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ZOMBIE FIRMS AND THE GROWTH OF THE LIVING: THE LABOR MARKET CHANNEL

by Antonio Accetturo*, Michele Cascarano* and Andrea Locatelli*

Abstract

Zombie firms may hinder growth not only via capital misallocation, but also by tightening local labor markets.

This paper studies whether zombie prevalence weakens healthy firms' ability to expand employment when they face positive export-demand shocks. Using Italian firm-level data for 2015-23, we exploit the variation in the incidence of employment in zombie firms over active population at local labor market level and firm-specific exposure to exogenous export-demand shocks constructed with a shift-share design. We show that firms located in local labor markets with a higher share of employment in zombie firms exhibit a weaker employment response to foreign-demand shocks. Effects are strongest for white-collar workers and for micro and small firms, consistent with tighter constraints on scarce skills and greater reliance on local hiring. Results are robust to alternative zombie definitions and shock constructions.

JEL Classification: J23, D22, G33, R23, F16.

Keywords: zombie firms, labor hoarding, labor misallocation, foreign demand shocks, local labor markets.

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1 Introduction[1]

In the aftermath of the "Great Recession," renewed attention has been devoted to the adverse effects of zombie firms – low-profitability firms that face persistent difficulties in servicing their interest obligations – on aggregate economic performance. The concept of zombie firms was originally introduced to explain the depth and persistence of Japan's "lost decade" (Caballero et al., 2008). Inefficient insolvency regimes or civil justice systems, misguided industrial policies, and evergreening practices may all facilitate the proliferation of zombie firms and help explain the weak productivity growth observed in several countries after the Great Recession.[2]

The presence and survival of zombie firms generate "excessive" competition in input markets, thereby constraining the growth and expansion of healthy firms. In addition, they may lock productive resources into non-performing firms, reducing the overall allocative efficiency of the economy. Much of the literature has emphasized the role of capital misallocation; however, despite substantial policy concern, the empirical evidence on the aggregate growth consequences of zombie firm prevalence remains mixed.

In this paper, we identify and quantify a complementary and largely unexplored mechanism, i.e., distortions in local labor markets (LLMs).[3] We study whether zombie firms constrain economic growth by hoarding workers in unproductive employment relationships, thereby limiting the labor supply available to healthier and more productive firms.

Zombie firms, kept alive by continued financial support, typically neither expand nor exit the market. Instead, they persist in a state of economic stagnation, maintaining employment levels despite poor performance. As a result, workers remain attached to firms that generate low or negative economic surplus, rather than being reallocated to more productive uses.

Crucially, labor markets are not frictionless across space. Geographic mobility is limited by housing constraints, family ties, and social networks, which imply that labor supply is largely determined at the local level (Rosenthal and Ross, 2015). In geographically segmented LLMs the presence of zombie firms may significantly tighten the pool of available workers. As a result, workers remain employed in firms where their productivity is low, even though they could be more productive if reallocated to healthier firms, but labor market frictions prevent

[1]We thank Federico Cingano, Francesco Manaresi, Sauro Mocetti, Giacomo Rodano, Giacomo Romanini, John Van Reenen, and participants at the annual conferences of AISRE and EALE and at the seminars held at Banca d'Italia for helpful comments and suggestions. All remaining errors are our own.

[2]See, among others, McGowan et al. (2017), McGowan et al. (2018), Rodano (2026), and Nurmi et al. (2020).

[3]LLMs are functionally integrated geographic areas defined on the basis of commuting flows and are designed to capture the relevant spatial scope of labor market interactions (source: Istat).

such reallocation from occurring smoothly.

This mechanism becomes particularly relevant when healthy firms experience positive demand shocks. Faced with an expansion in demand, productive firms may wish to increase employment, but their ability to do so depends on local labor availability. In areas where a substantial share of active population is employed by zombie firms, labor supply may be constrained precisely when demand conditions are most favorable. As a result, healthy firms may be unable to translate positive demand shocks into employment growth, not because of a lack of opportunities, but because labor is effectively trapped in unproductive firms.

In order to analyze these mechanisms, we focus on Italy, a setting characterized by a sizable presence of zombie firms, pronounced regional heterogeneity, and strong frictions in geographic labor mobility. We combine detailed firm-level balance sheet and employment data with information on international trade to study how local zombie prevalence shapes firms' employment responses to exogenous shocks to foreign demand. Our empirical approach exploits variation across LLMs in zombie employment shares over the active labor force and firm-level exposure to export demand shocks, allowing us to isolate the role of labor market distortions from other channels emphasized in the literature.

More specifically, we focus on exporting firms, for which we can construct a Bartik-style demand shifter, and examine whether, for firms facing the same export demand shock, exposure to high- versus low-zombie-intensity LLMs differentially affects employment growth. We exploit a rich set of fixed effects to account for firms' time-invariant characteristics as well as common shocks at the LLM and sectoral level (commuting zones).

Our findings suggest that zombie firms generate substantial labor-market congestion for healthy exporters. In particular, we show that firms' employment responses to exogenous export-demand shocks become significantly weaker as the local prevalence of zombie firms increases. For a firm located in a LLM with no zombie employment, a 10 per cent increase in export demand raises employment by about 0.34 per cent[4]. This coefficient should be interpreted as a reduced-form semi-elasticity linking exogenous shifts in foreign demand to observed employment dynamics, reflecting both firms' incentives to expand and their actual ability to scale up production and exports in the presence of local hiring frictions. The

[4]This estimate is broadly consistent with recent micro-level evidence on firms' employment responses to demand shocks. Dhyne et al. (2025) find an instantaneous employment response of 0.7 per cent following a 10 per cent demand-driven increase in sales for Belgian firms, while Garin and Silvério (2024) report a similar estimate of 0.75 per cent for Portuguese exporters using an analogous shift-share design. For Italy, Lucifora and Origo (2025) document a somewhat larger response of 1.3 per cent, whereas D'Amuri et al. (2025) find a cumulative employment decline of approximately 0.16 percentage points for every 1 per cent fall in sales. Our estimates are not directly comparable to these results, however, as we explicitly adjust for sectoral and geographical business-cycle conditions.

magnitude of the effect declines markedly in areas with greater zombie-firm concentration. In LLMs at the 25th percentile of the zombie-employment-share distribution, the same export-demand shock increases employment by roughly 0.27 per cent. In contrast, in LLMs at the 75th percentile of zombie prevalence, the estimated effect is close to zero, indicating no detectable employment response.

A second set of results supports the interpretation that the constraint operates through skill-specific labor scarcity in geographically segmented markets. The dampening effect of zombie prevalence is concentrated in the expansion of white-collar employment, while it is negligible for blue-collar workers. This pattern is consistent with two complementary mechanisms: (i) skilled labor is locally scarcer and harder to poach or attract when mobility is limited, and (ii) positive foreign-demand shocks tend to tilt labor demand toward more skill-intensive occupations.

Third, the heterogeneity analysis indicates that the trapped-labor channel is most binding for firms that are more reliant on local hiring and have limited ability to recruit outside the LLM. The negative interaction between export shocks and zombie prevalence is strongest among micro and small firms, for which the demand shock effect matters more for employment growth. This evidence appears consistent with their narrower catchment area and weaker access to broader recruitment networks. These findings are robust to alternative zombie definitions and shock constructions, and they are not driven by LLM size. Our results are stronger for zombie firms that remain in distress for prolonged periods and are robust to controlling for the labor share of firms undergoing formal insolvency procedures.

The labor constraint has real consequences on firms' performance: higher zombie employment shares also dampen the response of revenues to foreign-demand shocks, while leaving capital accumulation essentially unaffected, pointing to labor reallocation frictions (rather than investment capacity) as the dominant margin.

These findings have important policy implications. If the misallocation externality affecting growing firms were mainly driven by zombie firms experiencing temporary shocks, policies aimed at early crisis detection would need to balance the benefits for expanding firms within the same LLM against the potential loss from terminating still-productive matches. Similarly, if the effects were primarily driven by firms already in formal insolvency proceedings, the relevant policy margin would lie in improving insolvency and restructuring frameworks. Instead, our results point to the importance of addressing pre-insolvency distortions — such as credit evergreening, misdirected industrial support, and weak early detection of corporate distress — that allow persistently unviable firms to remain active without entering proper

insolvency procedures.

