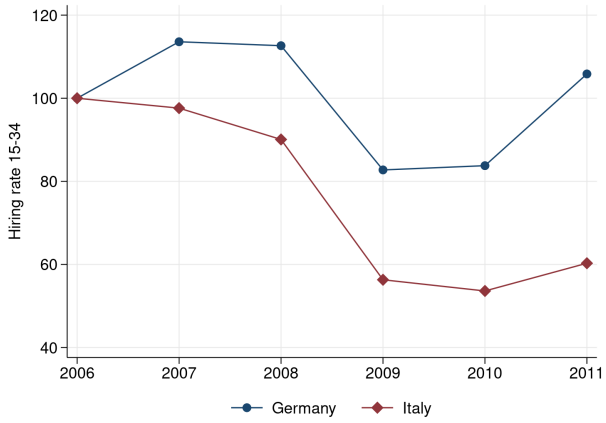


(a) Employment dynamics

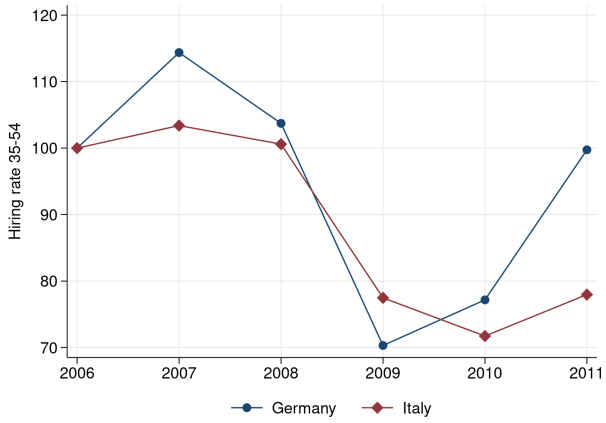


(b) Nominal wage dynamics

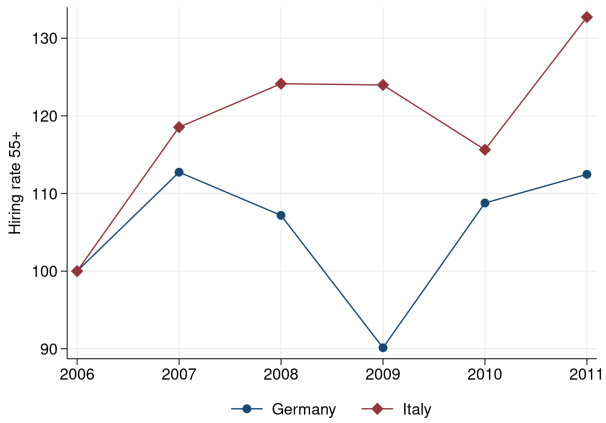
Figure A.3: Employment and wages



(a) Hiring rate 15-34

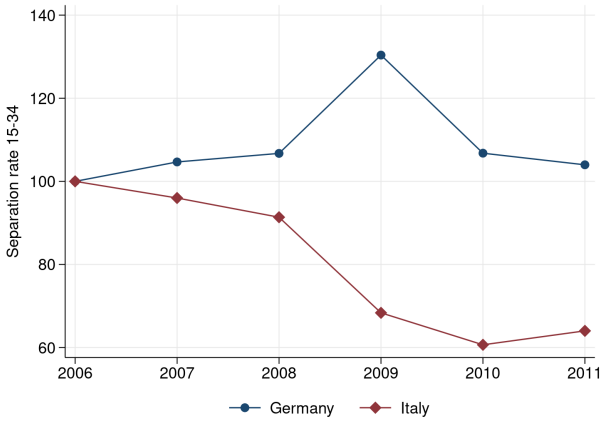


(b) Hiring rate 35-54

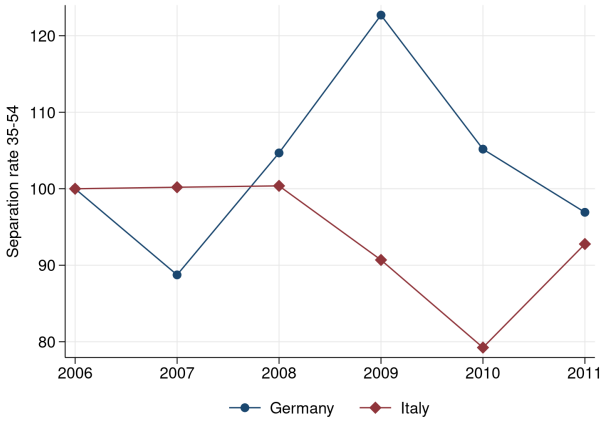


(c) Hiring rate 55+

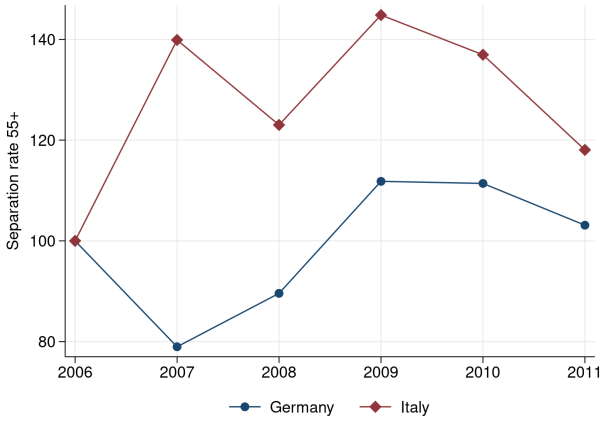
Figure A.4: Hiring rate



(a) Separation rate 15-34



