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Energy and Fiscal Shocks: Reassessing Industrial Competitiveness

Carl Grekou, Thomas Grjebine & Florian Morvillier

Highlights

- We build a novel dataset of sector-level energy prices to reassess the role of energy costs in industrial performance after the post-COVID recovery and the war in Ukraine.
- Focusing solely on energy prices overlooks the crucial influence of domestic demand, which is heavily shaped by fiscal policy.
- Expansionary fiscal measures can stimulate short-run industrial output by boosting domestic sales.
- Competitiveness gains from lower energy prices can be offset by demand-boosting fiscal policy, while contractionary policies can partly soften the impact of higher energy costs.

Abstract

Energy price shocks never occur in isolation: their impact is shaped by the broader macroeconomic context, in particular by governments' fiscal stance. This paper investigates how two key forces-energy price shocks and demand stimuli induced by fiscal policy-affect industrial performance in advanced economies, and shows that their effects depend critically on trade exposure. Using sector-level data for 30 countries over the period 1978-2022, we find that rising energy prices reduce manufacturing value added through both cost and demand channels, with more persistent effects in less open sectors. In contrast, demand-led fiscal expansions generate more complex dynamics: while boosting domestic sales, they simultaneously weaken external competitiveness. On average, a 1% increase in domestic demand leads to a 1.8% decline in manufacturing exports within three years. The overall effect on value added depends on the degree of trade openness - it is positive in the short term for sheltered sectors, but turns negative after two years in globally integrated ones.

Keywords

Energy Prices, Demand Shocks, Industry, Competitiveness.

JEL

Q41, Q43.

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Centre d'études prospectives
et d'informations internationales
20, avenue de Ségur
TSA 10726
75334 Paris Cedex 07

contact@cepii.fr
www.cepii.fr – @CEPII_Paris
Press contact: presse@cepii.fr

Energy and Fiscal Shocks: Reassessing Industrial Competitiveness[1]

Carl Grekou*, Thomas Grjebine†, Florian Morvillier ‡.

1. Introduction

The recent energy crisis, driven by the post-COVID-19 recovery and Russia's invasion of Ukraine, has brought energy costs back to the forefront of industrial concerns. Focusing on energy prices alone, however, risks missing an essential part of the picture: the concomitant role of domestic demand, itself strongly shaped by fiscal policy, in driving industrial performance. Expansionary fiscal measures can support industrial output in the short run by stimulating domestic sales, but they may also put upward pressure on wages and prices, eroding competitiveness and dampening exports. As a result, competitiveness gains from lower energy prices may be offset by demand-boosting fiscal policies, while the adverse effects of higher energy costs may, conversely, be mitigated over time by contractionary ones.

The transatlantic comparison highlights the interplay between energy price shocks and domestic demand dynamics in shaping industrial competitiveness (Figure A1 in the Appendix). In the United States, the shale gas revolution sharply reduced industrial energy prices (Figure A1a). However, expansionary fiscal policy and strong domestic demand (Figure A1b) likely contributed to wage growth and price pressures, which in turn may have fueled an appreciation of relative costs and a weakening of export performance (Figure A1c).[2] In the euro area, by contrast, demand-compression policies (Figure A1b) likely helped moderate wage growth, which in turn may have supported improvements in unit labour costs, bolstered export growth (Figure A1c), and strengthened the external contri-

[1]Corresponding author: Thomas Grjebine, CEPII, 20 avenue de Ségur 75007 Paris, France. Email: thomas.grjebine@cepii.fr .
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*CEPII and EconomiX-CNRS, University of Paris Nanterre, France. Email: carl.grekou@cepii.fr.
†CEPII. E-mail: thomas.grjebine@cepii.fr
‡CEPII. Email: florian.morvillier@cepii.fr
[2]For instance, Ferrara et al. (2021) show, in the case of the United States, that a fiscal stimulus leads to an appreciation of the real exchange rate and a deterioration of the trade balance.

bution to manufacturing value added (Figure A1d).

This paper examines how two key macroeconomic forces, energy price shocks and demand-led fiscal stimuli, shape manufacturing dynamics in advanced or industrial economies. A distinctive contribution of this paper is to highlight the role of varying degrees of trade openness —an aspect that remains largely unexplored in the literature— in shaping heterogeneous responses of manufacturing outcomes. Rising energy prices reduce manufacturing value added through both cost and demand channels —with more closed sectors experiencing more severe and persistent negative effects. In contrast, demand-led fiscal stimuli generate more complex dynamics. We find that, over the past three decades, a 1% increase in domestic demand has been associated, on average, with a 1.8% decline in manufacturing exports within three years. The overall impact on manufacturing value added critically depends however on the degree of trade openness: in the sectors most sheltered from international competition, domestic gains may compensate for export losses; in highly open sectors, however, declining exports tend to dominate, resulting in a net contraction.

To empirically assess these dynamics, we construct a novel cross-country dataset and implement an identification strategy designed to address potential endogeneity concerns. While most existing studies rely on a single energy price —typically oil price shocks, and more recently, gas price shocks— to analyze the macroeconomic effects of energy prices, our paper distinguishes itself by employing a composite energy price indicator, following the approach proposed by Sato et al. (2019).[3] We construct a detailed industrial energy price index covering 30 countries over a 45-year period and estimate the effects of energy price shocks on manufacturing dynamics using local projections-instrumental variable methods (LP-IV). We investigate the effects of demand-driven tax shocks on the same manufacturing outcomes, using changes in property taxes as an instrument for domestic demand. Property taxes provide a valid instrument for domestic demand, as they are widely regarded as among the least distortive forms of taxation and primarily affect disposable income rather than supply-side incentives.[4]

[3] This indicator has two key features: it is, first, comprehensive, as it incorporates coal, electricity, gas, and oil prices, weighted by each source's share in the industrial energy mix at the country-sector level; second, it captures the actual prices paid by industrial users, taking into account taxes and subsidies. Sato et al. (2019) covered the period 1995–2015, we extend it to the period 1978–2022.

[4] For this reason, increases in land taxes have been advocated by classical and neoclassical economists since at least Smith (1776) and Ricardo (1817), and very forcefully by George (1879). Because they are as close as it gets to a lump-sum tax, creating minimal distortions, increases in property taxes are often recommended

This paper contributes to two main strands of the literature: one examining the macroeconomic effects of energy shocks, and the other analyzing the impact of fiscal and budgetary shocks. A substantial body of research has long focused on the macroeconomic implications of oil price fluctuations in particular in the United States, employing a wide range of empirical methodologies (see, e.g., Baumeister and Peersman, 2013; Kilian, 2014; Herrera et al., 2019; Caldara et al., 2019; Känzig, 2021). In the wake of the recent surge in gas prices in Europe, a growing literature has examined the inflationary consequences of energy price shocks in the Eurozone (Adolfsen et al., 2024; Alessandri and Gazzani, 2025). The effects of energy price shocks on real economic activity, particularly industrial production, remain more debated. Adolfsen et al. (2024) report no statistically significant effect of energy price changes on industrial output, while Alessandri and Gazzani (2025) find only a limited response — a 10% increase in gas prices is associated with a 0.6% drop in industrial production.[5] Other studies, however, identify considerably larger effects. De Santis and Tornese (2025), for example, show that in a low-inflation environment, a 10% increase in energy prices leads to a 4.5% decline in industrial output. These findings align with those of Arezki et al. (2017), who document substantial macroeconomic effects associated with the U.S. shale gas boom. Our own estimates, which rely on a composite energy price index, yield results that are closer in magnitude to these latter studies. We further show that, following an energy price shock, the effects are significantly stronger in less open (more closed) sectors compared to more trade-exposed ones.

This paper also relates closely to the empirical literature on tax multipliers. Studies based on aggregate data typically follow either a narrative approach (see, in particular, Romer and Romer, 2010; Cloyne, 2013, or more recently, Gunter et al., 2021, and Ziegen-

by international organizations as an efficient source of public revenue (OECD, 2024). Another advantage is that property tax changes are largely exogenous, as their base is not directly linked to current GDP fluctuations, unlike indirect taxes such as VAT or excise taxes, which are directly impacted by consumption levels. This allows us to use property tax changes as an instrument without requiring cyclical adjustment (Geerolf and Grjebine, 2018).

[5] Firm and sectoral analyses reveal considerable heterogeneity in firms' response to energy shocks due to varying degrees of reliance on energy, leading to different energy costs. From the trade perspective, Dussaux and Monjon (2023) show that for the average firm, export value is reduced by 3.6% following a 10% energy price hike for a sample of French firms over the period 2001–2015. On the import side, using sectoral data, Sato and Dechezlepretre (2015) provide evidence of a small impact of energy price differentials on import dynamics. Indeed, imports rise by 0.2% in response to a 10% increase in the energy price difference between two country-sectors. Using firm-level M&A data in a gravity model, Saussay and Sato (2024) demonstrate that energy price differentials between countries are a significant determinant in the industrial investment location of firms, particularly in energy-intensive sectors.

bein, 2024) or a structural approach (as in Blanchard and Perotti, 2002).[6] The existing literature is generally agnostic about the transmission channels through which tax changes affect output, whether via supply-side incentives or demand-side disposable income. As Romer and Romer (2010) put it, their results are "largely silent about whether the output effects operate through incentives and supply behavior or through disposable income and demand stimulus." In this paper, we focus on changes in property taxes, which offer a particularly clean setting to disentangle demand-side from supply-side effects. As such, they allow us to isolate tax changes that primarily operate through the demand side of the economy.[7]

Building on our empirical estimates of the effects of energy-price shocks and demand shocks, we quantify the respective contributions of these shocks to the evolution of productive dynamics in the United States and euro area since the early 2000s. This analysis highlights both the significant role played by the decline in U.S. energy prices following the shale-gas boom and the contribution of European demand-particularly during the austerity episodes of the early 2010s.

The rest of the paper is organized as follows. Section 2 describes the data and methodology. Section 3 discusses the baseline results. Section 4 examines the role of sectoral openness. Section 5 documents the respective contributions of energy and demand shocks to manufacturing dynamics in the United States and Europe. Section 6 presents additional results and robustness checks. Finally, Section 7 concludes the paper.

2. Data and Methodology

This section describes the data, variables, and empirical strategy used in the analysis.

[6] A complementary strand of the literature relies on cross-sectional evidence, using regional, county-level, or individual data. These studies often employ structural models to capture general equilibrium effects, as in Nakamura and Steinsson (2014). Micro-level analyses focus on the direct impact of tax changes on household consumption, relying on quasi-experimental variation in the timing of tax reforms (e.g., Parker, 1999; Johnson et al., 2006; Parker, 2011; Parker et al., 2013; Cloyne and Surico, 2017). By construction, such approaches typically abstract from general equilibrium considerations.

[7] More details on property taxes and on the identification of domestic demand shocks are given in Section 2.2.2.

2.1. Data

2.1.1. Sectoral energy prices

Given the central role of energy as a production input, the economic effects of energy price shocks have been studied using a variety of approaches. Two main strands of the literature can be distinguished. The first focuses on the effects of shocks to a single energy source —such as oil, gas, or electricity— allowing for a more granular identification strategy.[8] The second strand of the literature adopts a more aggregate perspective, using composite or multi-dimensional indicators of energy prices rather than focusing on a single source. For example, De Santis and Tornese (2025) rely on the energy component of the Harmonized Index of Consumer Prices (HICP), while Marin and Vona (2021), using French establishment-level data, construct an energy price index combining multiple sources, including oil, gas, and electricity.

In this paper, we build on the approach proposed by Sato et al. (2019) to construct an annual, sector-level energy price index covering the period 1978-2022 for 30 countries.[9] We distinguish between eight industrial sectors: *Chemical & Petrochemical*, *Food & Tobacco*, *Machinery*, *Mining & Quarrying*, *Non-ferrous metals*, *Textiles & Leather*, *Transport equipment*, and *Wood & Paper*.[10]

More specifically, we compute a sector-specific composite energy price index in logarithmic form, denoted $SEPI$, for Sectoral Energy Price Index, which incorporates time-varying

[8] For instance, studies on oil price shocks often follow the methodology developed by Kilian (2009). More recently, Känzig (2021) proposed a narrative-based identification of oil supply shocks using OPEC announcements to construct a measure of oil supply news shocks. This approach has been extended by Alessandri and Gazzani (2025) to the European gas market to identify gas supply news shocks exogenous to economic activity. In a related study, Boeck et al. (2023) analyze the impact of gas price shocks using the real price of natural gas, measured via the Dutch Title Transfer Facility (TTF) spot price deflated by the euro area GDP deflator.

[9] The sample includes the following countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. The selection reflects the set of advanced economies for which sufficiently detailed and consistent data are available to construct our aggregate energy price indicator.