Our work builds on and extends several strands of the literature on zombie firms. The foundational contribution by Caballero et al. (2008) documented how forbearance lending in Japan during the 1990s led to the survival of unproductive firms that crowded out credit to more viable enterprises. Subsequent work has shown that similar mechanisms operate more broadly across advanced economies. Using firm-level data on listed non-financial companies, Banerjee and Hofmann (2018, 2022) document the rise of zombie firms and their adverse effects on productivity and resource allocation across a broad set of advanced economies. Related evidence shows that zombie firms depress investment and employment growth of healthy competitors through intensified product market competition and reduced profitability (Acharya et al., 2024).

Related cross-country evidence is provided by OECD studies by McGowan et al. (2017, 2018), which document a robust association between zombie congestion and slower productivity growth, while Storz et al. (2017) provide detailed evidence on the prevalence and persistence of zombie firms across the euro area.

Recent contributions have focused explicitly on the Italian context. Pelosi et al. (2021) show that, during the Covid-19 pandemic, zombie firms were more likely to exit the market and exhibited a lower take-up of public support measures, suggesting that policy interventions did not disproportionately sustain the least viable firms. In addition, Ascani and Nair (2025) document that zombie firms depress innovation activity of healthy firms operating in the same sector, providing further evidence that zombie firms generate real spillovers.

Importantly for our analysis, Schivardi et al. (2022) find that zombie firms do not generate sizable distortions in the Italian credit market. This result challenges the relevance of the standard credit-congestion channel in the Italian context and naturally raises the question of whether zombie firms may instead generate distortions through other margins. In this paper, we focus on the labor market as a potential alternative channel.

Our paper is also related to the literature on the role of orderly insolvency regimes in shaping economic performance. Bernstein et al. (2019a) and Bernstein et al. (2019b) highlight the positive effects of efficient reorganization procedures – rather than liquidation – on local economic outcomes and the allocation of capital across firms. Rodano et al. (2016) emphasize the role of stronger creditors' rights within insolvency regimes in fostering bank lending and investment. A common theme in this literature is that firms enter insolvency proceedings at a sufficiently early stage, when the quality of their assets remains relatively high and creditors can still be repaid through the procedure. The Italian case, by contrast, is characterized by

firms entering insolvency procedures only after a prolonged period of distress – in a zombie status –, often with very few employees remaining, thereby substantially reducing the quality of their assets (Fornasari and Rodano, 2025).

Our contribution to this literature is threefold. First, we identify and provide systematic evidence of a labor market channel through which zombie firms constrain economic growth. While existing work has emphasized capital misallocation, credit-market congestion, and product-market competition, we show that labor hoarding constitutes an independent and economically meaningful mechanism. Second, we exploit spatial variation in zombie prevalence across Italian LLMs, combined with firm-level exposure to exogenous export demand shocks, to obtain credible identification of this channel and isolate the effect of zombie prevalence on the employment dynamics of healthy firms. Third, we provide a rich set of heterogeneity analyses, documenting that the labor constraint varies systematically across worker types, sectors, firm size, and LLM conditions, thereby highlighting the specific contexts in which the trapped-labor mechanism is most pronounced.

The paper is organized as follows. Sections 2 and 3 describe, respectively, the data used in the analysis and the identification strategy. Section 4 presents the main results. Section 5 reports a number of heterogeneity analyses aimed at identifying the prevailing channels. Section 6 concludes and discusses the policy implications.

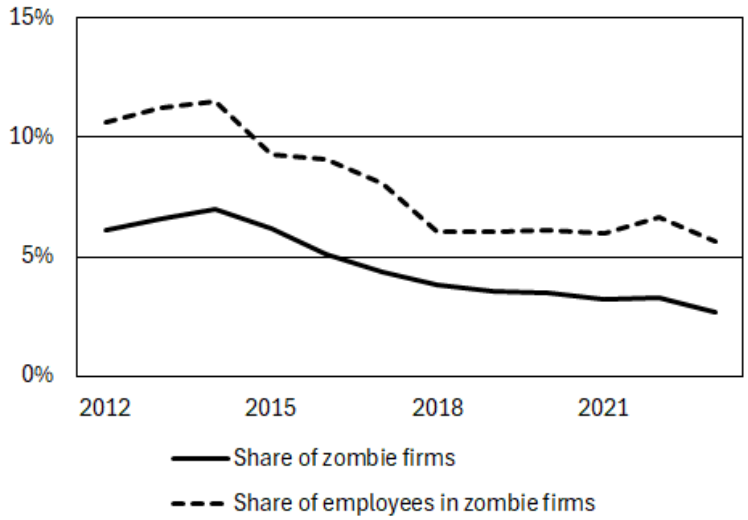
2 Data

Our empirical analysis combines detailed firm-level balance sheet and employment data with information on international trade flows and LLM characteristics in Italy. The resulting dataset allows us to study how local zombie prevalence shapes firms' employment responses to exogenous demand shocks.

Firm-level balance sheet information is drawn from the Cerved database and covers Italian limited-liability firms over the period 2015–2023. These data provide detailed information on firms' financial statements, including operating profits, interest expenses, assets, and other balance sheet items. Firm-level employment data come from administrative records of the Italian Social Security Institute (INPS). These data allow us to observe total employment at the firm-year level, as well as a breakdown between white-collar and blue-collar workers. Employment is measured as the average number of employees over the year. The availability of worker-type information is crucial for our heterogeneity analysis.

Firms are assigned to LLMs based on their municipality of operation. We use the 2011

Figure 2.1: Prevalence of zombie firms in Italy



Notes: Sample restricted to limited liability companies. The figure reports the annual share of zombie firms in the Italian economy and the share of employees over active population in those firms over the period 2012–2023. A firm is classified as a zombie if its EBIT is below interest expenses for at least three consecutive years and the firm is at least ten years old.

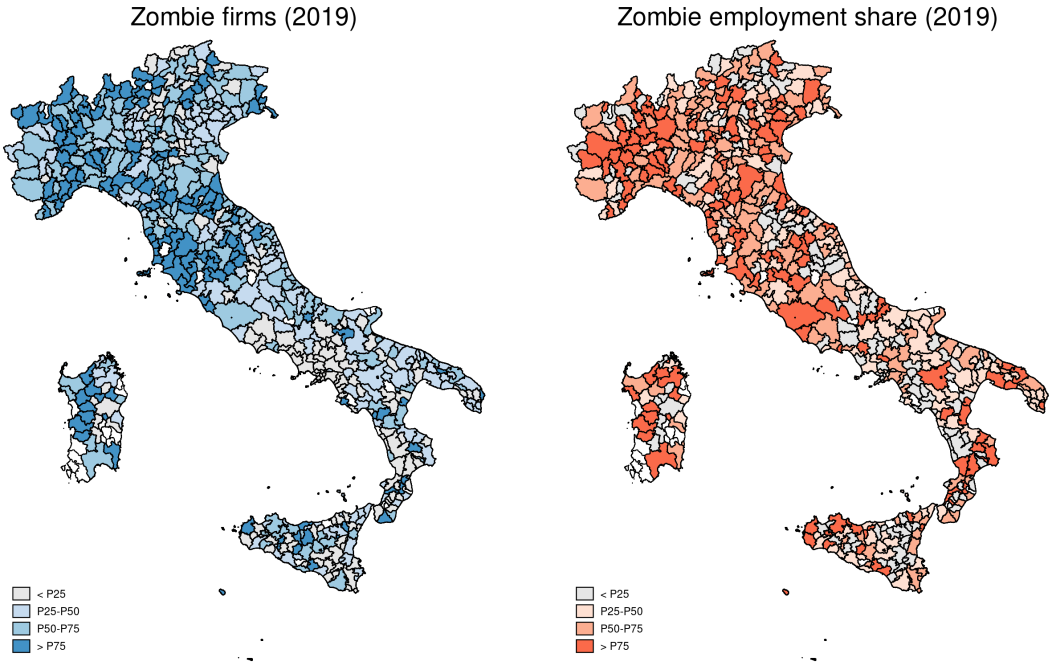
definition of LLMs, which is predetermined with respect to our period of analysis. For each LLM-year, we construct a measure of zombie employment share defined as the ratio between the number of workers employed in zombie firms within the LLM and the corresponding LLM-level labor force, using official labor force statistics from the Italian National Institute of Statistics (Istat). Labor force includes employed and unemployed individuals and captures local labor supply.