(b) Separation rate 35-54



(c) Separation rate 55+

Figure A.5: Separation rate

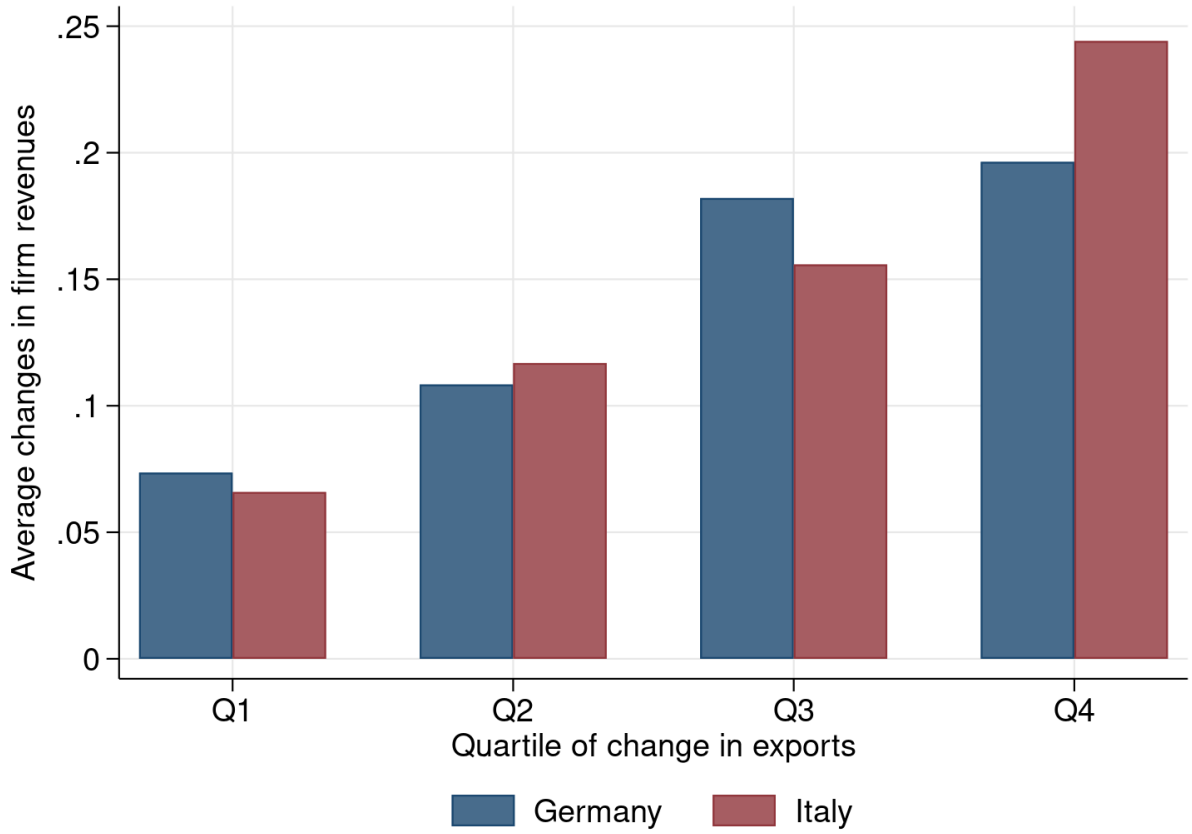


Figure A.6: Average absolute change in revenues by quartile of change in export volume

Notes. The figure reports the average change in revenues between 2008 and 2009 at the firm-level (in absolute values) by quartiles of the change in export volume at the sector-level. A higher quatile indicates a stronger drop in exports between 2008 and 2009.