[10] The sectoral classification is based on ISIC Revision 3 at the 2-digit level, aggregated where necessary to ensure consistency across energy, trade, and industrial activity datasets.

weights by fuel type as follows:

$$SEPI_{\text{i,s,t}} = \sum_j w^j_{i,s,t} \cdot log\left(EPI^j_{i,s,t}\right) \tag{1}$$

where $EPI^j_{i,s,t}$ stands for the real energy price index —end-user prices— of energy j per tonnes of oil equivalent (toe) in sector s in country i. $\omega_{i,s,t}$ denotes the energy weights, defined as follows:

$$w^j_{i,s,t} = \frac{F^j_{i,s,t}}{\sum_j F^j_{i,s,t}} \tag{2}$$

where $F^j_{i,s,t}$ denotes the quantity (in toe) of energy type j used by sector s in country i at time t. Accordingly, the weights $w^j_{i,s,t}$ vary across countries, sectors, and time. In practice, however, we compute time-varying weights over non-overlapping five-year windows, rather than on an annual basis, to smooth short-term fluctuations and reduce noise. We include four energy sources in our composite energy price index: coal, electricity, gas, and oil.

The $SEPI$ indicator thus provides an estimate of the average real energy cost borne by firms at the sectoral level. Its variation reflects both fluctuations in end-user energy prices and shifts in the composition of energy inputs across fuel types. The construction of this index draws on multiple data sources.

Data on national industry end-user prices for coal, electricity, heavy fuel oil, and gas are obtained from the International Energy Agency (IEA). These data are reported as 12-month averages and include taxes paid by industry (such as excise and environmental taxes), but exclude VAT and other recoverable levies. The few gaps in the IEA data are addressed by replacing the missing sectoral prices with the corresponding regional ones.[11] Industrial weights for the construction of the index are sourced from the EXIOBASE database. We provide in the Appendix (Section A.2.2), an overview of the evolution of energy prices.

2.1.2. Specification of dependent and control variables

In our empirical analysis, we cover multiple dimensions of manufacturing activity by considering six dependent variables: (i) the domestic sales of manufactured goods, (ii)

[11] These gaps in the data concern almost exclusively, when they occur, a single energy source. The non-interpolated series (which rely on three energy sources for a few observations) and the interpolated ones show virtually no meaningful differences. To anticipate, note that both series yield similar results.

the manufacturing employment (number of employees), (*iii*) manufacturing exports, (*iv*) an index of industrial production, (*v*) manufacturing value added, and (*vi*) manufacturing wages and salaries.

We collect the data on manufacturing employment, value added, wages and salaries, as well as indices of industrial production from the United Nations Industrial Development Organization (UNIDO) database (INDSTAT Revision 3). All the initial data are collected at the sectoral level —2-digit level of aggregation. Data on exports are from the CEPII CHELEM database (de Saint-Vaulry, 2008). Domestic sales, defined as national production for the domestic market, are calculated by subtracting sector-level exports from production data sourced from UNIDO. Domestic sales, exports, value added and wages are in constant 2015 prices, expressed in U.S. dollars. All the variables enter in logs in the specifications.

In selecting control variables, we adopt a parsimonious specification to ensure consistency across models and facilitate interpretation. To maintain comparability, the set of covariates remains identical across all model specifications, regardless of the dependent variable. First, we account for external demand conditions by including measures of foreign demand. Our preferred specification uses the trade-weighted average GDP of partner countries, with sector-specific trade flows determining the weights to match the level of analysis.[12] Second, we control for movements in the real effective exchange rate (REER), using data from the CEPII EQCHANGE database (Couharde et al., 2018). This measure corresponds to the trade-weighted average of the real exchange rate relative to 186 partner countries, using a time-varying weighting scheme. Finally, depending on the shock being analyzed, we alternatively include either domestic demand or sector-level energy prices as additional controls.

All variables are formally defined, and their sources are documented in Table A1.

[12] As a robustness check, we also consider the Global Real Economic Activity (GREA) index developed by Kilian (2009).

2.2. Identification of energy price and domestic demand shocks

2.2.1. Energy price shocks

We use the growth rate of our composite energy price indicator —$SEPI$— to capture energy shocks at the country-sector level. As discussed above, changes in $SEPI$ reflect both developments in end-user prices and shifts in the energy mix. While $SEPI$ offers a relatively accurate measure of energy costs faced by firms, its use raises potential endogeneity concerns in an econometric framework for two reasons. First, $SEPI$ may be subject to endogeneity, as firms can respond to price shocks by adjusting their energy mix. This substitution across energy sources may, in turn, affect the aggregate energy price level. Second, the use of $SEPI$ can also be subject to reverse causality issues, since national energy prices can still be affected by endogenous factors such as tax policy changes, macroeconomic fluctuations, or demand-side shocks. To handle concerns related to potential endogeneity, we construct a fixed-weight regional energy price index ($FREPI$) at the country-sector level, which we use as an instrument for $SEPI$.[13] Conceptually, $FREPI$ "orthogonalizes" $SEPI$ by *(i)* fixing the energy mix and *(ii)* replacing national energy prices with regional ones, thus eliminating endogeneity arising both from energy substitution (i.e., time-varying energy mix adjustments) and from country-specific price determinants. Regional prices serve as a proxy that is less directly influenced by domestic policy or macroeconomic conditions, offering a more exogenous source of variation in the price component. In particular, they capture broader market dynamics that shape non-tax components of end-user prices, while remaining plausibly uncorrelated with country-specific shocks affecting manufacturing output. This makes $FREPI$ a relevant and credible instrument for isolating exogenous shifts in energy prices.

The instrument is constructed as follows:

$$FREPI_{i,s,t} = \sum_{j} w_{i,s}^{j} \cdot \log\left(RP_{i,t}^{j}\right) \tag{3}$$

where $RP_{i,t}^{j}$ denotes the regional price of fuel type j for country i at time t. $w_{i,s}^{j}$ denotes the energy mix at the country-sector level for a reference year —defined analogously to

[13] More specifically, we rely on the $FREPI$ measure purged of global demand effects, as it more accurately isolates energy shocks. See, among others, Kilian (2009).

expression (2) but considering only a specific year.

The construction of $FREPI$ relies on three energy sources: coal, gas, and oil. We circumvent the lack of consistent and uncontested data on regional electricity prices by reallocating the weights associated with coal, gas, and oil in electricity production, using data from the World Development Indicators database (World Bank). For each country, we match domestic energy prices with the most appropriate regional benchmark. For oil, we rely on regional price series such as U.K. Brent, Dubai Fateh, and West Texas Intermediate (WTI). For natural gas, we use the Dutch Title Transfer Facility (TTF), Henry Hub, and the Indonesian Liquefied Natural Gas index.[14]

2.2.2. Domestic demand shocks

Domestic demand is proxied by real GDP augmented by imports and net of exports, expressed in constant 2015 U.S. dollars. This measure may introduce endogeneity concerns, as increases in manufacturing value added, output, or exports can themselves contribute to higher domestic demand. Given that our shock variable is not exogenously determined, we follow the same strategy as above and adopt an instrumental variable approach.

More specifically, we rely on property taxes to isolate demand-driven fiscal shocks and strengthen identification.[15] Property taxes are particularly well-suited for this purpose, as they are widely regarded as the least distortive form of taxation. Their effects operate primarily through disposable income rather than through supply-side or incentive channels. In this sense, they approximate lump-sum taxes, and increases in property taxation are often advocated by international organizations as a way to raise revenue with minimal economic distortion (see, e.g., OECD, 2024).

Another advantage of using property tax changes is their relative exogeneity compared to other types of taxes, which are often influenced by contemporaneous economic conditions. In particular, the tax base for property taxation —typically the assessed value of

[14]For instance, to represent the regional gas price for European Union countries, we use the Dutch Title Transfer Facility (TTF), which accounted for 79% of total traded volumes on the continent (Alessandri and Gazzani, 2025). Coal prices are proxied by regional indices, including South African, Australian, U.S. steam coal, and Northwestern steam coal prices. Consistent with the construction of our shock variable, $FREPI$ is based on real prices and enters the regressions in log-difference form. As an additional precaution, both the shock variable and its instrument are lagged by one year.

[15]We collect cross-country time series data on "recurrent taxes on immovable property" (item 4100) from the OECD Revenue Statistics. This category includes taxes levied regularly on the use or ownership of immovable property.

immovable assets— is not directly tied to current GDP. This stands in contrast to consumption —based taxes such as VAT or excise duties, whose bases fluctuate in real time with aggregate demand. Even in countries where property values are frequently reassessed —such as the United States, a rare case in our sample— the influence of macroeconomic developments on the tax base tends to operate with a lag through housing prices.[16] This makes property tax changes particularly suitable as indicators of fiscal shocks, without requiring ex-post cyclical adjustment. Moreover, since property taxes are typically set at the local level while macroeconomic stabilization falls within the remit of central governments, the scope for actively adjusting tax rates in a countercyclical manner-and thus the risk of endogeneity -is limited.

All in all, using property tax changes to instrument domestic demand provides a credible strategy to capture demand-driven tax shocks. In our empirical analysis, we define the shock variable as the one-year lagged growth rate of domestic demand, instrumented by the lagged first difference of property tax revenue as a share of GDP.

2.3. Empirical framework

2.3.1. Estimation strategy

The objective of the empirical analysis is to shed light on the industrial effects of energy and domestic demand shocks. Rather than focusing solely on average point estimates, we aim to characterize the dynamic responses that unfold in the aftermath of such shocks. To this end, we employ the Local Projections (LP) method introduced by Jordà (2005), which enables direct estimation of impulse response functions. Given the potential endogeneity concerns in our setting, we rely on instrumental variable extensions of this approach – specifically, the LP-IV framework developed by Jordà et al. (2015).[17] LP methods offer several advantages: they are straightforward to implement, robust to model misspecification, and well-suited to accommodate rich dynamics, nonlinearities, and heterogeneity across sectors or countries (Jorda and Taylor, 2025). Compared to traditional Vector

[16]The endogeneity issue is thus significantly less severe for property taxes than for other types of taxes. While exceptions exist–for instance, South Korea has occasionally used property taxation as a tool to curb real estate bubbles (Geerolf and Grjebine, 2018)–such cases are rare.

[17]For comprehensive reviews of LP-IV methods, see Ramey (2016) and Jorda and Taylor (2025). A more detailed discussion of endogeneity issues is provided below.

Autoregressive (VAR) models, LP methods tend to yield more reliable inference in small samples.[18]

For a given horizon $h = 0, 1, ..., H$, the local projection of an interest variable $Y_{.,t}$, i.e., $Y_{.,t+h}$, on a shock $S_{.,t}$, can be estimated with the following regression:

$$\Delta^h Y_{i,s,t+h} = \alpha^h_{i,s} + \beta^h S_{i,s,t} + \sum_{j=1}^{p} \phi^h_j \Delta Y_{i,s,t-j} + \sum_{j=0}^{q} \theta^h_j \Delta X_{i,s,t-j} + \varepsilon_{i,s,t+h} \quad (4)$$

where $\Delta^h Y_{i,s,t+h} = Y_{i,s,t+h} - Y_{i,s,t-1}$ refers to the long-differences (or cumulative changes) of the dependent variable relative to its pre-shock level. $S_{i,s,t}$ is the country-sector-year specific shock variable. $X_{i,s,t-j}$ —with $j = 0, 1, ..., q$— is a vector of control variables (both contemporaneous and lagged). The specification also includes p lags of the dependent variable, as well as country-sector fixed effects specific to each horizon ($\alpha^h_{i,s}$). $\varepsilon_{i,s,t+h}$ stands for the country-sector adjusted error term at horizon h.

Our main focus is on the horizon-specific responses of the dependent variable to the shock, as captured by the estimated β^h coefficients, which together trace out the impulse response.[19]

3. Empirical analysis

This section is devoted to the presentation of our empirical analysis. First, we discuss the macroeconomic impacts of energy price shocks on the manufacturing sector. Then, we examine how the manufacturing sector responds to a domestic demand shock.

3.1. Macroeconomic impacts of energy price shocks on the manufacturing sector

Figure 1 displays the dynamic responses of our variables of interest following a one percent energy prices shock.[20] Overall, in the short to medium term, an energy shock is

[18] For a sufficiently large number of lags, however, both methods deliver very similar results in the short and medium run. At longer horizons, VAR responses tend to be smoother than LP estimates (the latter typically exhibiting higher variance but less bias). See, in particular, Plagborg-Moller and Wolf (2021).

[19] The confidence bands are based on the respective estimated standard errors.

[20] As previously discussed, we implement local projections combined with instrumental variable techniques (LP-IV) to address potential endogeneity issues (see Jordà et al., 2015) affecting both the energy price shocks and the domestic demand shocks. Results from the first stage estimations are reported in Table B1 in the Appendix. As expected, (i) a rise in $FREPI$ leads to an increase in $SEPI$, while (ii) the relationship between property taxes and domestic is negative and statistically significant. The negative relationship

associated with negative outcomes.