Following Pelosi et al. (2021), we classify a firm as a zombie if its EBIT (Earnings before interests and taxes, that measures operating income before financial expenses) is persistently insufficient to cover interest expenses. Specifically, a firm is defined as a zombie in year t if:

$$\text{EBIT}_{f,t-i} < \text{Interest Expenses}_{f,t-i} \quad \forall i = 0, 1, 2, \tag{1}$$

and the firm is at least ten years old. The age requirement ensures that we do not classify young firms experiencing transitory losses as zombies, while the requirement of three consecutive years captures persistent financial distress rather than temporary shocks. The resulting definition identifies a non-negligible and persistent group of financially distressed firms in the Italian economy, as illustrated in Figure 2.1; the incidence is even higher when the zombie share is weighted by the number of employees, indicating that zombie firms are, on average, larger than other firms.

Figure 2.2: Spatial distribution of zombie firms and employment across Italian LLMs



Notes: The left panel reports quartiles of the distribution across Italian LLMs of the share of zombie firms in total firms. The right panel reports quartiles of the distribution across Italian LLMs of the share of employment in zombie firms in total employment. Darker shades indicate higher values of the corresponding indicator. Blank areas denote LLMs with missing data. A firm is classified as a zombie if its EBIT is below interest expenses for at least three consecutive years and the firm is at least ten years old.

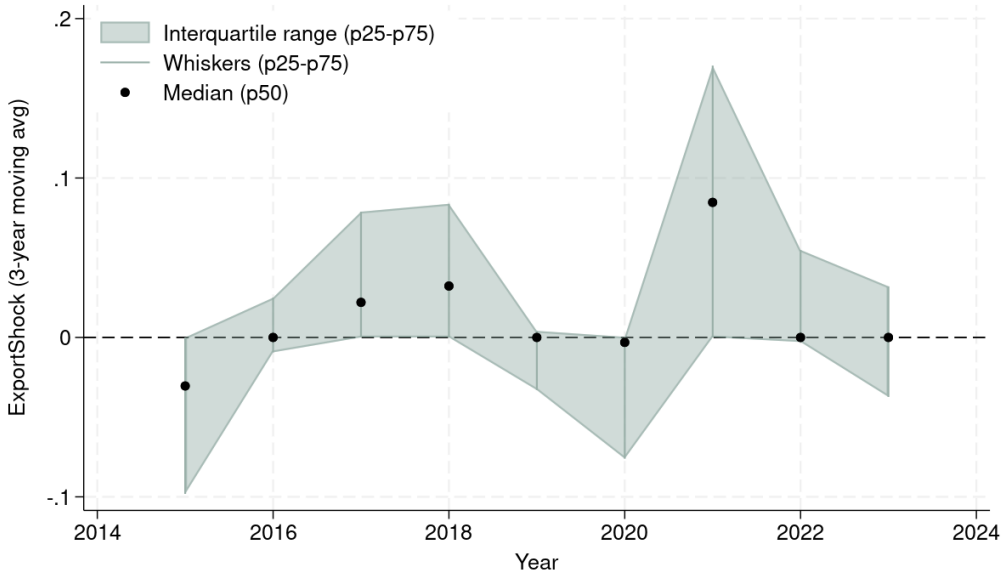
In addition to its persistence over time, zombie firm prevalence exhibits substantial geographic heterogeneity across Italian LLMs, as shown in Figure 2.2, that does not follow the usual North-South or rural-urban pattern.

To measure firms' exposure to exogenous demand fluctuations, we combine Italian Customs data on firm-level exports with international trade data from CEPII's BACI database, available since 2012. Customs data provide information on export values by firm, destination country, and product at a highly disaggregated level, while BACI data supply consistent measures of world imports by country and product. We construct firm-specific export demand shocks using a shift-share approach as in Hummels et al. (2014), Berman et al. (2012), and, more recently, Garin and Silvério (2024). For each firm f and year t, the export demand shock is defined as:

$$\text{ExportShock}^{\tau}_{ft} = \sum_{p,c} \omega^{\tau}_{fpc} \cdot \Delta \log(\text{WorldImports}_{pc,t}), \tag{2}$$

where ω^{τ}_{fpc} denotes the share of firm f's exports of product p to destination country c in a reference period τ, and $\Delta \log(\text{WorldImports}_{pc,t})$ is the growth rate of world imports for

Figure 2.3: Distribution of export demand shocks over time



Notes: The figure shows the distribution of firm-level export demand shocks over time for exporting firms. The export shock is constructed as a weighted average of changes in foreign demand at the firm–destination–product level and aggregated to the firm level.

product p in country c, excluding Italy.

Export shares $\omega^{\tau}_{fpc} = \frac{\text{Exports}^{\tau}_{fpc}}{\sum_{p,c} \text{Exports}^{\tau}_{fpc}}$ are computed using a three-year moving window covering years $t-3$ to $t-1$, which smooths short-run fluctuations in export patterns while preserving firms' underlying exposure to foreign markets. Because world import growth is driven by foreign demand conditions, these shocks are plausibly exogenous to LLM dynamics in Italy. The growth rate of world imports is computed as a log-difference, $\Delta \log(\text{WorldImports}_{pc,t}) = \log(\text{WorldImports}_{pc,t}) - \log(\text{WorldImports}_{pc,t-1})$. Figure 2.3 illustrates the distribution of firm-level export demand shocks over time for exporting firms.

Our baseline sample includes firms for which balance sheet, employment, and export information is available. Export demand shocks are defined for exporting firms, while non-exporters enter the analysis through the LLM variables.[5]

The estimation sample consists of roughly 650,000 firm-year observations. The average firm employs about 11 workers (Table 2.1), more than twice the average size of Italian firms (Accetturo et al., 2025). This reflects the well-established regularity that exporting firms are larger and more productive than other firms (see, among others, Melitz, 2003; Bernard et al., 2003; Mayer and Ottaviano, 2008).

[5]Export demand shocks are winsorized at the 5th and 95th percentile for exporting firms.

Table 2.1: Descriptive statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	log(Empl)	Share white coll.	Export shock	Zombie share	log(Net rev)	log(Exports)	log(int. K)	log(tang. K)
Mean	2.444	0.467	0.013	0.031	8.086	5.339	5.561	3.648
SD	1.395	0.310	0.074	0.030	1.403	2.521	2.164	2.094
p25	1.575	0.222	-0.022	0.010	7.081	3.353	3.951	2.079
p75	3.308	0.700	0.056	0.039	9.077	7.336	7.259	5.220

Note: The table reports descriptive statistics for the main variables used in the empirical analysis. The export shock and other firm level variables are winsorized at the 5th and 95th percentiles. Sample restricted to exporting firms over the period 2014–2023 and to the subsample available for the final specification reported in Table 4.1.

The share of white-collar workers is about one-half for the average firm, but it is characterized by a huge variability. Firms report average revenues above 3 million euros.

On average, firms are exposed to positive export shocks, although the lower tail of the distribution includes negative values. The share of zombie employment in LLMs is approximately 3 per cent.

Table 2.2 compares zombie firms with non-zombie firms in our estimation sample. The reported coefficients are obtained from separate regressions of each outcome on a zombie indicator, controlling for exporter status and year-by-LLM fixed effects. Zombie firms are, on average, larger than non-zombie firms, employing about 11 per cent more workers, but they display substantially lower productivity, with total factor productivity around 35 per cent lower. Despite their weaker performance, zombie firms exhibit higher labor costs and wages. The difference is particularly pronounced for white-collar workers, whose average wages are approximately 27 per cent higher than those of workers employed by non-zombie firms, while the corresponding differential for blue-collar workers is much smaller.