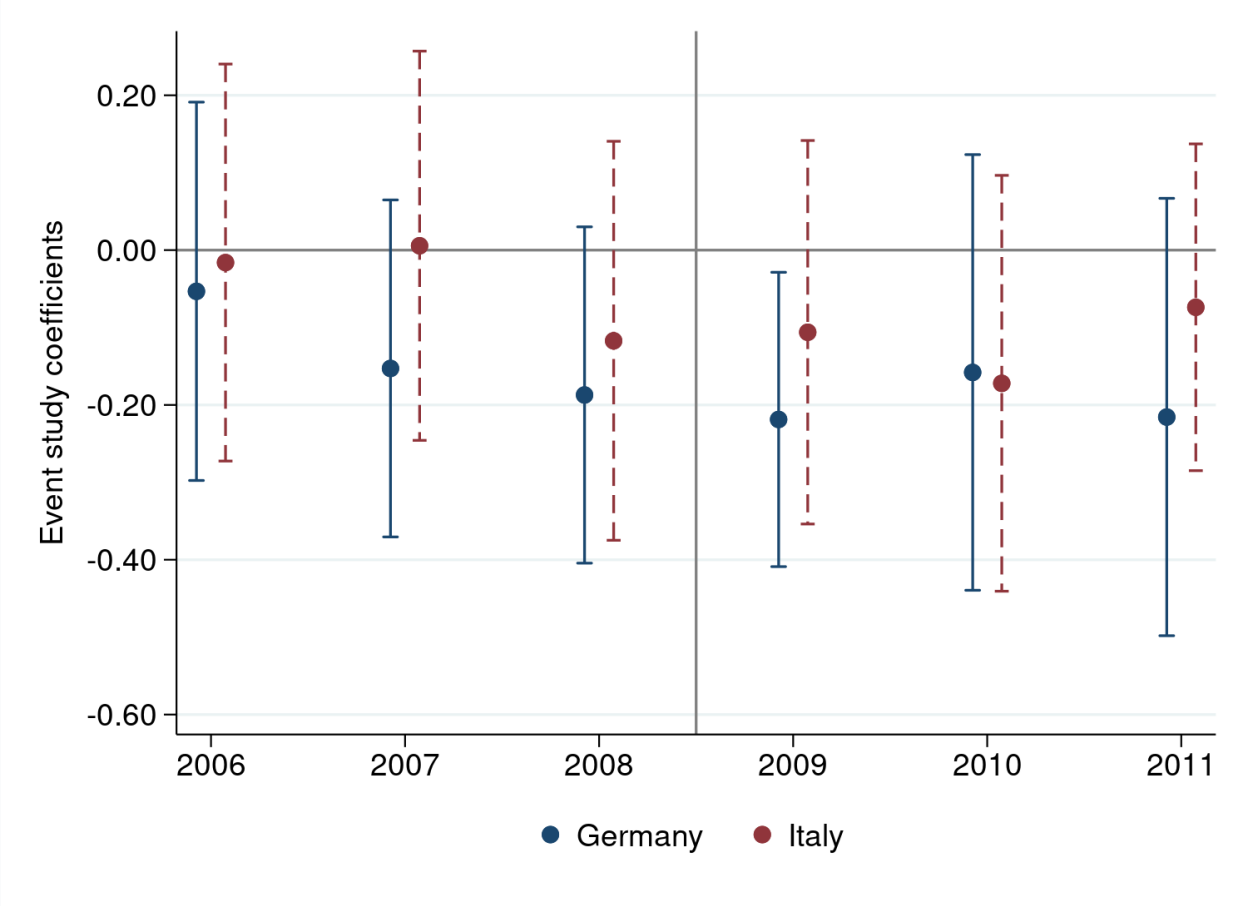


Figure A.7: Exit rate

Notes. The figure reports the coefficient of year-by-year regressions of the exit probability on the predicted change in exports. The dependent variable is a dummy equal to one if the firm is observed in a given year and not observed in the next one.

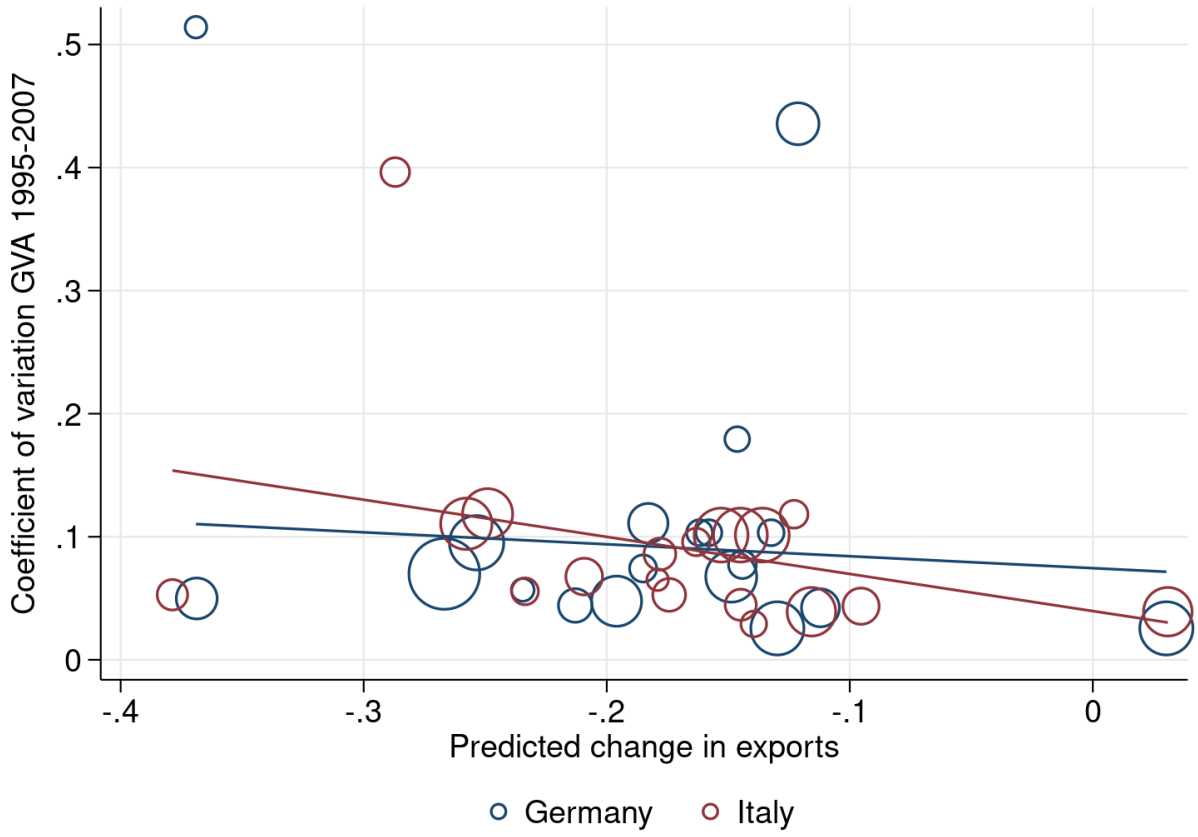
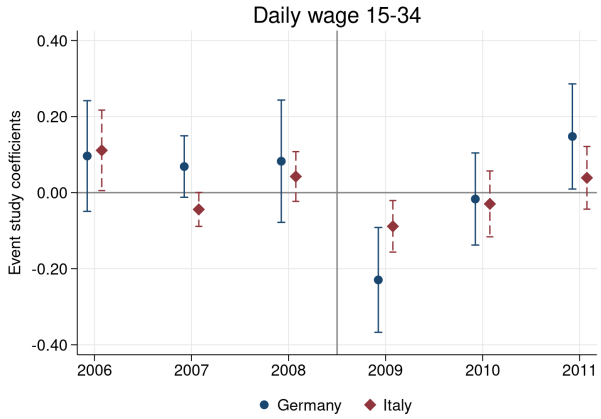
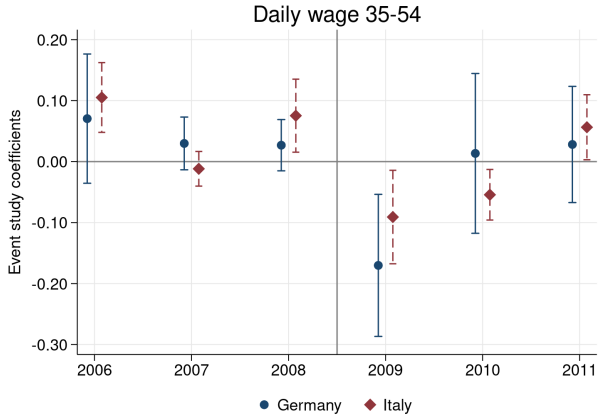