Looking first at the value added (panel *a*), we observe a negative and highly statistically significant response from horizon $h = 0$, that is, in the year of the shock. The immediate response —averaged across all manufacturing sectors— is estimated at about -0.28, indicating that a one-percent increase in energy prices is associated with a contemporaneous decline in manufacturing value added of 0.28 percent. This effect reaches its peak three years after the shock ($h = 3$), with a cumulative impact of roughly -0.85 percent. The index of industrial production (IIP, panel *b*) also exhibits a pronounced response to energy price shocks. Following an initial decline of about -0.26 percent at horizon $h = 0$, the effect reaches its peak of approximately -1 percent three years after the shock, before gradually receding thereafter. Overall, energy shocks are clearly associated with recessionary dynamics in industrial activity.

The decline in the manufacturing activity stems from both supply- and demand-side factors. On the supply side, rising energy prices increase production costs, thereby eroding competitiveness —both domestically and internationally— and depressing output.[21] Simultaneously, the energy price surge constitutes an adverse demand shock, affecting both final consumers and intermediate users of manufactured goods, notably industrial firms. Higher energy prices slow down value-added and output simultaneously due to income redistribution from energy-consuming economies to energy-producing ones presenting lower propensity to spend (Emter et al., 2023). At the domestic level, the marked contraction in sales (panel *c*) reflects these recessionary effects, with an estimated cumulative response of approximately -0.77 over the two years following the energy shock —i.e., two years after a 1 percent increase in energy prices, domestic sales are cumulatively reduced by about 0.77 percent relative to their pre-shock level. These effects are further exacerbated by second-round effects stemming from employment and real wage declines (panel *e* and

between property taxes and domestic demand is expected, since increases in taxation reduce households' disposable income. We rely on the weak identification test proposed by Kleibergen and Paap (2006) to assess the relevance of our instruments for each of the considered horizons, i.e., $h = 0, 1, ..., 4$. The null of weak identification is rejected in all cases, the test statistics being above the Stock and Yogo (2005)'s critical value at 10 percent max IV size. Tables B2 and B3 report second stage estimates underlying the estimations of the impacts of energy price and domestic demand shocks on the manufacturing sector along with summary statistics, including the Kleibergen and Paap (2006)'s statistics.

[21] These effects are expected to be particularly pronounced in energy-intensive industries (International Energy Agency (IEA), 2025), where energy accounts for a larger share of total input costs and substitution possibilities are more limited.

f, resp.) —thereby further dampening demand for manufactured goods. On the international front, the reduction in exports (panel *d*), estimated around -0.73 percent three years after the shock (cumulative effects relative to pre-shock export levels), underscores the persistent loss of competitiveness induced by the energy shock (Emter et al., 2023).

Our estimated effects are broadly comparable to those of Arezki et al. (2017), who find that the decline in energy prices following the shale gas boom led to a 10% increase in output and exports and a 3.7% rise in employment in the U.S. Applying a shock of similar magnitude and our estimated coefficients, we obtain more moderate increases in output[22] and exports (7% for each), and a slightly larger rise in employment (6%). Similarly, De Santis and Tornese (2025) estimate that a 10% increase in energy prices in a low-inflation regime results in a 4.5% fall in euro area industrial production - compared with a 7% decline in our own estimates.

[22] To ensure comparability with these papers, we measure the effect of energy prices on output (rather than on value added, as in Table B2).

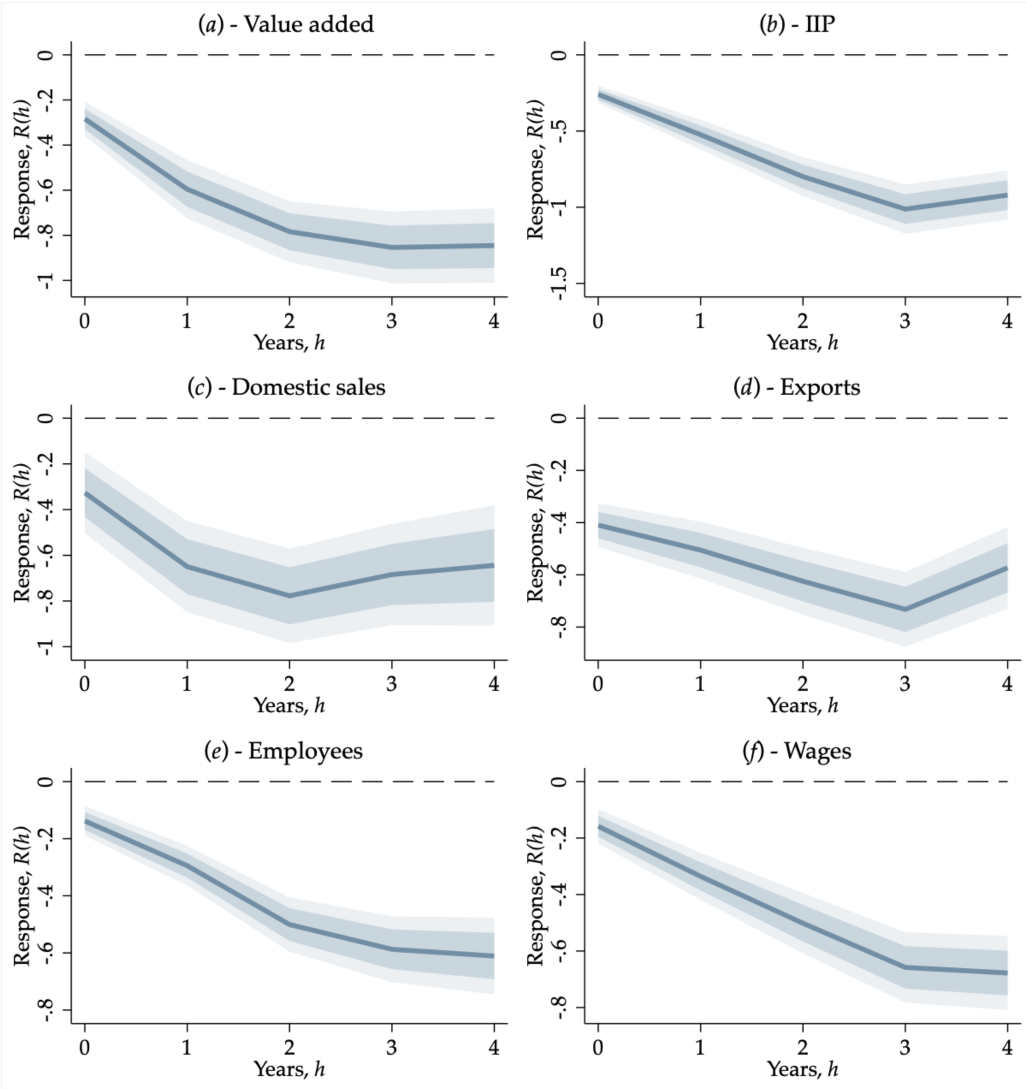

Figure 1 – Cumulative responses to an energy shock

Notes: Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

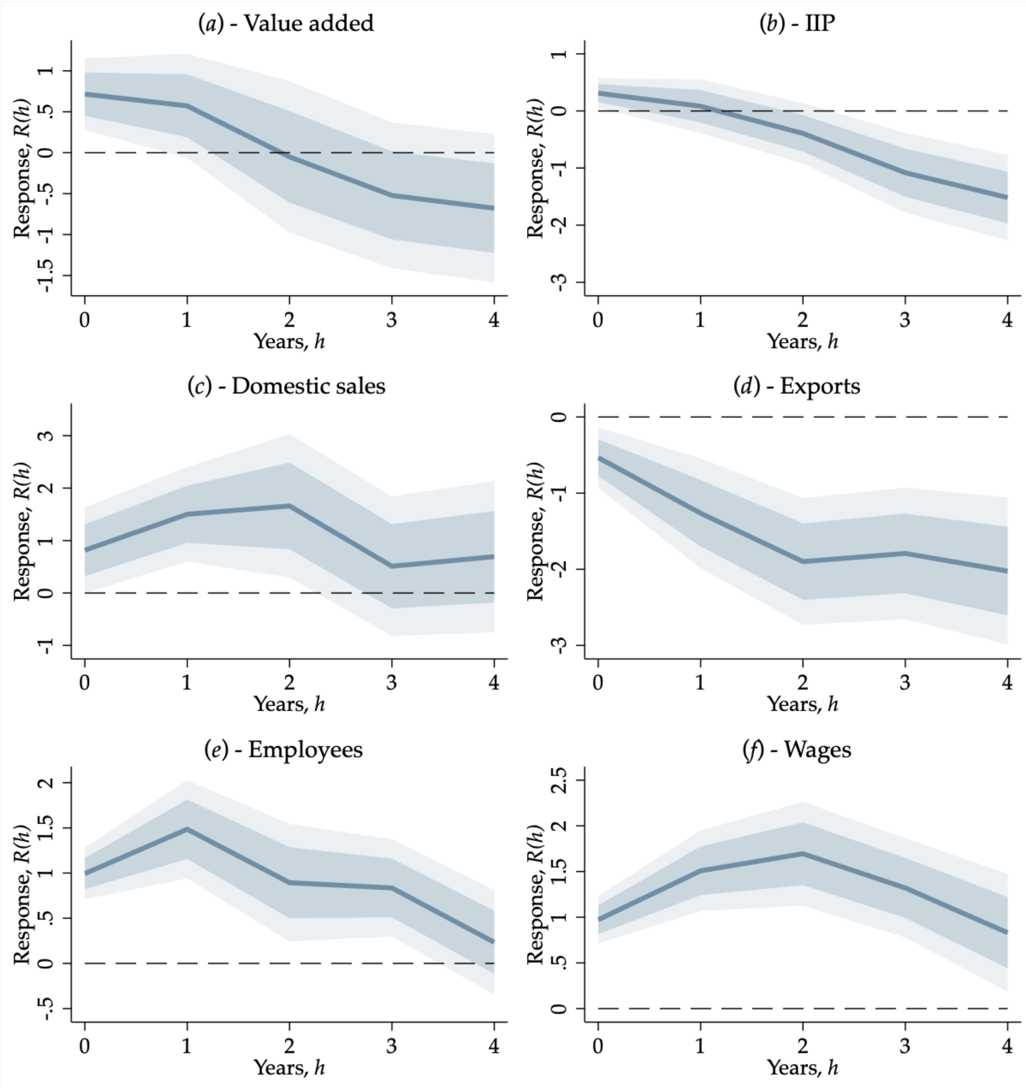

Figure 2 – Cumulative responses to a demand shock

Notes: Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

3.2. Macroeconomic impacts of domestic demand shocks on the manufacturing sector

The responses of our variables to a domestic demand shock —one percent increase— are reported in Figure 2.[23]

Following a domestic demand shock, manufacturing value added (panel *a*) responds positively. On average, the estimates indicate a 0.72-percent increase in the year of the shock, i.e., at horizon $h = 0$. However, at longer horizons, the cumulative effect gradually dissipates before turning negative. By $h = 4$, the estimates point to a cumulative decline of about 0.57 percent, significant only at the 68% confidence level. Thus, over the five years following a one-percent domestic demand shock, manufacturing value added falls by 0.57 percent relative to its pre-shock level.

The response of the index of industrial production (IIP, panel *b*) likewise indicates, as previously noted, a short-term positive effect of rising domestic demand —albeit a more modest one. At horizon $h = 0$, the estimated increase is around 0.31 percent. At longer horizons, the responses become more dramatic, with a more pronounced and highly significant decline. Hence, based on panels *a* and *b*, one can infer an ambivalent character of demand-stimulus policies with respect to industrial activity; an immediate positive effect that fades over time, and a negative effect that grows in magnitude as time progresses. A short-term revitalization of demand for domestic manufactured goods, followed by a subsequent loss of competitiveness, appears to be two sides of the same coin in a demand stimulus.

This conjecture tends to be confirmed by panels *c* and *d*. Indeed, the above noted short term increases in the value added and production appear to be driven by the domestic sales growth, which offsets the decline in exports. In fact, following a positive domestic demand shock, domestic sales show a steady increase, reaching a cumulative effect of 1.66 percent within three years (i.e., $h = 2$) before gradually declining (Figure 2, panel *c*). These estimates suggest a strong multiplier effect for domestic sales. Meanwhile, exports rapidly and continuously decline, with no signs of recovery in the medium term (Figure

[23] Results from the first stage estimations are reported in Table B1 in Appendix B. Table B3 provides the detailed LP-IV coefficients underlying the impulse responses reported in Figure 2. This table documents the sectoral responses of manufacturing value added, exports, and imports to demand shocks.

2, panel *d*). At $h = 4$, the estimates reveal a pronounced and lasting negative multiplier effect around 2.