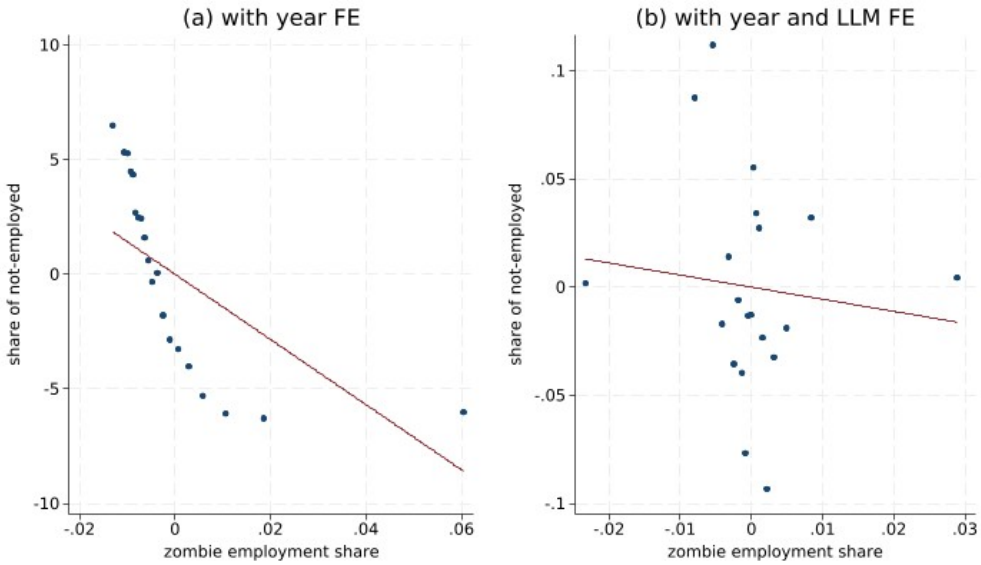
Table 2.2: Comparison of zombie and non-zombie firms

	Difference	Std. error
Employment	0.112***	0.015
Total factor productivity	-0.354***	0.008
Cost of labor	0.074***	0.005
Wages	0.041***	0.003
White-collar wages	0.274***	0.017
Blue-collar wages	0.050***	0.018

Notes: Each coefficient is obtained from a separate regression of the outcome on a dummy identifying zombie firms. The comparison is between zombie firms and non-zombie firms in the estimation sample. Employment, labor costs, and wages are expressed in logarithms. All regressions include exporter and year × local labor market fixed effects. Standard errors are clustered at the firm level. *** $p < 0.01$.

Figure 2.4 shows that the share of employment in zombie firms is negatively correlated

Figure 2.4: Incindence of employment in zombie firms and LLM tightness



Notes: The figure shows the (bin-scatterd) correlation between the share of non-employed aged 15-64 years old and the incidence of employment in zombie firms over total active population. Unit of observation: LLM-year over the period 2015-2023. Residualized values controlling for year fixed effects (panel (a)) and year and LLM fixed effects (panel (b)).

with the share of the non-employed population aged 15-64, our measure of local labor market tightness, across local labor markets after removing year fixed effects (panel (a)). The estimated regression coefficient is -142.146, with a standard error of 18.693. This pattern is not surprising: practices that help keep zombie firms alive, such as bank forbearance, credit evergreening, or more generous industrial policies, may be more prevalent in the country's more advanced areas. However, the relationship becomes much weaker once local labor market fixed effects are included: the estimated coefficient falls to -0.559, with a standard error of 1.181. The within-local-labor-market variation shown in panel (b) indicates that the zombie employment shares and non-employment rates co-move only modestly over time. This suggests that the negative association in panel (a) is mainly driven by persistent cross-sectional differences across local labor markets.

3 Identification Strategy

Our empirical strategy is designed to test whether the presence of zombie firms constrains the employment response of healthy firms to positive demand shocks through a labor market channel. The key idea is that exogenous increases in foreign demand create incentives

for firms to expand employment, but the extent to which they can do so depends on the availability of local labor supply, which may be reduced by zombie firms hoarding workers.

To identify this mechanism, we exploit two sources of variation. The first is firm-level exposure to exogenous export demand shocks, which capture changes in foreign demand conditions unrelated to local economic dynamics in Italy. Consistent with the logic in Goldsmith-Pinkham et al. (2020) and the quasi-experimental shift-share framework of Borusyak et al. (2022), identification relies on the exogeneity of aggregate import shocks at the country level. This assumption is particularly plausible in our context, since it is highly unlikely that fluctuations in a country's total imports are driven by the behavior of any single Italian firm. Given the negligible influence of an individual firm on aggregate trade flows, these shocks can be reasonably treated as exogenous to firm-level outcomes, satisfying the relevant shock-level orthogonality condition.

The second is variation across LLMs in the share of employment accounted for by zombie firms. By interacting these two dimensions, we test whether firms located in areas with higher zombie prevalence exhibit a weaker employment response to positive demand shocks.

The identifying assumption underlying this approach is that, conditional on the included fixed effects and controls, variation in foreign demand shocks exposure at firm level is orthogonal to LLM conditions in terms of absorption of workers in zombie firms. Differences in firms' employment responses across LLMs can therefore be interpreted as reflecting differences in local labor supply constraints associated with zombie firm prevalence.

This is a testable assumption. Figure 3.1 shows that the residual correlation between the two main explanatory variables is negligible (-0.01).[6] This result implies that the interaction term truly captures the constraint for healthy firms derived by the presence of zombie companies.

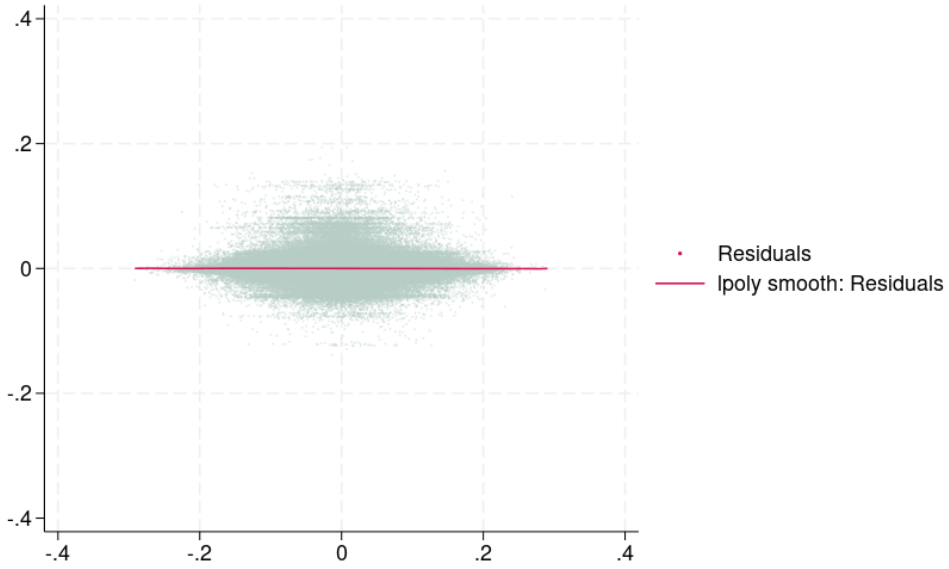
Our baseline estimating equation is given by:

$$\begin{aligned}\log(\text{Employment}_{ft}) = \beta_1 \, \text{ExportShock}^{\tau}_{ft} \times \text{ZombieShare}_{lt} + \beta_2 \, \text{ExportShock}^{\tau}_{ft} \\ + \beta_3 \, \text{ZombieShare}_{lt} + \text{FEs}_{ft}\gamma + \varepsilon_{ft}.\end{aligned} \tag{3}$$

where $\log(\text{Employment}_{ft})$ denotes the logarithm of employment of firm f in year t, $\text{ExportShock}^{\tau}_{ft}$ is the firm-specific export demand shock defined in Section 3, and ZombieShare_{lt} is the ratio between the number of employees in zombie firms and total active population in LLM l in year t. The vector FEs_{ft} includes a rich set of fixed effects aimed at controlling for unob-

[6] Residuals in figure 3.1 are computed without including year × LLM fixed effects, that are collinear with the share of employees in zombie firms.