Figure A.8: Sector-level volatility and change in predicted exports

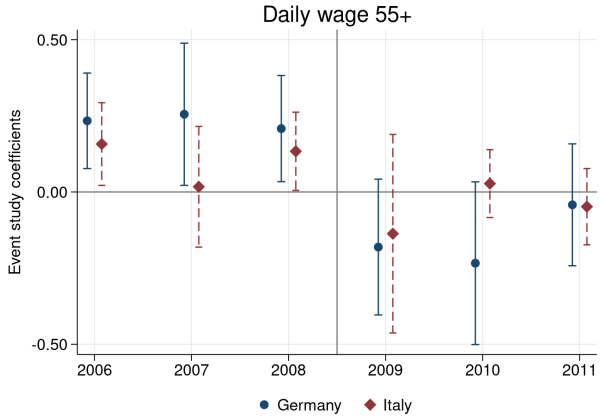
Notes. The figure reports a scatter plot of the relationship between the coefficient of variation of gross value added between 1995 and 2007 and the predicted change in exports between 2008 and 2009 at the sector-level in Italy and Germany. Gross value added is measures in 2005 chain linked volumes from annual National Accounts. The size of each marker is proportional to the sector-specific share of gross value added over total gross value added.



(a) 15-34



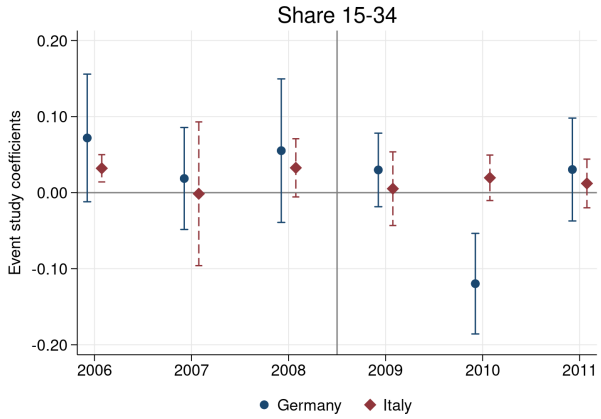
(b) 35-54



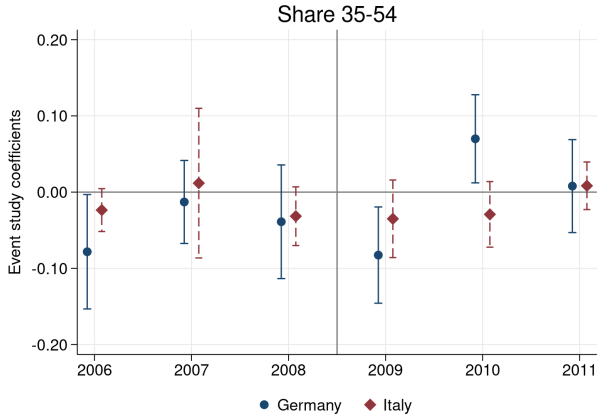
(c) 55+

Figure A.9: Daily wage, by age

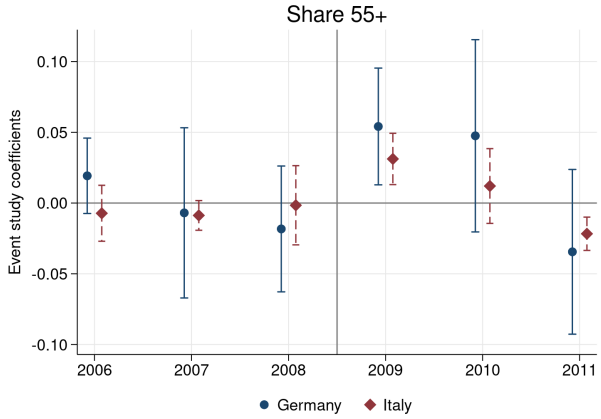
Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) 15-34



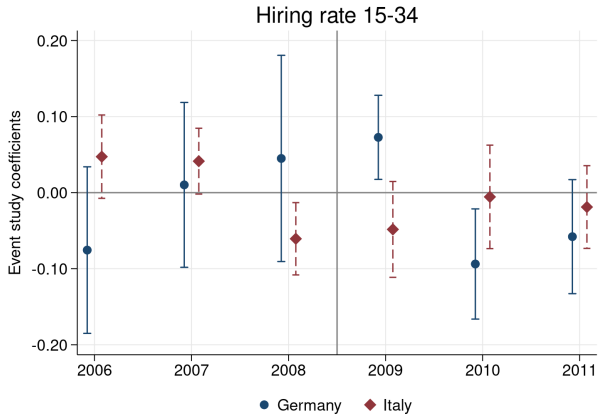
(b) 35-54



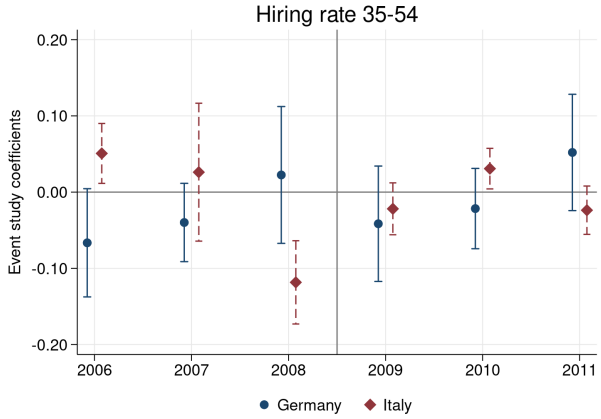
(c) 55+

Figure A.10: Employment shares by age

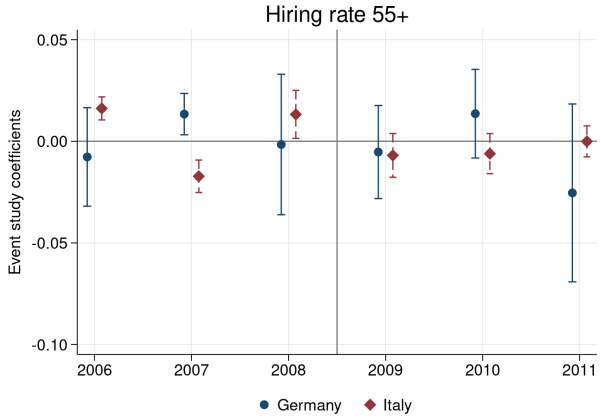
Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) 15-34