While the significant and positive responses in employment supports the view of an invigorating effect of a positive domestic demand shock on industry (Figure 2, panel *e*), the associated upward effect on wages (Figure 2, panel *f*) tones down the overall effect as it also links a positive demand shock to a loss of (cost) competitiveness, thereby underlining an adverse effect on exports. Also, consistent with the upward impact on wages and the strong multiplier effect noted for domestic sales, it is worth noting that, in the short to medium term, exports may be further dampened by a reversed "vent-for-surplus" mechanism (Smith, 1776), that is, a reallocation of trade flows in favor of the domestic market due to its increased profitability.

4. The Role of Trade exposure

The results presented above provide baseline evidence on the impact of energy and demand shocks on manufacturing dynamics. However, trade openness can significantly shape these effects. In highly open sectors, activity depends more heavily on export performance than on domestic sales, which fundamentally conditions the response to a demand shock. By contrast, more closed sectors are less exposed to competitiveness channels and therefore respond primarily through domestic-demand adjustments. The transmission of energy-price shocks is also mediated by openness. In relatively closed sectors, limited exposure to international competition increases the likelihood of stronger cost pass-through, potentially amplifying the shock. In more open sectors, by contrast, competitive pressures and access to foreign demand can partly absorb or mitigate the effect of rising or falling energy costs.

In this section, we therefore assess whether the effects of energy-price shocks and demand shocks differ across sectors with varying degrees of trade openness-an aspect that remains largely unexplored. We proceed in three steps. First, we discuss why openness can act as a structural factor shaping the propagation of shocks. Second, we examine how it influences the impact of energy-price shocks. Finally, we analyze how demand shocks interact with trade openness in shaping manufacturing outcomes.

4.1. Relevance of sectoral openness

Conceptually, sectoral openness offers a valuable perspective for distinguishing between the domestic and foreign components of industrial activity. In the case of demand shocks, the observed contrast between short-term positive effects on output and longer-term declines in external competitiveness highlights the ambivalent nature of demand-driven fiscal stimulus. This ambivalence naturally calls for a closer examination of the role played by trade openness in the transmission of such shocks.

In particular, the supply-side effects resulting from a demand expansion are likely to vary with the degree of sectoral openness. The presence of an external constraint fundamentally shapes firms' capacity to respond to domestic demand. In relatively closed sectors, firms are insulated from international price competition and can therefore absorb demand increases more favorably. By contrast, firms in more open sectors face tighter competitive constraints, which can limit the expansionary effects of demand shocks. The extent to which this external constraint is binding may significantly affect the effectiveness of fiscal stimulus — and, in some cases, even offset its intended objectives.

Along the same lines, the sensitivity of energy shock effects to the degree of sectoral openness appears worth examining, as the latter may influence both the transmission of shocks and the propagation of their effects. Indeed, unlike in more open sectors, producers operating in sectors less exposed to international competition — i.e., more closed sectors — may have stronger incentives to pass on energy price increases, thereby amplifying the impact of energy shocks. This amplification mechanism may not stem primarily from the magnitude of the initial shock, but rather from the way its economic effects unfold over time, taking the form of an accelerator dynamic (Kilian, 2008; Baumeister and Hamilton, 2019). In such cases, the lack of openness could act as a sounding board for both the direct effects of the energy shock and its secondary ripple effects: a sharper slowdown in industrial activity due to rising production costs, but also a more pronounced decline in domestic demand in response —what could be called a "shock reverberation" effect. By contrast, in open sectors, energy shocks may be less severe due to *(i)* the greater adjustment capacity and flexibility of firms operating in highly competitive environments —which includes both weaker price pass-through and potential strategies such as outsourcing or relocating parts of the production process— and *(ii)* greater exposure to foreign demand, which can help offset the weakening of domestic demand caused by the shock.

To deep dive into the key role played by the sectoral openness, we classify sectors into two categories: "closed" and "open" sectors. Specifically, we construct various proxies for sectoral openness and partition the sample based on the relative position of each sector-country-year observation within the distribution of each openness measure, as follows:

$$\text{Openness degree} = \begin{cases} Open & \text{if} \quad p_{2.5} < Openness\ variable \leq p_{50} \\ Closed & \text{if} \quad p_{50} < Openness\ variable \leq p_{97.5} \end{cases} \quad (5)$$

where p_n refers to the n-th percentile of the openness variable's distribution.

Our baseline measure is the domestic market share defined as the ratio of the domestic sales to the total domestic market (domestic sales plus imports).[24] Hence, for each sector-country-year observation, if the domestic market share is below the median, it is classified as an "open sector"; observations above are assigned to the "closed sectors" group.[25]

4.2. Sectoral openness and the transmission of energy shocks

Figure 3 presents the results of the sensitivity analysis for energy shocks. As anticipated, although the overall patterns are broadly similar, energy shocks have more pronounced effects in closed sectors than in open ones. When examining value added, the shock is both more severe and more persistent in closed sectors, with a peak effect of -0.9 percent occurring two to four years after the shock, compared to a smaller peak of -0.7 percent at horizon $h = 2$ in open sectors (Figure 3, panels *a*.1 and *a*.2). The distinction between open and closed sectors is less apparent with regard to the index of industrial production (IIP, panels *b*.1 and *b*.2). However, domestic sales also fall more sharply and persistently in closed sectors, while they appear more resilient in open ones. This steeper decline likely reflects a more acute transmission of the energy shock through demand channels in closed

[24] The alternative proxies are *(i)* the share of domestic sales in total production, and *(ii)* the openness ratio computed as the ratio of the sum of exports and imports to total output. For the latter measure, the classification is reversed, with the bottom tercile representing "closed" sectors and the top tercile representing "open" ones.

[25] The sample is trimmed —2.5% on both tails of the distribution— to mitigate the influence of outliers. The findings remain robust to alternative definitions of thresholds. In particular, consistent results are obtained when considering groups based of the first and third terciles.

sectors, particularly via substantial contractions in employment (panel *e*) and wages (panel *f*). The same contrast holds for exports (panel *d*), where adverse supply-side effects are again more pronounced in closed sectors, reinforcing the broader asymmetry in the shock's transmission.

These results highlight the importance of sectoral openness in shaping the transmission of energy shocks. Closed sectors —those more reliant on domestic demand and less integrated into global value chains— experience more severe and persistent negative effects. The sharper contractions observed in value added and domestic sales in these sectors likely result from a combination of greater cost pass-through and more fragile demand dynamics. The absence of foreign demand as a stabilizing force amplifies the impact of the shock, while limited flexibility in input sourcing or production relocation constrains firms' capacity to adjust. Conversely, open sectors appear more resilient. Their integration into international markets not only diversifies demand sources but also allows firms to absorb domestic cost shocks through greater operational flexibility. Labor market responses further reinforce this asymmetry: employment and wage losses appear more pronounced in closed sectors, exacerbating negative demand spillovers and deepening the downturn. Export dynamics also suggest stronger supply-side constraints in closed sectors, likely due to competitiveness losses or capacity limitations. Overall, sectoral openness emerges as a key structural determinant of economic vulnerability to energy shocks. In particular, openness appears to act as a stabilizing or cushioning factor in the case of energy shocks.

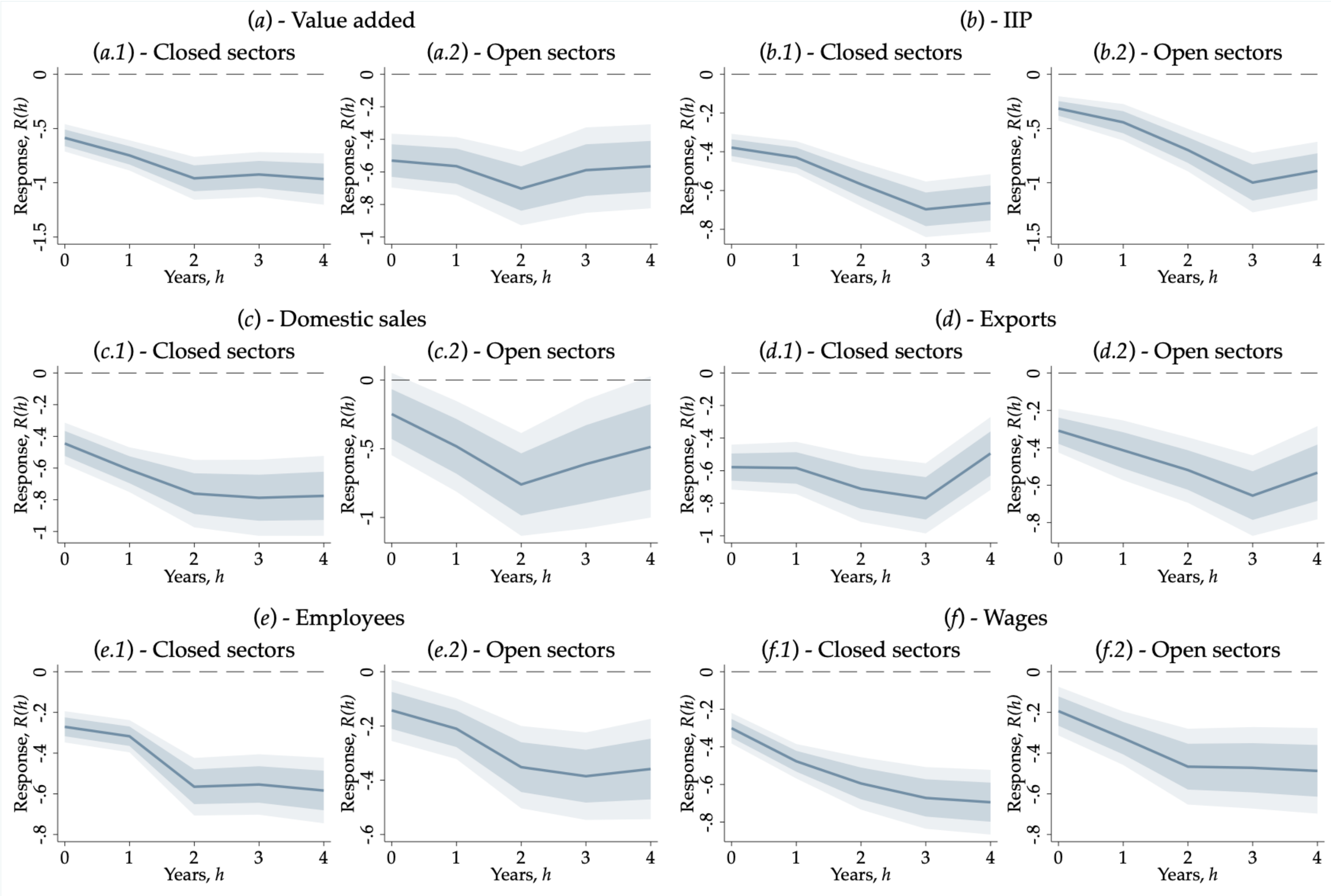

Figure 3 – Cumulative responses to an energy shock, by domestic market share

Notes: Domestic market share is defined as the ratio of domestic sales to the total domestic market, calculated as domestic sales plus imports. "Closed sectors" (resp. "Open sectors") correspond to observations above (resp. below) the median. Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