Figure 3.1: Export demand shocks and firm-level residual outcomes



Notes: The figure plots the correlation between the export demand shock and the LLM incidence of employees in zombie firms over active population, which are the two main explanatory variables in the baseline specification. Both variables are residualized with respect to firm fixed effects and year × industry fixed effects, using the same estimation sample as in the last column of Table 4.1. Each dot represents one firm. The solid line reports a local polynomial (lpoly) smoothing.

served heterogeneity at multiple levels. In the baseline specification, we include firm fixed effects, which absorb time-invariant differences across firms such as productivity, managerial quality, and persistent differences in export orientation. We also include year fixed effects to control for aggregate macroeconomic shocks common to all firms. In more saturated specifications, we further include time-by-sector (Nace 2 digit-level) and time-by-LLM fixed effects, allowing for systematic differences in firms' employment levels across sectors and locations. These fixed effects absorb a wide range of potential confounding factors related to sectoral characteristics, local economic conditions, and persistent firm–location interactions.[7]

The coefficient of interest is β_1, which captures how the employment response to export demand shocks varies with local zombie prevalence. Our hypothesis is that $\beta_1 < 0$: firms located in labor markets with a higher share of zombie employment should display a weaker employment response to positive demand shocks, consistent with labor hoarding by zombie firms tightening local labor supply. The inclusion of the interaction between export demand shocks and local zombie employment share implies that identification comes from differences

[7]Including year-by-LLM fixed effects also accounts for changes in the size of the workforce at the LLM level, which enter the denominator of the incidence of employment in zombie firms. This is an important control because LLMs with a higher incidence of zombie employment tend to be characterized by higher activity rates in the cross-section, while their changes over time are less correlated (see Figure 2.4).

in firms' employment responses to the same exogenous demand shock across LLMs with varying zombie prevalence. A negative estimate of β_1 indicates that LLM conditions associated with zombie firms act as a binding constraint on firms' ability to expand employment in response to favorable demand conditions.

Importantly, this approach does not rely on differences in employment levels driven directly by zombie prevalence, but rather on differences in the elasticity of employment with respect to exogenous demand shocks. This distinction is central to interpreting the results as evidence of a labor supply constraint rather than a direct effect of zombie firms on firm size.

Standard errors are clustered at the firm level to account for serial correlation in firm-level outcomes. We show in the robustness analysis that the results are not sensitive to alternative clustering schemes.

4 Results

4.a Baseline results

Table 4.1 reports our baseline estimates of firms' employment responses to export demand shocks as a function of local zombie prevalence.

As expected, the export shock is positively correlated with employment growth across all specifications. The coefficient of the interaction term ($\text{ExportShock}^{\tau}_{ft} \times \text{ZombieShare}_{lt}$) is negative and highly significant in all columns, indicating that zombie firms substantially constrain the employment growth of healthy exporters through a labor market channel. The coefficient remains stable as we progressively saturate the model with year-by-sector and year-by-local-labor-market fixed effects, ruling out the possibility that the result is driven by unobserved sectoral or local shocks rather than genuine congestion externalities imposed by zombie firms. As expected, the overall impact is driven by firm-year observations that experience a positive export shock, as reported in column (4). However, the estimated effect is less precise, reflecting the smaller sample on which the estimation of that coefficient is based. For this reason, we keep column (3) as our preferred specification.

For a firm located in a LLM with no zombie employment, a 10 per cent increase in export demand raises employment by about 0.34 per cent. This direct effect should not be interpreted as the elasticity of labor demand with respect to output; rather, it is a reduced-form semi-elasticity that maps an exogenous increase in foreign demand into firms' observed employment responses, combining both firms' desired expansion and their effective ability

Table 4.1: Employment responses to export demand shocks

	(1)	(2)	(3)	(4)
ExportShock	0.035***	0.040***	0.034***	
	(0.008)	(0.008)	(0.009)	
ExportShock (+)				0.772***
				(0.025)
ExportShock (-)				-0.423***
				(0.017)
ZombieShare	-0.003	-0.031		
	(0.052)	(0.052)		
ExportShock × ZombieShare	-0.854***	-0.969***	-0.696***	
	(0.180)	(0.180)	(0.229)	
ExportShock (+) × ZombieShare				-0.671*
				(0.364)
ExportShock (-) × ZombieShare				-0.053
				(0.234)
Firm FE	X	X	X	X
Year FE	X			
Year×Sector FE		X	X	X
Year×LLM FE			X	X
Observations	649,101	649,101	649,101	649,101

Note: Sample restricted to exporting firms, years 2015–2023. ExportShock (+) refers to positive export shocks. ExportShock (-) refers to negative export shocks. Standard errors in parentheses. Errors clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.

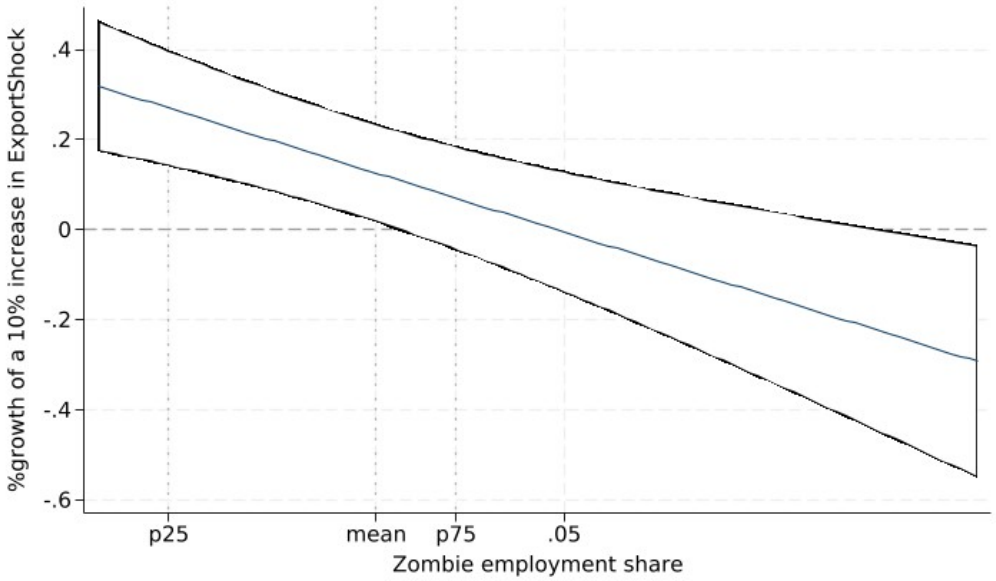
to expand production and exports in the presence of local labor-market frictions and hiring constraints. It is broadly consistent with recent micro-level evidence on firms' employment responses to demand shocks (see, among others, Dhyne et al., 2025 and Garin and Silvério, 2024, for estimates on Belgian and Portuguese firms).[8]

The negative interaction term indicates that this response declines sharply as the LLM-level incidence of employees in zombie firms over active population increases (Figure 4.1). In LLMs at the 25th percentile of the zombie-employment-share distribution, the same export-demand shock is associated with an employment increase of roughly 0.27 per cent. By contrast, in LLMs at the 75th percentile of zombie prevalence, the estimated effect is close to zero, implying no statistically detectable employment expansion.

Our main findings are robust to alternative definitions of zombie firms based on different measures of profitability from balance sheet data (EBIT-, EBITDA-based definitions, zombie

[8]For Italy, Lucifora and Origo (2025) report a larger response of 1.3 per cent, whereas D'Amuri et al. (2025) find a cumulative employment decline of approximately 0.16 percentage points for every 1 per cent fall in sales. Our estimates are not directly comparable to these results, however, as we explicitly adjust for sectoral and geographical business-cycle conditions.

Figure 4.1: The impact of export demand shocks on employment growth for different levels of Zombie employment share



Notes: The figure plots the marginal effects of a 10 per cent increase of the export demand shock for different levels of zombie employment shares. Confidence intervals are at 90%. Calculations are based on column (3) of Table 4.1.

incidence calculated at LLM-sector level), alternative reference periods used to construct export-share weights, different clustering schemes, and sample restrictions (including or excluding zombie firms). Detailed results are reported in Appendix Tables A1–A4. Appendix Table A6 also shows that the result does not depend on the size of the LLM in terms of population and activity rates.

5 Heterogeneity and Mechanisms

We next examine heterogeneity in the labor hoarding effect across firms, workers, and locations in order to better understand the mechanisms underlying the baseline results.