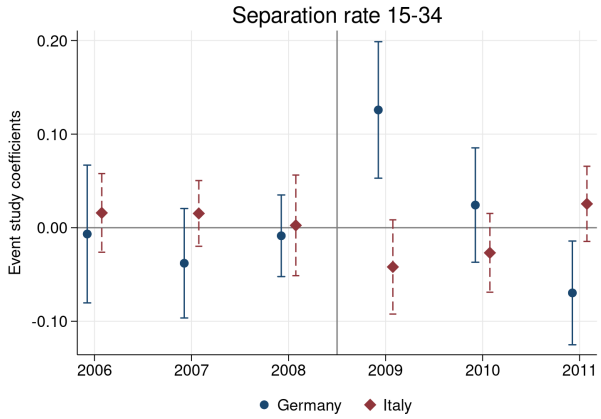
(b) 35-54



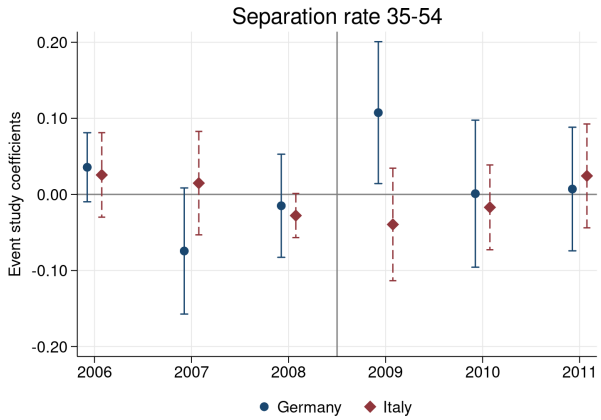
(c) 55+

Figure A.11: Change in hirings by age

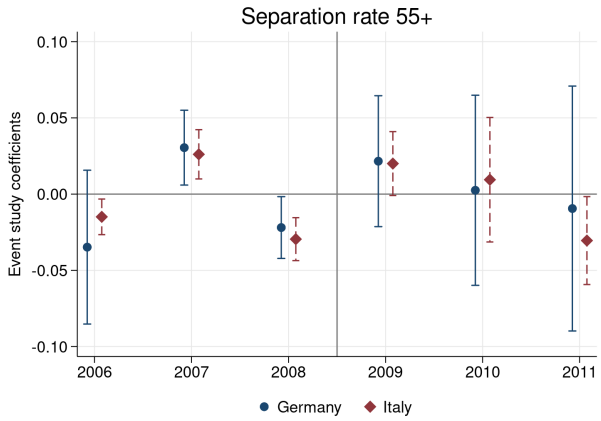
Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) 15-34



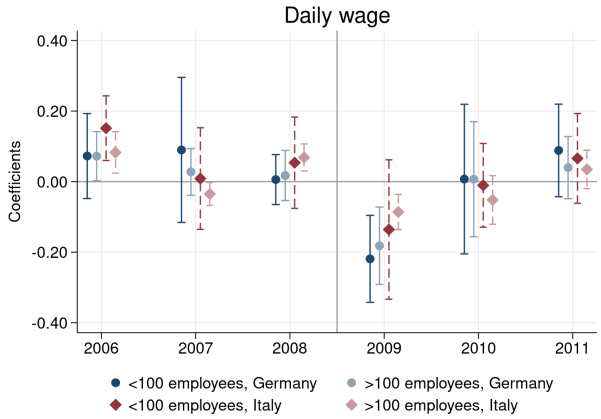
(b) 35-54



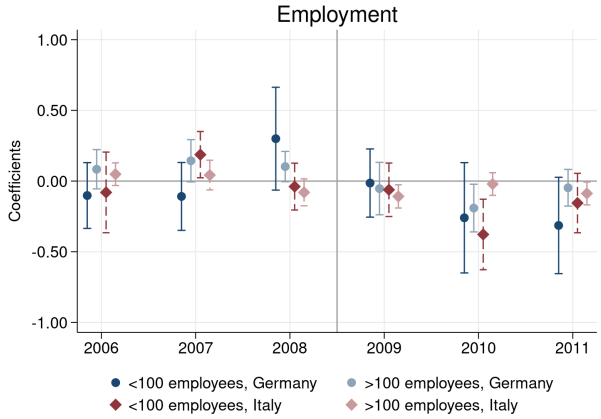
(c) 55+

Figure A.12: Change in separations by age

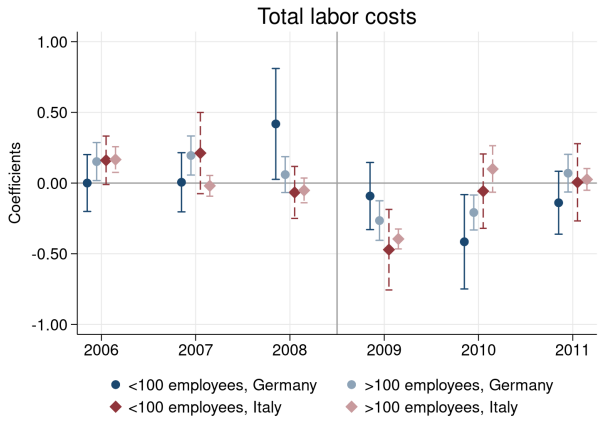
Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) Daily wage