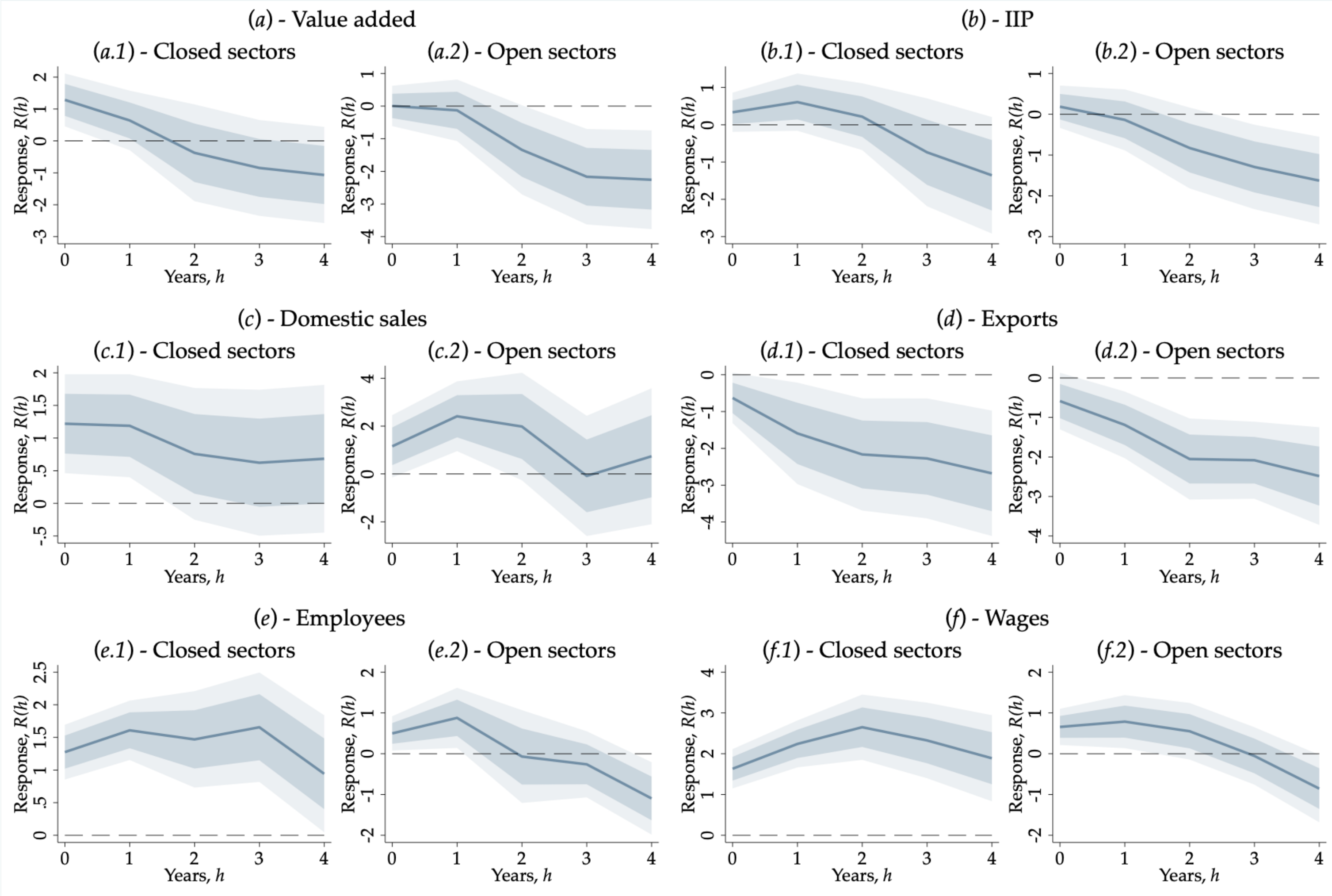

Figure 4 – Cumulative responses to a demand shock, by domestic market share

Notes: Domestic market share is defined as the ratio of domestic sales to the total domestic market, calculated as domestic sales plus imports. "Closed sectors" (resp. "Open sectors") correspond to observations above (resp. below) the median. Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

4.3. Sectoral openness and the effects of demand shocks

As for demand shocks, results reported in Figure 4 also point to different developments for open and closed sectors. Panels *a* and *b*, illustrating the dynamic responses of closed and open sectors to a one-percent domestic demand stimulus, highlight the importance of the domestic market share in shaping the responses of industrial value added and production. In closed sectors, fiscal policies that support domestic demand stimulate manufacturing value added and output, at least in the short run. The boost to value added appears relatively short-lived but substantial, with an estimated multiplier of 1.28 at horizon $h = 0$ (panel *a*.1). For industrial production, the effect peaks at 0.66 percent one year after the shock before gradually declining (panel *b*.1). At longer horizon however, domestic demand stimuli are associated with industrial contraction —in contrast with open sectors where the negative responses to domestic demand shocks appears relatively early, within the two years following the crisis. The above responses for closed sectors appear to be fueled by invigorated domestic sales (panel *c*.1), outweighing the decline in exports (panel *d*.1) resulting from a loss of international competitiveness due to rising costs (see panels *e*.1 and *f*.1). These dynamics stand in sharp contrast with those observed in open sectors, where demand stimuli are associated with a contraction in industrial activity, particularly marked between the third and fourth year following the shock. Four years after the stimulus, the cumulative estimated effects amount to -2.26 percent for value added (panel *a*.2) and -1.63 percent for industrial production (panel *b*.2). Despite the contained increase in labor costs (see panels *e*.2 and *f*.2), exports in open sectors decline (panel *d*.2), dragging down overall industrial activity as the rise in domestic sales proves insufficient to compensate.

These findings support our hypothesis regarding the potentially ambivalent nature of domestic demand shocks, contingent on the degree of sectoral openness. In relatively closed sectors, a boost in domestic demand tends to translate into higher domestic sales and, in turn, an increase in value added, with minimal impact on exports due to limited integration into global markets. However, these initial gains may be offset as external constraints —such as rising labor costs or labor shortages— begin to erode firms' production capacity and profitability. In more open sectors, the overheating associated with domestic demand shocks is less pronounced. This is largely due to the need for firms to remain competitive internationally, which limits their capacity to increase prices. Despite potential downward pressures on wages in response to external competition, our results show a reduction in exports, which contributes to a contraction in overall value added. This suggests that international exposure may act as a constraint, reducing the effectiveness of domestic demand support policies in such sectors. The persistence of this decline points to a long-lasting effect, potentially linked to a structural reorientation of firms. Establishments may have shifted their focus toward domestic markets, either as a strategic response to global uncertainty or due to the higher costs associated with maintaining former levels of export production.

5. Explaining euro area and U.S. manufacturing dynamics through energy and domestic demand shocks

To what extent have energy and domestic demand shocks contributed to the U.S.-Eurozone divergence? Building on our identification of energy-price and demand shocks and our previous results, this section quantifies the contributions of these shocks to manufacturing dynamics in the United States and the euro area.[26]

Energy-price shocks have been a major driver of U.S. manufacturing performance since 2011 (Figure B9), largely due to the shale gas revolution. In the 2010s, cumulative energy shocks explain around 47% of the total absolute contribution of all identified and residual forces shaping U.S. manufacturing value-added.[27] From 2011 onward, lower energy prices also bolster domestic sales (Figure B10) —via improved consumer purchasing power— and exports (Figure B11) through reduced production costs.

The euro area exhibits the opposite pattern. Energy prices weigh negatively on manufacturing value-added from 2000 to 2017, except for a brief period in 2017-2021 during which the contribution becomes slightly positive-consistent with the decline in energy prices over this period, particularly the fall in oil prices.. The sustained rise in energy prices from 2000 to 2013 dampened both domestic sales (Figure B10) and export dynamics (Figure B11) in the euro area.

[26]For the sake of brevity, we present the results only for France, Germany, Italy, Spain, the United States as well as the euro-area average. The results for the other countries are available upon request.

[27]The "Others" category is a net residual term that may include offsetting positive and negative contributions; its magnitude therefore understates the absolute size of the forces it aggregates

While energy-price shocks account for an important share of cross-Atlantic differences in manufacturing performance since 2011, domestic-demand shocks shape a distinct set of mechanisms. They influence manufacturing value added not only through their effect on internal markets and domestic sales, but also through their impact on wage dynamics, relative prices, and ultimately export competitiveness.

Crucially, the impact of demand shocks is structured around two markedly different macroeconomic phases. The 2000s were characterized by broad-based demand expansion, which supported domestic sales but generated wage pressures and deteriorating competitiveness. By contrast, the 2010s were dominated in the euro area by demand-compression policies, which weighed on internal markets but improved cost competitiveness and thereby strengthened export performance. The balance between these forces ultimately determines the contribution of domestic-demand shocks to manufacturing value added.

The contribution of domestic demand shocks to domestic sales (Figure B10) provides a clear illustration of these distinct phases. The 2000s correspond to a period of domestic-demand stimulation —both in the United States and in the Eurozone— which contributed positively to domestic sales. Within the Eurozone, this positive contribution was particularly pronounced in Spain, where cumulative domestic-demand shocks accounted for roughly 48% of the total absolute contribution of all identified and residual factors driving domestic-sales dynamics between 2000 and 2008, compared with only 16% in Germany.[28] By contrast, the 2010s in the euro area were characterized by demand-compression policies enacted in the wake of the global financial crisis and amid the sovereign-debt crisis. The contribution of demand shocks to domestic sales thus turns negative, particularly in Spain between 2010 and 2015, before becoming positive again from 2016 onward. In the United States, by contrast, domestic demand contributes positively —and strongly— almost every year, with a particularly large contribution between 2000 and 2008, when cumulative domestic demand shocks accounted on average for roughly 40% of the dynamics of domestic sales.

Domestic demand shocks also contributed positively to wage dynamics (Figure B12), with particularly strong effects in the euro area during the 2000s. This upward pressure on wages reinforced the positive contribution of demand shocks to domestic sales, but it

[28]Energy shocks account for 20% in Spain and 34% in Germany.

simultaneously weighed on export performance by deteriorating price competitiveness.

Regarding exports, Figure B11 shows the large negative contributions of demand shocks during the demand-stimulation phase of the 2000s. Between 2000 and 2008, cumulative demand shocks accounted on average for roughly 38% of export dynamics in the United States, 38% in the euro area, and 42% in Spain. During the 2010s and the sovereign-debt crisis, demand compression exerted a positive influence on export dynamics, especially in Spain and Italy. Cumulative domestic demand shocks accounted for 24% of export dynamics in Spain between 2013 and 2016, and for 15% in Italy between 2013 and 2017.

Given the relatively high openness of manufacturing sectors, the export channel dominates the total effect of domestic demand shocks on value added (Figure B9). As a result, the domestic demand-stimulation policies of the 2000s-while boosting internal activity-contributed negatively to manufacturing value added in the euro area, reflecting the deterioration of competitiveness. Conversely, the demand-compression policies of the 2010s contributed positively to manufacturing value added in the euro area, and even more strongly in Spain, as wage moderation improved unit labor costs and strengthened the external contribution to manufacturing growth.

Overall, the contribution of energy prices appears quantitatively larger than that of domestic demand when examining manufacturing value-added dynamics —particularly in the United States— reflecting in part the positive effect of lower energy prices on consumers of industrial goods. By contrast, when focusing on export performance, domestic demand shocks clearly dominate on both sides of the Atlantic: over the whole period, they account for roughly 40% of export dynamics in both the United States and the euro area, compared with 24% for energy shocks in the United States and 22% in the euro area. Interestingly, in the 2010s, the positive contribution of falling energy prices to U.S. export dynamics (36%) merely offsets the negative contribution associated with strong domestic-demand pressures (38%).

6. Additional results and Robustness checks

This section presents a set of complementary estimations and robustness checks. We first extend the analysis to the case of imports, and then examine the robustness of our findings to alternative measures of openness as well as to the assumption of a fixed energy mix.

6.1. The case of imports

Understanding how imports respond to energy price and domestic demand shocks provides useful additional insights. Analyzing import dynamics alongside export reactions offers a more comprehensive view of trade balance effects and sheds light on the strategies firms adopt to mitigate rising energy costs. Examining the import response to demand shocks also helps capture fiscal spillovers through the trade channel, by highlighting the extent to which increased demand leaks abroad via higher imports. Sectoral openness could shape all of these mechanisms: in highly open sectors, firms are more exposed to international competition, more reliant on global inputs, and more likely to adjust sourcing and production strategies in response to shocks. As such, sector-specific trade exposure could be central to interpreting the magnitude and channels of both energy- and demand-driven trade dynamics.

Figure B1 reports the response of imports to an energy shock, distinguishing sectors by three alternative measures of openness: the share of domestic sales in total production, the domestic market share, and the trade openness ratio. We find that energy price shocks have a negative effect on imports, with no significant difference between closed and open sectors. Figure B2 displays the effects of demand shocks on imports. The effect is weakly positive in closed sectors during the first year (significant at the 68% level), indicating that the import leakages associated with a demand expansion remain relatively limited. By contrast, it turns negative in open sectors. As suggested earlier, the decline in exports following a demand shock also leads to a reduction in imported inputs required for production, particularly in sectors with the most integrated production chains.

6.2. Alternative openness and energy-price measures

As additional —and final— analyses, we assess the robustness of our results to alternative measurement choices.

We begin by evaluating the sensitivity of our findings to different proxies for sectoral openness, replacing our baseline indicator with two alternatives: (*i*) the share of domestic sales in total production and (*ii*) the trade-openness ratio, defined as the sum of exports and imports relative to total production. The results, shown in Figures B3 to B6, remain consistent with our baseline findings.

We then examine whether our conclusions hold when energy prices are measured using alternative price indices. Specifically, rather than relying on time-varying weights in the construction of energy prices, we build fixed-weight energy price indices using two alternative base years for the energy-mix composition (2000 and 2010). Once again, both the baseline results —reported in Figure B7— and those conditional on openness —reported in Figure B8— confirm that our findings are not driven by shifts in the energy-mix composition over time.

Taken together, these robustness checks demonstrate that the patterns documented above do not hinge on specific measurement assumptions.

7. Conclusion

This paper examines how two major macroeconomic forces — energy price shocks and demand-led fiscal stimuli — shape manufacturing dynamics across advanced economies. Using a novel cross-country dataset and a robust identification strategy, we show that rising energy prices significantly depress manufacturing value added, with effects that are stronger and more persistent in less open sectors. By contrast, demand-led fiscal stimuli generate more nuanced dynamics: while they can sustain domestic activity in the short run, they also tend to erode price competitiveness and reduce exports, especially in the most trade-exposed industries. The net impact on manufacturing therefore crucially depends on the degree of sectoral openness.