5.a Worker types

The negative interaction between export demand shock and local zombie prevalence may not be uniform across worker types. Skilled labor is typically locally scarcer than less-skilled labor. In geographically segmented labor markets, mobility frictions limit the extent to which firms can draw on workers residing outside the local commuting basin, so effective labor supply is largely determined at the local level (Rosenthal and Ross, 2015; Moretti, 2011; Monte

Table 5.1: Employment responses to export demand shocks, by worker type

	(1)	(2)	(3)
	White-collars	Blue-collars	Share of white-collars
ExportShock	0.021**	0.024**	0.003
	(0.010)	(0.012)	(0.003)
ExportShock × ZombieShare	-0.807***	0.101	-0.129**
	(0.248)	(0.327)	(0.065)
Observations	604,997	563,001	649,101

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Standard errors clustered at the firm level. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

et al., 2018). This segmentation matters more for skilled occupations because recruiting and matching for white-collar jobs rely on narrower occupational pools, stronger task-specific requirements, and more pronounced match quality considerations (De La Roca and Puga, 2017). White-collar workers are also paid relatively higher wages in zombie firms, which makes them less mobile in response to shocks. In contrast, blue-collar labor can be expanded, at least partially, by tapping into a broader margin of adjustment that includes unemployed or inactive individuals with more general and transferable skills (or by reallocating workers across tasks within occupations), implying a more elastic local supply at the relevant horizon (Brandolini et al., 2006).

This mechanism is amplified when we analyze positive foreign demand shocks, that tend to increase the skill intensity of the workforce in exporting firms (Accetturo et al., 2013). In our context, when foreign demand rises, the marginal hire is more likely to be a white-collar worker (e.g., managerial, commercial, technical, or organizational profiles that support exporting, compliance, marketing, product adaptation, and coordination), that is specific to the export-related expansion.

These considerations help rationalize the worker-type heterogeneity in Table 5.1. We find that the negative interaction between export demand shocks and local zombie prevalence is substantially stronger for white-collar employment than for blue-collar employment, and we also detect a decline in the white-collar share in response to demand shocks in high-zombie areas. Appendix Table A5 reports additional results showing that the estimated effects are driven by the absorption of white-collar workers by zombie firms.[9]

[9]These results are not directly comparable to the baseline estimates, since here we use the total number of employees, separately for white- and blue-collar workers, from INPS-Cerved data rather than the total labor force.

Table 5.2: Firm performance responses to export demand shocks

	(1)	(2)	(3)	(4)
Outcome variables	Net revenues	Exports	Tangible capital	Intangible capital
ExportShock	0.202***	0.722***	0.038**	-0.069**
	(0.010)	(0.027)	(0.018)	(0.032)
ExportShock × ZombieShare	-0.435*	-0.682	-0.631	0.524
	(0.231)	(0.624)	(0.453)	(0.750)
Observations	649,022	649,101	636,855	513,921

Notes: All outcome variables are in logs. Standard errors in parentheses. Standard errors are clustered at the firm level. All models include firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

Importantly, the scarcity of white-collar labor has first-order feedback effects on firms' ability to export and grow. White-collar workers – and managers in particular – play a key role in sustaining and scaling exporting activities. Evidence shows that managers' export-relevant experience is an important determinant of firms' export performance (see, among others, Mion et al., 2025; Manaresi et al., 2022). Therefore, when local zombie prevalence prevents expanding firms from hiring (or upgrading toward) the relevant white-collar profiles, it can hinder not only employment growth but also the firm's capacity to translate foreign demand opportunities into export expansion. Our results on firm outcomes are consistent with this mechanism: Table 5.2 shows that higher zombie employment shares weakly dampen the response of net revenues to positive export-demand shocks; the effect is also large and negative for exports, but the estimate is more imprecise. Capital accumulation is instead largely unaffected. This pattern suggests that the binding constraint operates through labor, while investment capacity —- more linked to the availability of financial external resources or the possibility to substitute blue-collar workers —- is confirmed to be unaffected (Schivardi et al., 2022).

Firm skill-intensity. – Table 5.3 complements the worker-type results by showing that the trapped-labor mechanism is stronger precisely for firms that are more reliant on skilled labor. Consistent with the evidence that the zombie-induced constraint operates primarily through white-collar scarcity, the interaction term *ExportShock* × *ZombieShare* is markedly more negative for firms that at the start of the estimation period had an above-median white-collar share.

More broadly, these results emphasize that heterogeneity is not only sectoral – a margin that is accounted for with sector-time fixed effects – but also reflects differences in firms' workforce

Table 5.3: Employment responses to export demand shocks, by skill intensity

	(1)	(2)	(3)
Estimation Sample	All firms	High share of white-collars	Low share of white-collars
ExportShock	0.034***	0.051**	0.019
	(0.009)	(0.012)	(0.014)
ExportShock × ZombieShare	-0.696***	-0.775**	-0.585*
	(0.306)	(0.339)	(0.300)
Observations	649,101	307,299	328,277

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Standard errors clustered at the firm level. Low and high share of white-collars correspond on whether the firm is above or below the median share of white collars (0.4) at the start of the estimation period. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

organization and factor intensity: even within the same sector and LLM, firms that operate with higher skill intensity face tighter constraints when skilled workers are locally trapped in zombie firms.

5.b Firm size

Firm size is a second margin along which the labor-hoarding channel should generate heterogeneous effects. Firm size directly relates to monopsony power and, more broadly, to how firms face an upward-sloping labor supply curve (Manning, 2021). In standard search-and-matching or job-ladder environments, employment expansion requires either offering higher wages (or better non-wage amenities) or devoting resources to recruiting, screening, and vacancy posting. Larger firms often operate with more developed HR functions and a higher capacity to scale recruitment efforts, while micro and small firms typically rely more on informal networks and short-distance search. When local labor supply is tightened by zombie firms, these differences matter: firms with limited recruiting technology and weaker outside reach will experience a steeper effective labor supply, so that hiring additional workers becomes disproportionately costly at the margin. Under such conditions, a demand shock may raise desired labor demand, but the realized response in employment can remain muted.

A second channel works through operating margins and the scope for rent sharing (Helpman et al., 2010; Akerman et al., 2013). Positive export-demand shocks raise the marginal product of labor, but the extent to which firms can convert this into actual hiring depends on whether they can finance the implied increase in labor costs. In tight labor markets, expanding

firms often need to pay wage premia, offer hiring bonuses, or otherwise share part of the incremental surplus with workers to attract them away from incumbent matches. Larger firms may be better positioned to do so because they tend to have more stable cash flows, better access to external finance, and more diversified revenue streams, while small firms typically operate with thinner margins and higher sensitivity of profits to input-cost increases. In this view, local zombie prevalence amplifies a rent-sharing constraint: when labor is scarce, the additional surplus generated by foreign demand may be insufficient for small firms to both preserve profitability and bid successfully for workers.

A third mechanism concerns the relevant labor pool and spatial hiring constraints. Even in the absence of formal mobility frictions, hiring is often geographically segmented: commuting costs, housing constraints, and the role of local networks imply that the effective labor supply available to a firm is largely local. Firm size shapes how binding these segmentation forces are. Micro and small firms are generally more dependent on the immediate local pool and have limited ability to draw workers from outside the LLM, while larger firms may be able to widen the recruitment radius, leverage broader professional networks, or use internal labor markets to reallocate workers across units and tasks (Carballo et al., 2024). Therefore, when zombie firms absorb a sizable share of the local workforce, the tightening of effective labor supply should disproportionately affect smaller firms whose hiring is most local and least scalable.

These mechanisms yield a clear empirical prediction: the dampening effect of local zombie prevalence on the employment elasticity to export-demand shocks should be strongest among micro and small firms, and weaker for medium-large firms.

Table 5.4 confirms a pronounced size gradient. The interaction between export-demand shocks and local zombie employment shares is largest in magnitude and statistically significant for micro firms, remains negative and significant for small firms, and becomes statistically insignificant for medium and large firms; for micro and small firms the direct effect is larger, indicating a larger semi-elasticity of labor demand to export shocks. Quantitatively, for micro firms a 10 per cent increase in the export demand shock implies a difference in employment growth between firms located at the 25th and 75th percentiles of the zombie employment share distribution that is three time the one estimated for small firms. The gradient is basically flat for medium-large enterprises.