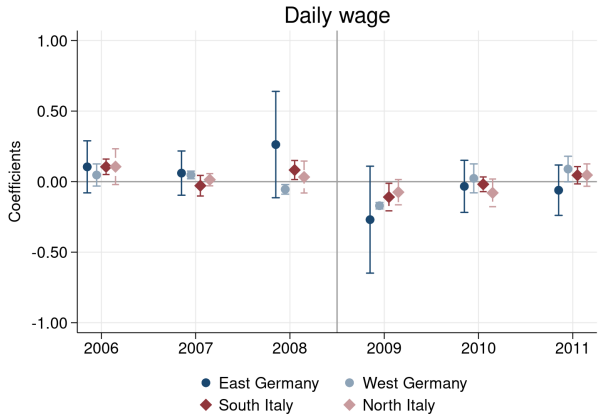
(b) Employment



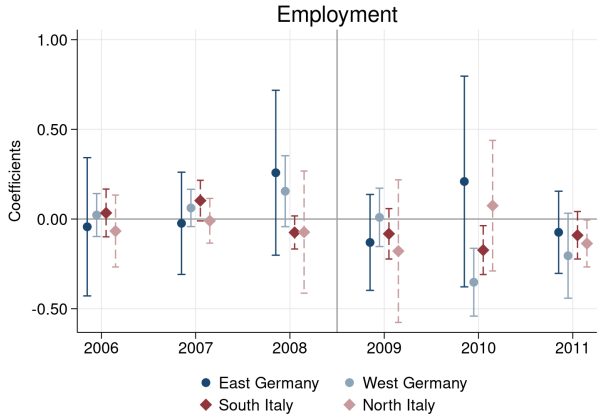
(c) Total labor costs

Figure A.13: Wages, employment and total labor costs by firm size

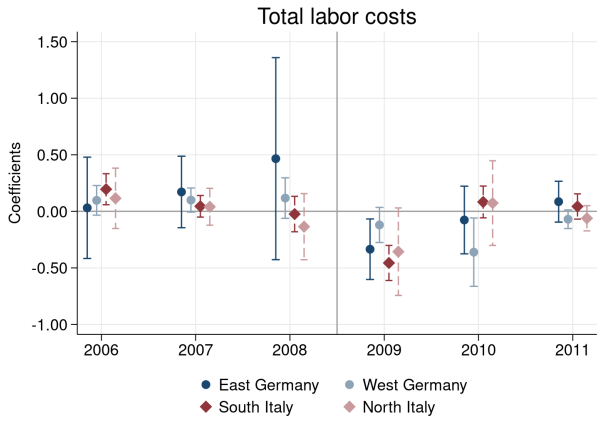
Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) Daily wage



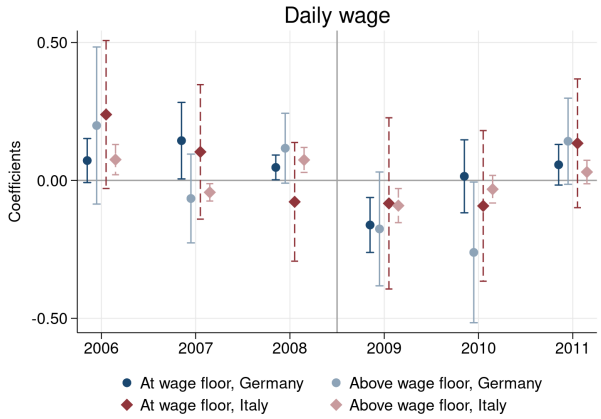
(b) Employment



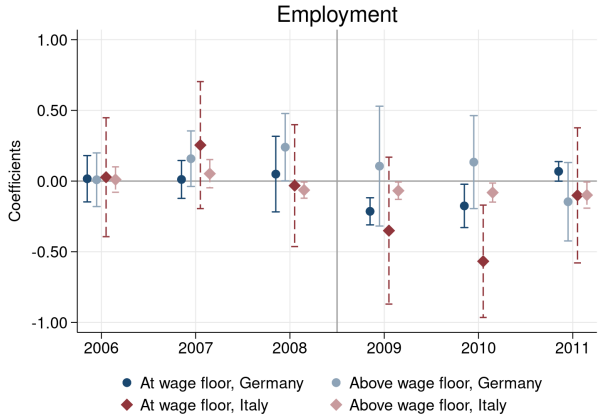
(c) Total labor costs

Figure A.14: Wages, employment and total labor costs by area

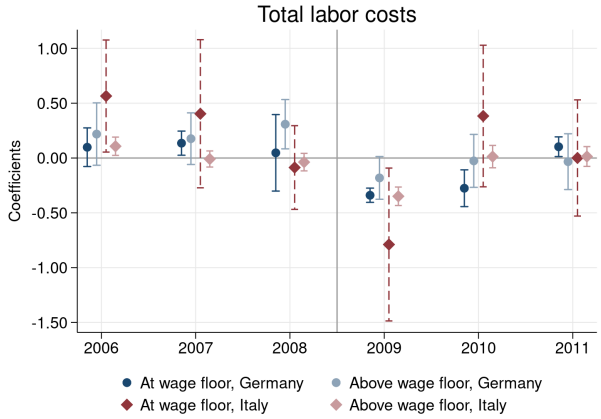
Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.



(a) Daily wage



(b) Employment



(c) Total labor costs

Figure A.15: Wages, employment and total labor costs by collective agreement

Notes: The figure reports estimates for an event study for equation 4 in which the 2009 change in sales is instrumented with the predicted change in exports (see equation 3 for the first stage specification and section 4 for a discussion of the identification strategy.) Standard errors are clustered at the firm level, vertical bars identify 95% confidence intervals.