Our findings open avenues for further research. One important direction is to investigate the asymmetric effects of fiscal stimulus measures. While restrictive fiscal policies reduce aggregate demand and may curb manufacturing output in the absence of external markets, fiscal expansions face a different constraint: the potential saturation of demand for manufactured goods. Households, for instance, are unlikely to purchase three cars or three televisions, even if their purchasing power increases.

Beyond its empirical contributions, our analysis highlights important policy implications. Energy shocks and fiscal demand shocks do not affect manufacturing uniformly: openness to trade acts as a key transmission channel. Policymakers thus face a fundamental tradeoff between supporting domestic demand and preserving external competitiveness. In the United States, abundant and relatively cheap energy has long been offset by strong domestic demand pressures, which contributed to a weakening of export performance. In the euro area, by contrast, more restrictive fiscal stances have helped contain wage and price pressures, but at the cost of subdued domestic demand. These divergent strategies shed light on the different industrial trajectories observed on both sides of the Atlantic.

Overall, our results suggest that addressing the dual challenge of energy price volatility and fiscal demand management requires a careful calibration of policies. Strengthening energy resilience, for example through diversification of supply and investment in renewables, appears critical to mitigating adverse cost shocks. At the same time, fiscal policy should be designed to support domestic demand without undermining long-term competitiveness. These findings underscore the importance of coordinating energy, fiscal, and industrial policies, especially for economies that either remain heavily reliant on manufacturing or seek to reindustrialize.

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Appendix

A. Data

A.1. Data, definitions and sources

Table A1 – Data description and sources

Variable	Source
Energy	
National industry end-user price indices (coal, electricity, heavy fuel oil, and gas)	IEA
Industrial weights: energy mix at the country-sector level.	EXIOBASE database
Regional energy prices (coal, gas, and oil)	Primary commodity prices database (IMF)
Manufacturing	
Employment (number of employees)	
Indices of industrial production (IIP)	UNIDO
Value added, in constant 2015 U.S. dollars.	(INDSTAT Revision 3)
Wages and salaries, in constant 2015 U.S. dollars.	
Domestics sales: production net of exports	
Exports, in constant 2015 U.S. dollars	CHELEM (CEPII)
Macroeconomic	
Domestic demand: real GDP augmented by imports and net of exports, expressed in constant 2015 U.S. dollars.	WDI (WB)
Foreign demand: sectoral trade-weighted average GDP of trading partners.	
Global Real Economic Activity ($GREA$)	Kilian (2009)
GDP deflator	IFS (IMF)
Property taxes: recurrent taxes on immovable property (item 4100), expressed in shares of GDP.	OECD Revenue Statistics
Real effective exchange rates ($REER$)	EQCHANGE (CEPII)

A.2. Stylized facts

A.2.1. A U.S.-Eurozone comparison

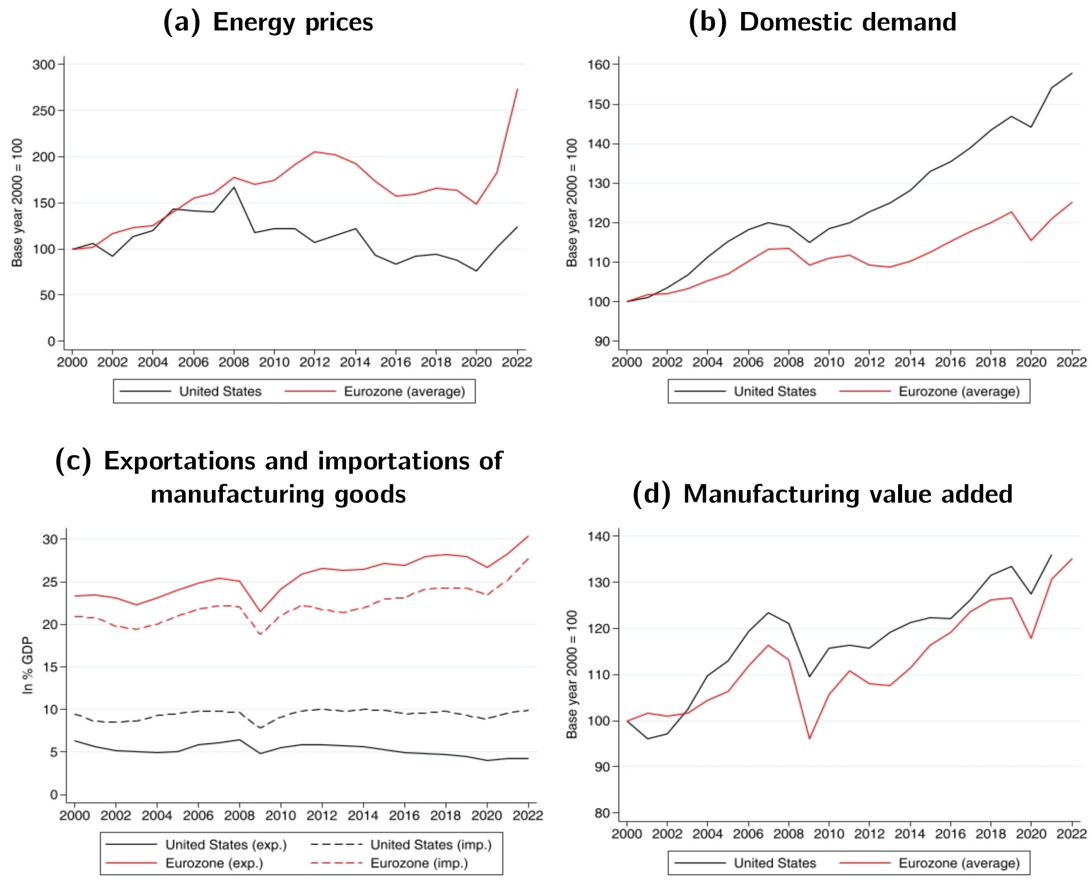

Figure A1 – US vs. Eurozone: key economic indicators

Note: Domestic demand and values added indexes are calculated using data expressed in constant 2015 US dollars. For energy prices, we use the sectoral energy price index ($SEPI$) computed with fixed weights (2010).

A.2.2. The energy price indices

Figure A2 shows our energy price measures for five major economies over the past four decades, differentiating between the time-varying measure (left panel) and the fixed-weight measure (right panel).

Overall, our measures accurately capture developments in energy markets, both at the national and international levels. Indeed, as shown in both panels at the beginning of the period, the second oil price shock of the late 1970s —driven by the Iranian Revolution and the subsequent Iran-Iraq War— resulted in sharp increases in energy prices across

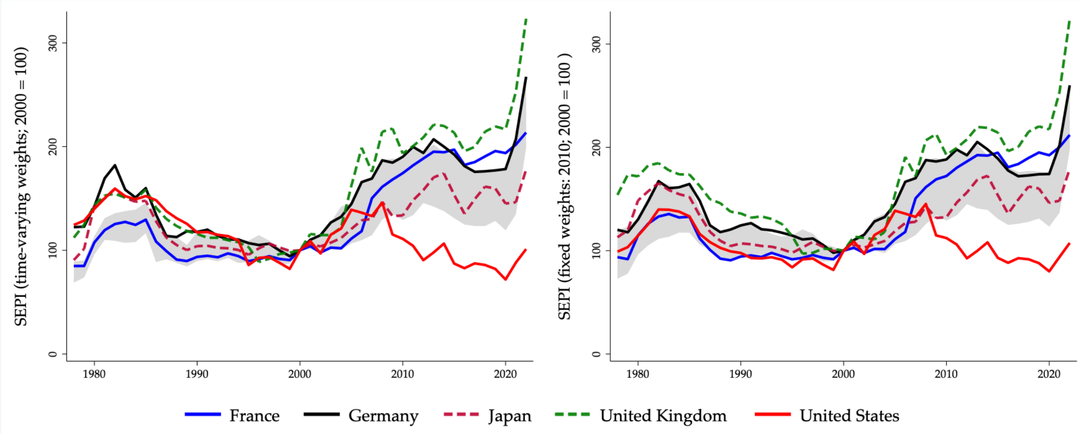

Figure A2 – Sectoral energy price indices: Time-varying vs. Fixed energy mix

Notes: The left (resp. right) panel displays the time-varying (resp. fixed, 2010) weights energy price levels. Average manufacturing energy prices. The shaded area represents the interquartile range, i.e., the range from the 25th percentile to the 75th percentile, across countries.

the countries under consideration. The peaks observed in the late 1970s and early 1980s stood as record highs for almost three decades. Benefiting from the increased production from non-OPEC countries and a shift in OPEC's strategy that triggered a sharp decline in global oil prices, energy prices experienced a two-decade-long downward trend. Taking into account the contemporary energy mix (left panel), France exhibited relatively low energy prices —compared to Germany and the United States—, brushing up against the first quartile of the distribution. Following a sharper decline in energy prices after the second oil shock, prices began to rise again around the 1990s. After a relatively calm period, the early 2000s marked a turning point, with energy prices entering an upward trend up to 2008 for most countries. By 2008, most countries were experiencing energy price levels comparable to those observed during the second oil shock. In the wake of the financial crisis and during the Great Recession, the upward trajectory of energy prices moderated, culminating in the end of the price cycle in 2014, driven by a steep drop in oil prices. The year 2008 also represents a major turning point for the United States. Reflecting the impact of the shale gas revolution, U.S. energy prices began to diverge from those of the other countries in the panel, following a downward trajectory and reaching historic lows by the late 2010s. In 2020, even at the trough of energy markets, average manufacturing energy prices —taking into account the sectoral energy mix— in France and Germany were slightly more than twice as high as those in the United States. In 2022, with the energy shock triggered by the war in Ukraine —in the post pandemic recovery—, the U.S. advantage was largely maintained, and even reinforced in some cases like the United Kingdom where the ratio exceeded 3 in 2022.

Figure A3 displays the sectoral and temporal distributions of the energy price index from 1978 to 2022, using stacked density curves. A clear rightward shift of the distributions over time reveals a strong, long-term increase in energy prices. In the early decades, the densities are concentrated at relatively low log-price levels, whereas from the 2000s onward they progressively cluster around much higher values. This pattern highlights a structural rise in energy costs consistent with global energy-market developments. Despite the common upward trend, the figure also shows substantial and persistent heterogeneity across sectors. Some industries —such as *Mining & Quarrying*, *Transport Equipment*, and *Machinery*— frequently appear toward the upper end of each year's distribution, suggesting a higher degree of energy-price exposure or a more energy-intensive production structure. Others, such as *Food & Tobacco* or *Wood & Paper*, tend to cluster closer to the middle of the distribution, indicating more moderate sensitivity to energy prices. This dispersion reflects underlying differences in energy intensity and in the composition of sector-specific energy mixes. The curves also reveal periods of heightened volatility. Several years, particularly between 2005 and 2010, exhibit wider and more asymmetric distributions, consistent with major global energy-market fluctuations during that decade. A similar pattern reappears in the early 2020s, when the pandemic and subsequent geopolitical tensions caused marked disturbances in energy supply and pricing. These dynamics underscore that energy shocks affect sectors unevenly, depending on their technological and input structures. Toward the end of the sample, especially after 2018, the distributions appear somewhat more concentrated. This may indicate a partial convergence in sectoral exposure to energy prices, potentially linked to a more homogeneous energy mix or to policy-driven adjustments associated with the energy transition.

Overall, Figures A2 and A3 provide a comprehensive depiction of the global, national, and sectoral dynamics of the energy environment in which firms operate, thereby reinforcing the relevance and credibility of our composite measure for the empirical analysis of energy price shocks on industrial performance.