Table 5.4: Employment responses to export demand shocks, by firm size

	(1)	(2)	(3)
Size class	Micro	Small	Medium-Large
ExportShock	0.055***	0.018*	0.002
	(0.020)	(0.009)	(0.012)
ExportShock × ZombieShare	-1.335***	-0.464**	-0.352
	(0.488)	(0.231)	(0.297)
Observations	231,448	271,826	128,302

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses, clustered at firm level. Size classes follow the European Commission Recommendation C(2003) 1422 (6 May 2003): Micro: employees < 10 and turnover or balance sheet ≤ 2 million euros. Small: employees < 50 and turnover or balance sheet ≤ 10 million euros. Medium-Large: firms above these thresholds. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

5.c Zombie persistence and worker reallocation

Zombie status is an outcome of weak operating performance relative to debt-service obligations, but the underlying economics can differ substantially across firms and over time. Some firms may experience a transitory deterioration in operating income – due to temporary demand shortfalls, short-lived cost shocks, or a brief tightening of credit conditions –while remaining fundamentally viable. Other firms may instead be chronically unviable, with low continuation value and little prospect of restoring profitability. These two situations have different implications for the efficient allocation of labor and for the magnitude of the externalities that zombie firms generate in geographically segmented labor markets.

From an allocative perspective, temporary distress creates an option value of waiting and strengthens the case for preserving existing worker-firm matches. When distress is short-lived, layoffs and worker reallocation can destroy match-specific surplus and firm-specific human capital that would otherwise remain productive once conditions normalize. In such circumstances, labor hoarding may be privately and socially rational: keeping workers attached to the firm avoids separation and re-hiring costs, preserves tacit knowledge and team-specific capital, and prevents inefficient churning when the firm is likely to recover.

By contrast, persistent distress implies low expected productivity in the existing match and a weak rationale for continued labor attachment. When a firm remains in a zombie-like state for extended periods, it delays the reallocation of labor toward more productive uses and generates a local congestion externality.

From a policy perspective this distinction is crucial. If the misallocation externality for

Table 5.5: Employment responses to export demand shocks, by persistence of zombie firms

	(1)	(2)	(3)	(4)
	Baseline	Persistence of zombie firms		
EmplShare variable:	All zombies	Strong only	Weak only	Strong & weak
ExportShock	0.034***	0.034***	0.016**	0.034***
	(0.009)	(0.009)	(0.007)	(0.009)
ES × ZombieShare	-0.696***			
	(0.229)			
ES × ZombieShare (persistent)		-0.763***		-0.778***
		(0.243)		(0.252)
ES × ZombieShare (temporary)			-1.042	0.255
			(1.382)	(1.437)
Observations	649,101	649,101	649,101	649,101

Notes: Sample restricted to exporting firms, years 2015–2023. *ES* stands for ExportShock. *ZombieShare* represents the share of total local employment accounted for by: (i) all zombie firms (column 1), (ii) *persistent* zombies only (column 2), (iii) *temporary* zombies only (column 3), or (iv) both types jointly (column 4). *Temporary* zombies are firms with only one year in which they are recorded as zombies in the dataset. *Persistent* zombies are those with at least two years in which they are recorded as zombie. All models include firm fixed effects, year×industry (Ateco), and year×LLM fixed effects. Standard errors clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.

growing firms is driven by zombie firms experiencing a temporary negative shock, the policy response in terms of early detection of a crisis status – that could benefit growing firms in the same LLM – should be weighted against the possible loss derived by the elimination of still-productive matches. If, instead, the negative effect is entirely driven by zombie firms that remain active despite being unviable, policy actions should be targeted in accelerating the cleansing of the market and favoring the exit of insolvent firms.

To analyze this issue, we classify the variable $ZombieShare$ according to the duration of zombie status. In particular, we calculate separately the variable if the firm is classified as zombies only once during our sample period and or if the firm remains in that status for at least two years. Building on this classification, we construct measures of LLM exposure to *temporary* zombies – firms with one-year zombie spells – and *persistent* zombies – firms that remain in that status for at least two years. We then replicate our baseline interaction framework using these alternative measures of zombie exposure.

Table 5.5 reports the corresponding estimates. The results show that the negative interaction between export demand shocks and local zombie prevalence is stronger in LLMs with greater exposure to *persistent* zombies. This evidence suggests that labor-hoarding effects are primarily driven by chronically unviable firms, which remain in operation and hinder a more efficient reallocation of workers toward growing and healthy firms.

5.d Zombie firms versus insolvency procedures

A potential concern with our interpretation is that the estimated interaction between export demand shocks and local zombie prevalence could be picking up the effects of formal insolvency rather than the effects of zombie firms that remain active despite persistent financial fragility. Zombie firms are, by construction, firms in sustained distress that continue operating. However, if a sizable portion of zombie employment were already associated with formal insolvency proceedings, our baseline estimates might partly reflect a state of insolvency *per se* – a regime in which employment adjustments and separations proceed differently – rather than the congestion externality generated by the continued survival of distressed firms. Zombie firms are indeed more likely to experience formal insolvency procedures (Fornasari and Rodano, 2025). In our data, 2.0 per cent of zombie firms are in procedure in year t, compared with only 0.15 per cent of non-zombie firms.[10]

This distinction is also central from a policy perspective. If the employment and reallocation effects associated with firms in formal insolvency procedures were the dominant force, the relevant policy margin would be the efficiency of insolvency and restructuring procedures themselves: faster and more predictable proceedings would accelerate separations and redeployment of workers, reducing the time during which labor remains locked in low-productivity matches and improving the responsiveness of local employment to demand shocks. In that case, the policy emphasis would naturally fall on shortening procedural delays, strengthening going-concern reorganizations when viable, and facilitating timely exit when not viable. By contrast, if the effect is dominated by persistently zombie firms that have not formally entered an insolvency procedure, the policy implications may hinge on pre-procedure distortions: evergreening practices, misdirected industrial support that keeps chronically unviable firms operating, or insufficient early detection of corporate distress. In that scenario, the key concern is not primarily the speed of formal proceedings, but the prolonged survival of financially fragile firms outside of them, which sustains labor hoarding and generates persistent congestion externalities in LLMs.

To explore this issue, we augment the baseline specification by interacting export demand shocks with the local employment share of firms undergoing insolvency proceedings (*Proc-Share*). This additional interaction allows LLMs to differ not only in the prevalence of zombie firms, but also in the contemporaneous intensity of formal insolvency, which could affect labor availability and the responsiveness of employment to demand shocks.

[10] When considering insolvency episodes in the previous three years, the corresponding shares rise to 6.08 per cent for zombie firms and 1.13 per cent for non-zombie firms.

Table 5.6: Employment responses to export demand shocks, by share of employment in firms under insolvency proceedings

	(1)	(2)	(3)
ExportShock	0.034***	-0.001	0.021**
	(0.009)	(0.008)	(0.010)
ES × ZombieShare	-0.696***		-0.828***
	(0.229)		(0.232)
ES × ProcShare		7.496***	9.500***
		(2.886)	(2.936)
Observations	649,101	649,101	649,101

Notes: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Standard errors are clustered at the firm level. *ProcShare* denotes the share of local employment accounted for by firms undergoing insolvency or bankruptcy proceedings, relative to the local labor force in the corresponding LLM. All models include firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

Table 5.6 reports the results. The coefficient on *ExportShock* × *ProcShare* is positive and statistically significant, indicating that healthy firms display a stronger contemporaneous employment response to export demand shocks in LLMs where a larger employment share is accounted for by firms in insolvency proceedings. The large coefficient reflects the fact that the share of employees working in firms undergoing insolvency procedures (0.2 per cent) is more than ten times smaller than the corresponding share in zombie firms (3.6 per cent); this occurs because firms generally start an insolvency procedure after having lost most of their employees (Fornasari and Rodano, 2025).

This pattern is consistent with the idea that, once formal procedures begin, separations and restructuring can accelerate, freeing up workers and easing local hiring constraints for expanding firms – thereby amplifying the measured responsiveness of employment to positive demand shocks.

Crucially, however, introducing *ProcShare* does not alter our main conclusion. The coefficient on *ExportShock* × *ZombieShare* remains large, negative, and highly statistically significant. The stability of this parameter suggests that the mechanism we identify is not driven by firms that are already in formal crisis, but rather reflects the behavior of zombie firms that remain active and continue to absorb labor despite persistent distress.

6 Conclusions and policy implications

This paper provides novel evidence on the costs that zombie firms impose on healthy ones through the labor-market channel. By hoarding workers in unproductive employment relationships, zombie firms reduce the effective local labor supply available to healthy competitors, thereby limiting productive firms' ability to expand employment when faced with favorable demand conditions. This mechanism constitutes a form of labor misallocation operating in geographically segmented labor markets, with the potential to dampen employment growth and, ultimately, economic dynamism.