Table A.1: Dynamic IV coefficients

	Panel A: Italy						Panel B: Germany					
	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Daily wage	0.100	-0.022	0.062	-0.100	-0.038	0.042	0.066	0.053	0.021	-0.193	0.005	0.052
	(0.033)	(0.025)	(0.028)	(0.042)	(0.022)	(0.025)	(0.041)	(0.024)	(0.019)	(0.036)	(0.065)	(0.036)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Daily wage, stayers	0.088	-0.009	0.068	-0.120	-0.048	0.039	0.113	0.030	0.073	-0.221	-0.040	0.114
	(0.035)	(0.027)	(0.034)	(0.049)	(0.019)	(0.025)	(0.047)	(0.036)	(0.034)	(0.046)	(0.068)	(0.061)
	[861]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Daily wage, new hires	0.215	0.182	-0.010	-0.041	0.119	-0.123	-0.116	-0.323	0.360	0.090	0.795	-0.271
	(0.140)	(0.183)	(0.192)	(0.272)	(0.381)	(0.298)	(0.436)	(0.568)	(0.435)	(0.213)	(0.376)	(0.644)
	[757]	[764]	[777]	[712]	[647]	[682]	[392]	[397]	[398]	[373]	[368]	[389]
Daily wage 15-34	0.111	-0.044	0.042	-0.089	-0.029	0.039	0.096	0.069	0.083	-0.229	-0.017	0.148
	(0.054)	(0.023)	(0.033)	(0.035)	(0.044)	(0.042)	(0.074)	(0.041)	(0.082)	(0.070)	(0.062)	(0.071)
	[857]	[856]	[855]	[859]	[858]	[851]	[423]	[423]	[423]	[421]	[419]	[419]
Daily wage 35-54	0.105	-0.012	0.075	-0.091	-0.054	0.056	0.071	0.030	0.027	-0.170	0.013	0.028
	(0.029)	(0.014)	(0.031)	(0.039)	(0.021)	(0.027)	(0.054)	(0.022)	(0.021)	(0.059)	(0.067)	(0.049)
	[862]	[862]	[862]	[862]	[861]	[861]	[424]	[424]	[424]	[424]	[424]	[424]
Daily wage 55+	0.157	0.017	0.134	-0.137	0.027	-0.048	0.234	0.255	0.208	-0.181	-0.234	-0.042
	(0.069)	(0.101)	(0.065)	(0.166)	(0.057)	(0.064)	(0.080)	(0.119)	(0.089)	(0.114)	(0.136)	(0.102)
	[806]	[813]	[824]	[834]	[839]	[839]	[418]	[419]	[421]	[420]	[420]	[422]
Total labor costs	0.165	0.037	-0.062	-0.415	0.056	0.020	0.087	0.132	0.208	-0.185	-0.287	-0.017
	(0.046)	(0.037)	(0.050)	(0.054)	(0.083)	(0.051)	(0.066)	(0.059)	(0.112)	(0.044)	(0.082)	(0.049)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Employment	0.012	0.078	-0.075	-0.102	-0.123	-0.102	0.011	0.053	0.185	-0.037	-0.203	-0.152
	(0.053)	(0.039)	(0.038)	(0.054)	(0.044)	(0.048)	(0.057)	(0.055)	(0.107)	(0.063)	(0.067)	(0.084)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Hiring rate	0.122	0.046	-0.176	-0.094	0.029	-0.041	-0.153	-0.016	0.061	0.036	-0.109	-0.031
	(0.037)	(0.048)	(0.038)	(0.041)	(0.047)	(0.029)	(0.080)	(0.059)	(0.106)	(0.049)	(0.062)	(0.079)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Hiring rate 15-34	0.047	0.041	-0.061	-0.048	-0.006	-0.019	-0.076	0.010	0.045	0.073	-0.094	-0.058
	(0.028)	(0.022)	(0.024)	(0.032)	(0.035)	(0.028)	(0.056)	(0.055)	(0.069)	(0.028)	(0.037)	(0.038)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Hiring rate 35-54	0.051	0.026	-0.118	-0.022	0.031	-0.024	-0.066	-0.040	0.023	-0.042	-0.022	0.052
	(0.020)	(0.046)	(0.028)	(0.017)	(0.014)	(0.016)	(0.036)	(0.026)	(0.046)	(0.039)	(0.027)	(0.039)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Hiring rate 55+	0.016	-0.017	0.013	-0.007	-0.006	-0.000	-0.008	0.013	-0.002	-0.005	0.014	-0.025
	(0.003)	(0.004)	(0.006)	(0.005)	(0.005)	(0.004)	(0.012)	(0.005)	(0.018)	(0.012)	(0.011)	(0.022)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Separation rate	0.018	0.052	-0.054	-0.078	-0.027	0.033	-0.003	-0.067	-0.063	0.263	0.050	-0.094
	(0.042)	(0.045)	(0.036)	(0.061)	(0.044)	(0.043)	(0.069)	(0.053)	(0.051)	(0.051)	(0.085)	(0.090)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Separation rate 15-34	0.016	0.015	0.002	-0.042	-0.027	0.025	-0.007	-0.038	-0.009	0.126	0.024	-0.070
	(0.021)	(0.018)	(0.027)	(0.026)	(0.021)	(0.020)	(0.038)	(0.030)	(0.022)	(0.037)	(0.031)	(0.028)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Separation rate 35-54	0.026	0.015	-0.028	-0.039	-0.017	0.024	0.036	-0.074	-0.015	0.107	0.001	0.007
	(0.028)	(0.035)	(0.015)	(0.038)	(0.028)	(0.035)	(0.023)	(0.042)	(0.035)	(0.048)	(0.049)	(0.041)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Separation rate 55+	-0.015	0.026	-0.030	0.020	0.009	-0.030	-0.035	0.030	-0.022	0.022	0.003	-0.009
	(0.006)	(0.008)	(0.007)	(0.011)	(0.021)	(0.015)	(0.026)	(0.013)	(0.010)	(0.022)	(0.032)	(0.041)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Share 15-34	0.032	-0.001	0.033	0.005	0.020	0.012	0.072	0.019	0.055	0.030	-0.120	0.030
	(0.009)	(0.048)	(0.020)	(0.025)	(0.015)	(0.016)	(0.043)	(0.034)	(0.048)	(0.025)	(0.034)	(0.035)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Share 35-54	-0.024	0.012	-0.032	-0.035	-0.029	0.008	-0.078	-0.013	-0.039	-0.083	0.070	0.008
	(0.014)	(0.050)	(0.020)	(0.026)	(0.022)	(0.016)	(0.038)	(0.028)	(0.038)	(0.032)	(0.030)	(0.031)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]
Share 55+	-0.007	-0.009	-0.002	0.031	0.012	-0.022	0.019	-0.007	-0.018	0.054	0.048	-0.034
	(0.010)	(0.005)	(0.014)	(0.009)	(0.013)	(0.006)	(0.014)	(0.031)	(0.023)	(0.021)	(0.035)	(0.030)
	[862]	[862]	[862]	[862]	[862]	[862]	[424]	[424]	[424]	[424]	[424]	[424]