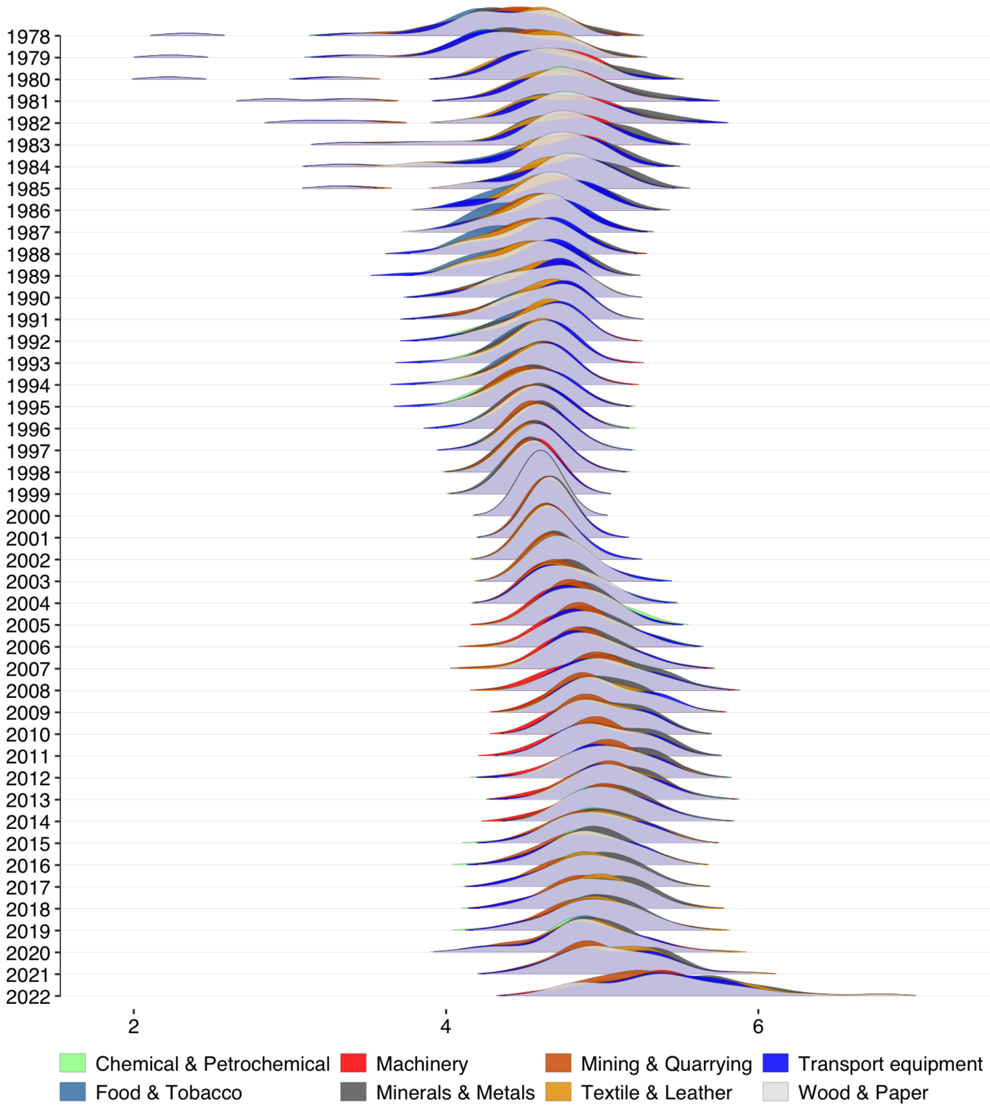

Figure A3 – Sectoral and temporal distributions of energy price index

Notes: Depicted are the energy price index measure (log scale) taking into account the contemporary sectoral energy mix, i.e., time-varying energy-mix $SEPI$.

B. Tables and Figures

B.1. LP-IV: auxiliary results

Table B1 – First-stage regressions

	Energy prices ($SEPI$)	Domestic Demand
$FREPI$	0.201***	
	(0.010)	
Property tax		-6.601***
		(0.986)
Observations	8,042	7,881
R-squared	0.212	0.155

Notes: Country-based cluster-robust standard errors in parentheses. All variables are expressed in log first differences. Auxiliary controls not reported. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table B2 – Responses to energy shocks (LP-IV estimations)

Horizon (year)	$h=0$	$h=1$	$h=2$	$h=3$	$h=4$
Δ_h Value added	-0.284***	-0.595***	-0.784***	-0.854***	-0.845***
	(0.046)	(0.079)	(0.083)	(0.097)	(0.100)
Obs. / Clusters	7,979 / 238	7,766 / 238	7,527 / 236	7,298 / 236	7,070 / 236
R-squared	0.086	0.026	0.031	0.017	0.022
K-P *rk* LM stat	121.3	145	140.4	141.6	139.4
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	363.9	541.3	469.3	500.3	484.1
Δ_h Industrial production	-0.259***	-0.524***	-0.799***	-1.012***	-0.920***
	(0.034)	(0.060)	(0.078)	(0.099)	(0.099)
Obs. / Clusters	6,766 / 206	6,586 / 206	6,381 / 206	6,176 / 206	5,971 / 206
R-squared	-0.025	-0.032	-0.064	-0.085	-0.043
K-P *rk* LM stat	107	121.8	114.4	117.3	115.9
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	256.3	345.8	298.1	324.4	316.5
Δ_h Domestic sales	-0.326***	-0.650***	-0.777***	-0.684***	-0.644***
	(0.108)	(0.121)	(0.126)	(0.135)	(0.160)
Obs. / Clusters	6,407 / 220	6,194 / 220	5,975 / 217	5,764 / 215	5,549 /213
R-squared	0.050	0.046	0.041	0.047	0.034
K-P *rk* LM stat	127.1	128.3	125.9	124.5	120.5
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	434.3	446.5	431.9	429.7	413.1
Δ_h Exports	-0.410***	-0.505***	-0.625***	-0.732***	-0.573***
	(0.051)	(0.066)	(0.078)	(0.087)	(0.095)
Obs. / Clusters	7,796 / 238	7,559 / 238	7,322 / 237	7,088 / 237	6,854 / 237
R-squared	0.003	0.013	-0.007	-0.039	-0.009
K-P *rk* LM stat	142.1	145.4	143.8	143.5	139.2
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	474.7	512	497	502.2	476.8
Δ_h Employees	-0.138***	-0.294***	-0.501***	-0.587***	-0.611***
	(0.032)	(0.042)	(0.058)	(0.070)	(0.082)
Obs. / Clusters	7,932 / 238	7,712 / 238	7,470 / 236	7,241 / 235	7,012 / 235
R-squared	0.015	0.035	0.030	0.026	0.014
K-P *rk* LM stat	118.1	142.8	136.5	137.8	136.1
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	335.8	507.7	431.8	459.9	447.1
Δ_h Wages	-0.158***	-0.336***	-0.502***	-0.658***	-0.678***
	(0.037)	(0.051)	(0.065)	(0.076)	(0.080)
Obs. / Clusters	7,833 / 236	7,622 / 236	7,385 / 235	7,157 / 235	6,927 / 234
R-squared	0.083	0.039	0.041	0.014	0.004
K-P *rk* LM stat	119.6	142	137.2	138.9	137
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	377.7	558.1	482.8	519.7	501.9

Notes: Δ_h denotes change from year $t-1$ to $t+h$. *** p<0.01, ** p<0.05, * p<0.1. Country-based cluster-robust standard errors in parentheses. Coefficient estimates of fixed effects and controls not reported. "K-P *rk* LM stat." refers to the Kleibergen-Paap (2006) statistic for underidentification test. "K-P *rk* Wald F stat." refers to the Kleibergen-Paap (2006) statistic for weak instruments.

Table B3 – Responses to demand shocks (LP-IV estimations)

Horizon (year)	$h = 0$	$h = 1$	$h = 2$	$h = 3$	$h = 4$
Δ_h Value added	0.717***	0.572	-0.050	-0.522	-0.678
	(0.266)	(0.387)	(0.563)	(0.542)	(0.551)
Obs. / Clusters	7,819 / 239	7,605 / 239	7,364 / 237	7,134 / 237	6,904 / 237
R-squared	0.090	0.051	0.068	0.053	0.054
K-P *rk* LM stat	67.59	64.04	67.21	66.57	64.56
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	44.03	40.51	48.11	46.13	44.69
Δ_h Industrial production	0.312**	0.082	-0.393	-1.082**	-1.517***
	(0.157)	(0.286)	(0.322)	(0.425)	(0.456)
Obs. / Clusters	6,774 / 207	6,593 / 207	6,387 / 207	6,181 / 207	5,975 / 207
R-squared	0.001	0.015	0.009	0.001	-0.006
K-P *rk* LM stat	48.48	42.61	50.14	48.32	46.81
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	28.14	24.92	30.68	29.32	28.32
Δ_h Domestic sales	0.816	1.501***	1.661**	0.510	0.693
	(0.498)	(0.549)	(0.833)	(0.811)	(0.879)
Obs. / Clusters	6,228 / 221	6,015 / 221	5,797 / 217	5,589 / 215	5,377 / 214
R-squared	0.056	0.053	0.047	0.064	0.046
K-P *rk* LM stat	58.77	58.20	55	54.66	52.94
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	42.16	42.26	41.12	39.99	37.75
Δ_h Exports	-0.533**	-1.263***	-1.899***	-1.791***	-2.024***
	(0.243)	(0.440)	(0.506)	(0.527)	(0.587)
Obs. / Clusters	7,633 / 239	7,395 / 239	7,157 / 238	6,922 / 238	6,686 / 238
R-squared	0.016	0.014	-0.006	-0.007	-0.008
K-P *rk* LM stat	66.68	65.38	63.77	62.75	61.77
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	49.07	47.61	46.21	45.16	44.37
Δ_h Employees	0.994***	1.485***	0.893**	0.835**	0.234
	(0.173)	(0.331)	(0.396)	(0.327)	(0.352)
Obs. / Clusters	7,771 / 239	7,549 / 239	7,306 / 237	7,075 / 236	6,846 / 236
R-squared	-0.021	0.001	0.047	0.042	0.039
K-P *rk* LM stat	71.07	67.32	64.15	64.24	62.38
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	51.53	47.60	45.46	43.68	42.72
Δ_h Wages	0.972***	1.508***	1.695***	1.320***	0.830**
	(0.158)	(0.268)	(0.346)	(0.331)	(0.393)
Obs. / Clusters	7,754 / 237	7,542 / 237	7,303 / 236	7,074 / 236	6,842 / 235
R-squared	0.073	0.023	0.041	0.035	0.035
K-P *rk* LM stat	68.79	64.89	68.50	67.43	65.73
rk LM *p*.value	0	0	0	0	0
K-P *rk* Wald F stat.	45.52	41.78	50.20	47.65	46.44

Notes: Δ_h denotes change from year $t-1$ to $t+h$. *** p<0.01, ** p<0.05, * p<0.1. Country-based cluster-robust standard errors in parentheses. Coefficient estimates of fixed effects and controls not reported. "K-P *rk* LM stat." refers to the Kleibergen-Paap (2006) statistic for underidentification test. "K-P *rk* Wald F stat." refers to the Kleibergen-Paap (2006) statistic for weak instruments.

B.2. The case of imports

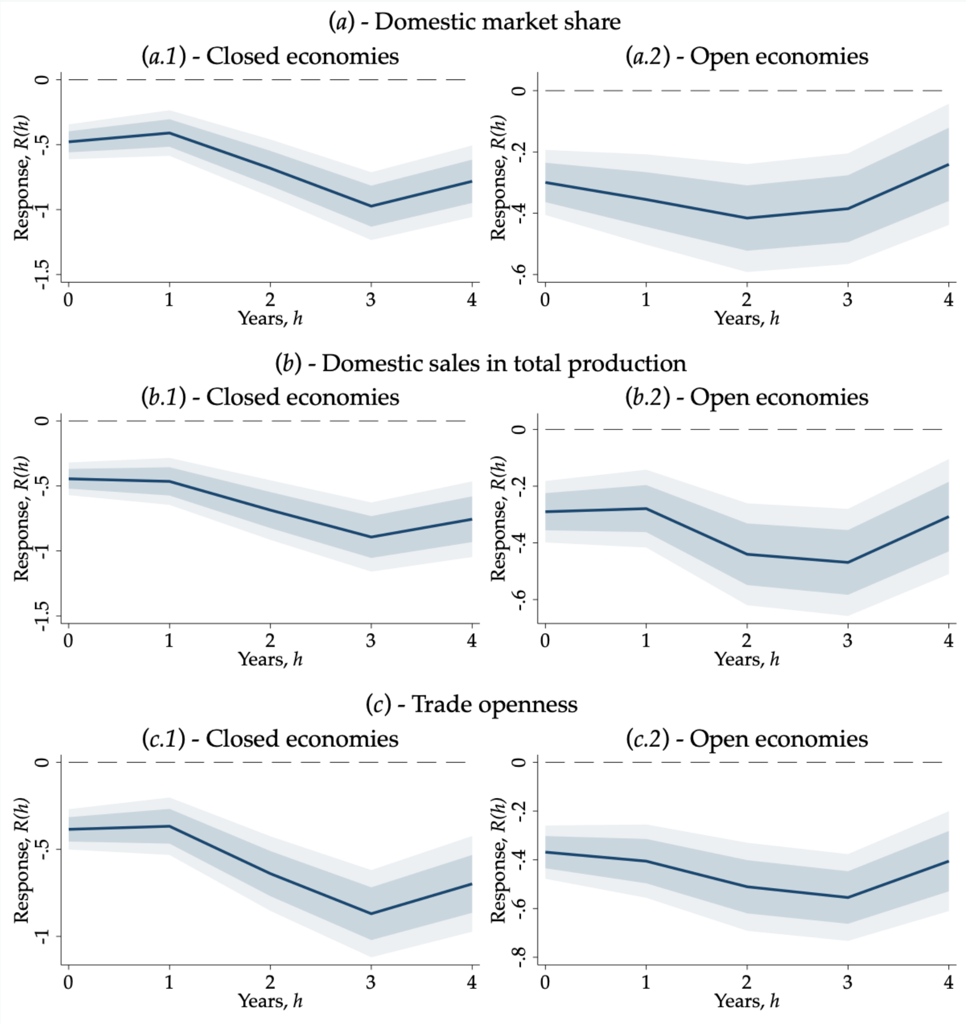

Figure B1 – Effects of Energy shocks on Imports

Notes: "Closed sectors" (resp. "Open sectors") correspond to observations above (resp. below) the median of domestic market share measure (panel *a*) and of the domestic-sales-to-total-production ratio (panel *b*). With respect to the trade openness ratio, closed sectors are defined as those in below the median, whereas open sectors are those above the median. All the measures are trimmed (2.5% trimming at each tail). Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (*i*) country-sector fixed effects, (*ii*) one lag of the endogenous variable, (*iii*) the log change in the domestic demand, (*iv*) the log change in foreign demand, and (*v*) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