Our empirical strategy exploits firm-level exposure to exogenous export-demand shocks, combined with cross-area variation in zombie prevalence across LLMs. We show that healthy firms located in areas with a higher zombie employment share exhibit a significantly weaker employment response to positive demand shocks. For a firm operating in a LLM with no zombie employment, a 10 per cent increase in export demand raises employment by approximately 0.34 per cent. The negative interaction term shows that this employment response weakens substantially as the local share of zombie employment rises. In LLMs at the 25th percentile of the zombie-employment-share distribution, the same export-demand shock is associated with an employment increase of about 0.27 per cent. In contrast, in LLMs at the 75th percentile of zombie prevalence, the estimated effect becomes close to zero, implying no statistically significant employment expansion.

We further explore heterogeneity along several dimensions to shed light on the underlying mechanism. The dampening effect of zombie prevalence on employment responses to positive demand shocks is substantially stronger for white-collar than for blue-collar workers, consistent with zombie firms disproportionately retaining skilled labor. The effect is also more pronounced among micro and small firms, suggesting that labor-market tightness induced by zombies may be particularly binding where hiring margins and recruitment networks are thinner.

Our findings highlight the value of timely identification of firms transitioning into persistent distress. Early detection mechanisms – based on forward-looking indicators of viability rather than purely backward-looking accounting measures – can help distinguish firms facing temporary liquidity strains from those in structural insolvency. Improving the speed and accuracy with which distress is diagnosed can facilitate earlier restructuring, orderly exit, or reallocation of workers toward more productive matches, limiting the scope for prolonged labor hoarding and the associated local labor-market externalities documented in this paper.

More broadly, the results caution against industrial policies that prioritize the preservation

of non-viable incumbents. Support measures that keep chronically unproductive firms operating may appear to protect jobs in the short run, but they can impose economy-wide costs by restricting the labor supply available to expanding, productive firms—especially in geographically segmented labor markets. In parallel, the policy framework should aim to eliminate incentives to evergreen credit to large, insolvent, "too-big-to-fail" firms. Stronger loss-recognition and provisioning rules, credible resolution regimes, and governance arrangements that reduce implicit guarantees can curb forbearance and encourage the redeployment of labor away from persistently unproductive firms.

Finally, because the mechanism we document operates through local labor-market tightness and sluggish worker reallocation, policies that facilitate mobility across firms are a natural complement to restructuring and insolvency reforms. Active labor market policies (for example job-search assistance, improved matching services, and targeted retraining and upskilling) can reduce transition frictions and help workers move from stagnant, low-productivity matches to expanding firms. By accelerating reallocation and preserving human capital, such interventions can alleviate the local labor-supply constraints created by zombie firms and strengthen the employment response of healthy firms to positive demand shocks.

Taken together, these measures would mitigate labor misallocation and support higher employment growth and productivity over the medium run.

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A Additional Robustness Checks

This appendix reports a series of robustness exercises that assess the sensitivity of the main results to alternative definitions of zombie firms, different constructions of the export demand shock, alternative clustering schemes, and sample restrictions.

Table A1: Alternative definition of zombie firms

	(1)	(2)	(3)	(4)	(5)
	EBIT definitions		EBITDA definition	Zombie-same sector	
Zombie definition:	`zombie_1`	`zombie_2`	`zombie_3`	`zombie_4`	`zombie_5`
ExportShock	0.034***	0.030***	0.027***	0.028***	0.025**
	(0.009)	(0.010)	(0.009)	(0.007)	(0.007)
ExportShock × ZombieShare	-0.696***	-0.429**	-0.644**	-0.248***	-0.221***
	(0.229)	(0.196)	(0.316)	(0.058)	(0.054)
Observations	649,101	649,101	649,101	649,101	649,101

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Unstandardized coefficients; standard errors clustered at the firm level (codfisc). (1) `zombie_1`: firms whose operating income before financial expenses does not cover interest expenses for at least three consecutive years, conditional on age ≥ 10. (2) `zombie_2`: stricter criterion, negative operating income or operating income below interest expenses for three consecutive years, conditional on age ≥ 10. (3) `zombie_3`: same as (1) but using EBITDA instead of EBIT. (4) `zombie_4` Zombie share (EBIT definition) calculated at Section (letter) and LLM level, using total sectoral employment as denominator. (5) `zombie_5` Zombie share (EBIT definition) calculated at Sector (2 digit) and LLM level, using total sectoral employment as denominator. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

Table A2: Alternative constructions of the export demand shock

	(1)	(2)	(3)
Historical export shares (ω^{τ}_{fsp})	3-year moving window	year $t-1$	year 2012
ExportShock	0.034***	0.007	-0.027***
	(0.009)	(0.005)	(0.006)
ExportShock × ZombieShare	-0.696***	-0.332***	-0.583***
	(0.229)	(0.128)	(0.166)
Observations	649,101	649,101	649,101

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Errors clustered at the firm level. Columns (1)–(3) use alternative definitions of the export demand shock: 3-year moving average, previous-year growth, and baseline year 2012. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

Table A3: Alternative clustering of standard errors

	(1)	(2)
ExportShock	0.034***	0.034***
	(0.011)	(0.010)
ExportShock × ZombieShare	-0.696***	-0.696***
	(0.200)	(0.249)
Observations	649,101	649,101
Clusters	firm	LLM

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

Table A4: Sample restricted to non-zombie firms

	(1)	(2)
Estimation Sample	all firms	non-zombie firms
ExportShock	0.034***	0.030***
	(0.009)	(0.010)
ExportShock × ZombieShare	-0.696***	-0.670***
	(0.229)	(0.191)
Observations	649,101	622,905

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Standard errors clustered at the firm level. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects.
* p<0.10, ** p<0.05, *** p<0.01.

Table A5: Heterogeneous effect by worker type in zombie firms

	(1)	(2)	(3)
Outcome variables	total employment	white-collars	blue collars
ExportShock	0.063***	0.052***	0.025
	(0.013)	(0.014)	(0.016)
ExportShock × w.c. ZombieShare	-0.709***	-0.586***	
	(0.139)	(0.129)	
ExportShock × b.c. ZombieShare	0.233		0.022
	(0.175)		(0.188)
Observations	649,101	604,997	563,001

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Standard errors clustered at the firm level. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects. w.c. ZombieShare (b.c. ZombieShare) indicates the ratio between white (blue) collar workers employed in zombie firms and total white (blue) collar employees at LLM-year level calculated using the Cerved-INPS dataset.
* p<0.10, ** p<0.05, *** p<0.01.

A1 Local labor market size

Employment density plays a crucial role in determining the economic performance of an area. More populated areas are characterized by higher productivity (Duranton and Puga, 2004) and a greater scope for high-quality matches between employers and employees (De La Roca and Puga, 2017). In principle, a high share of employment in zombie firms could be less harmful in more agglomerated areas, owing to the presence of a larger pool of specialized workers who could be hired by growing firms. To investigate this alternative channel, in Table A6 we include the local activity rate and the log of the working-age population as controls, both interacted with the export shock variable. The results show that the interaction term of interest increases slightly in magnitude once we control for LLM thickness; however, the confidence interval of this estimate largely overlaps with that of the baseline coefficient, indicating that the size of the LLM does not significantly influence the labor-hoarding effect of zombie firms.

Table A6: Employment responses to export demand shocks, by LLM conditions

	(1)	(2)	(3)
ExportShock	0.140	-0.014	0.083
	(0.085)	(0.029)	(0.092)
ExportShock × ZombieShare	-0.623***	-1.055***	-0.969***
	(0.233)	(0.319)	(0.324)
ExportShock × Activity rate	-0.002		-0.002
	(0.002)		(0.002)
ExportShock × log population		0.011*	0.010
		(0.006)	(0.006)
Observations	649,101	649,101	649,101

Note: Sample restricted to exporting firms, years 2015–2023. Standard errors in parentheses. Standard errors clustered at the firm level. All models include a constant, firm fixed effects, year×industry (Ateco), and year×LLM fixed effects. * p<0.10, ** p<0.05, *** p<0.01.