Notes. The table reports the estimates from equation (4) for Italy in panel A and Germany in panel B. Standard errors, clustered at the 2-digit industry-level, are reported in parentheses. The number of observations is reported in square brackets.

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LOBERTO M, A. LUCIANI and M. PANGALLO, *What do online listings tell us about the housing market?,* International Journal of Central Banking, v. 18, 4, pp. 325-377, **WP 1171 (April 2018).**

MIRENDA L., M. SAURO and L. RIZZICA, *The economic effects of mafia: firm level evidence,* American Economic Review, vol. 112, 8, pp. 2748-2773, **WP 1235 (October 2019).**

MOCETTI S., G. ROMA and E. RUBOLINO, *Knocking on parents' doors: regulation and intergenerational mobility,* Journal of Human Resources, v. 57, 2, pp. 525-554, **WP 1182 (July 2018).**

PERICOLI M. and M. TABOGA, *Nearly exact Bayesian estimation of non-linear no-arbitrage term-structure models,* Journal of Financial Econometrics, v. 20, 5, pp. 807-838, **WP 1189 (September 2018).**

ROSSI P. and D. SCALISE, *Financial development and growth in European regions,* Journal of Regional Science, v. 62, 2, pp. 389-411, **WP 1246 (November 2019).**

SCHIVARDI F., E. SETTE and G. TABELLINI, *Credit misallocation during the European financial crisis,* Economic Journal, v. 132, 641, pp. 391-423, **WP 1139 (September 2017).**

TABOGA M., *Cross-country differences in the size of venture capital financing rounds: a machine learning approach,* Empirical Economics, v. 62, 3, pp. 991-1012, **WP 1243 (November 2019).**

2023

APRIGLIANO V., S. EMILIOZZI, G. GUAITOLI, A. LUCIANI, J. MARCUCCI and L. MONTEFORTE, *The power of text-based indicators in forecasting Italian economic activity,* International Journal of Forecasting, v. 39, 2, pp. 791-808, **WP 1321 (March 2021).**

BARTOCCI A., A. NOTARPIETRO and M. PISANI, *Non-standard monetary policy measures in non-normal times,* International Finance, v. 26, 1, pp. 19-35, **WP 1251 (November 2019).**

DI ADDARIO S., P. KLINE, R. SAGGIO and M. SØLVSTEN, *It ain't where you're from, it's where you're at: hiring origins, firm heterogeneity, and Wages,* Journal of Econometrics,v. 233, 2, pp. 340-374, **WP 1374 (June 2022).**

FERRIANI F., *Issuing bonds during the Covid-19 pandemic: was there an ESG premium?,* International Review of Financial Analysis, v. 88, Article 102653, **WP 1392 (November 2022).**

LOBERTO M., *Foreclosures and house prices,* Italian Economic Journal / Rivista italiana degli economisti, , v. 9, 1, pp. 397-424, **WP 1325 (March 2021).**

NERI S., *Long-term inflation expectations and monetary policy in the Euro Area before the pandemic*, European Economic Review, v. 154, Article 104426, **WP 1357 (December 2021).**

ORAME A., *Bank lending and the European debt crisis: evidence from a new survey*, International Journal of Central Banking, v. 19, 1, pp. 243-300, **WP 1279 (June 2020).**

FORTHCOMING

CIAPANNA E, S. MOCETTI and A. NOTARPIETRO, *The macroeconomic effects of structural reforms: an empirical and model-based approach,* Economic Policy, **WP 1303 (November 2022).**

GIORDANO C., *Revisiting the real exchange rate misalignment-economic growth nexus via the across-sector misallocation channel,* Review of International Economics, **WP 1385 (October 2022).**

FERRARI A. and V. NISPI LANDI, *Whatever it takes to save the planet? Central banks and unconventional green policy,* Macroeconomic Dynamics, **WP 1320 (February 2021).**

FERRARI A. and V. NISPI LANDI, *Toward a green economy: the role of central bank's asset purchases,* International Journal of Central Banking, **WP 1358 (February 2022).**

LILLA F., *Volatility bursts: a discrete-time option model with multiple volatility components,* Journal of Financial Econometrics, **WP 1336 (June 2021).**

LOMBARDI M. J., M. RIGGI and E. VIVIANO, *Bargaining power and the Phillips curve: a micro-macro analysis, and wages,* Journal of the European Economic Association, **WP 1302 (November 2020).**

RAINONE E., *Real-time identification and high frequency analysis of deposits outflows,* Journal of Financial Econometrics, **WP 1319 (February 2021).**

RIZZICA L., G. ROMA and G. ROVIGATTI, *The effects of shop opening hours deregulation: evidence from Italy,* The Journal of Law and Economics, **WP 1281 (June 2020).**

TANZI G. M., *Scars of youth non-employment and labour market conditions,* Italian Economic Journal / Rivista italiana degli economisti, **WP 1312 (December 2020).**