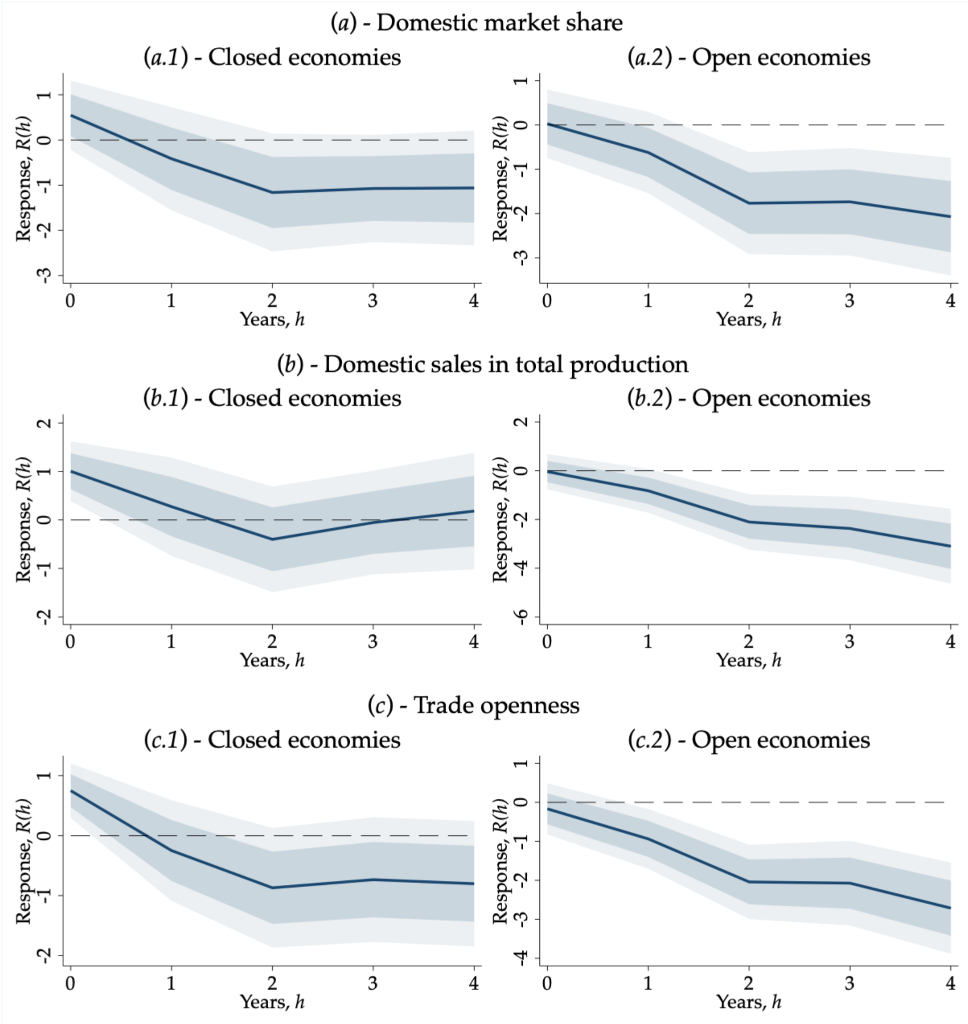

Figure B2 – Effects of Demand shocks on Imports

Notes: "Closed sectors" (resp. "Open sectors") correspond to observations above (resp. below) the median of domestic market share measure (panel *a*) and of the domestic-sales-to-total-production ratio (panel *b*). With respect to the trade openness ratio, closed sectors are defined as those in below the median, whereas open sectors are those above the median. All the measures are trimmed (2.5% trimming at each tail). Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

B.3. Alternative openness measures

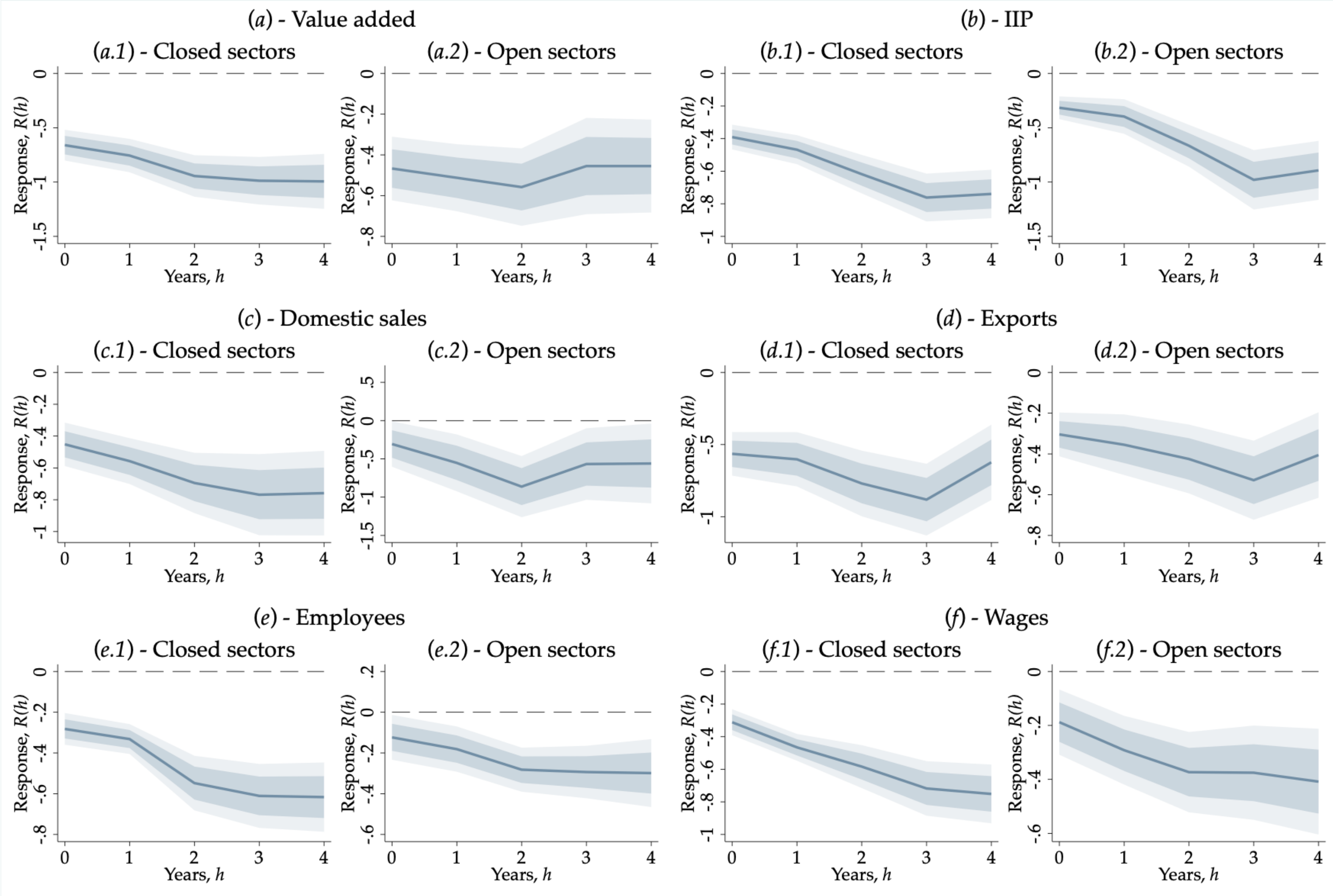

Figure B3 – Cumulative responses to an energy shock, by share of domestic sales in total production

Notes: "Closed sectors" (resp. "Open sectors") correspond to the second (resp. first) half of the domestic sales-to-total-production ratio (2.5% trimming at each tail). Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

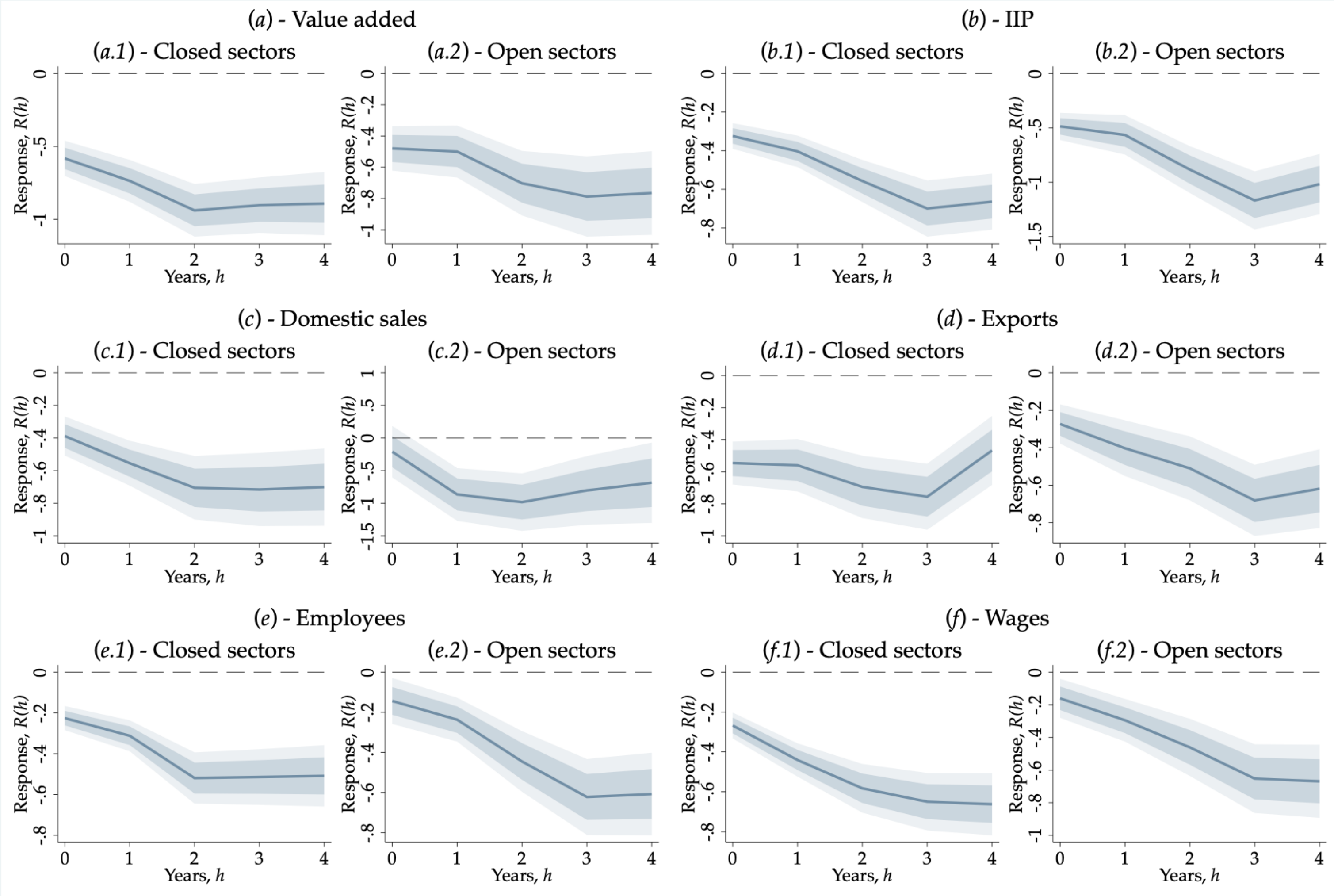

Figure B4 – Cumulative responses to an energy shock, by openness ratio

Notes: Openness is measured as the ratio of the sum of exports and imports to total output. "Closed sectors" (resp. "Open sectors") correspond to the first (resp. last) tercile of openness (2.5% trimming at each tail). Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (*i*) country-sector fixed effects, (*ii*) one lag of the endogenous variable, (*iii*) the log change in the domestic demand, (*iv*) the log change in foreign demand, and (*v*) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

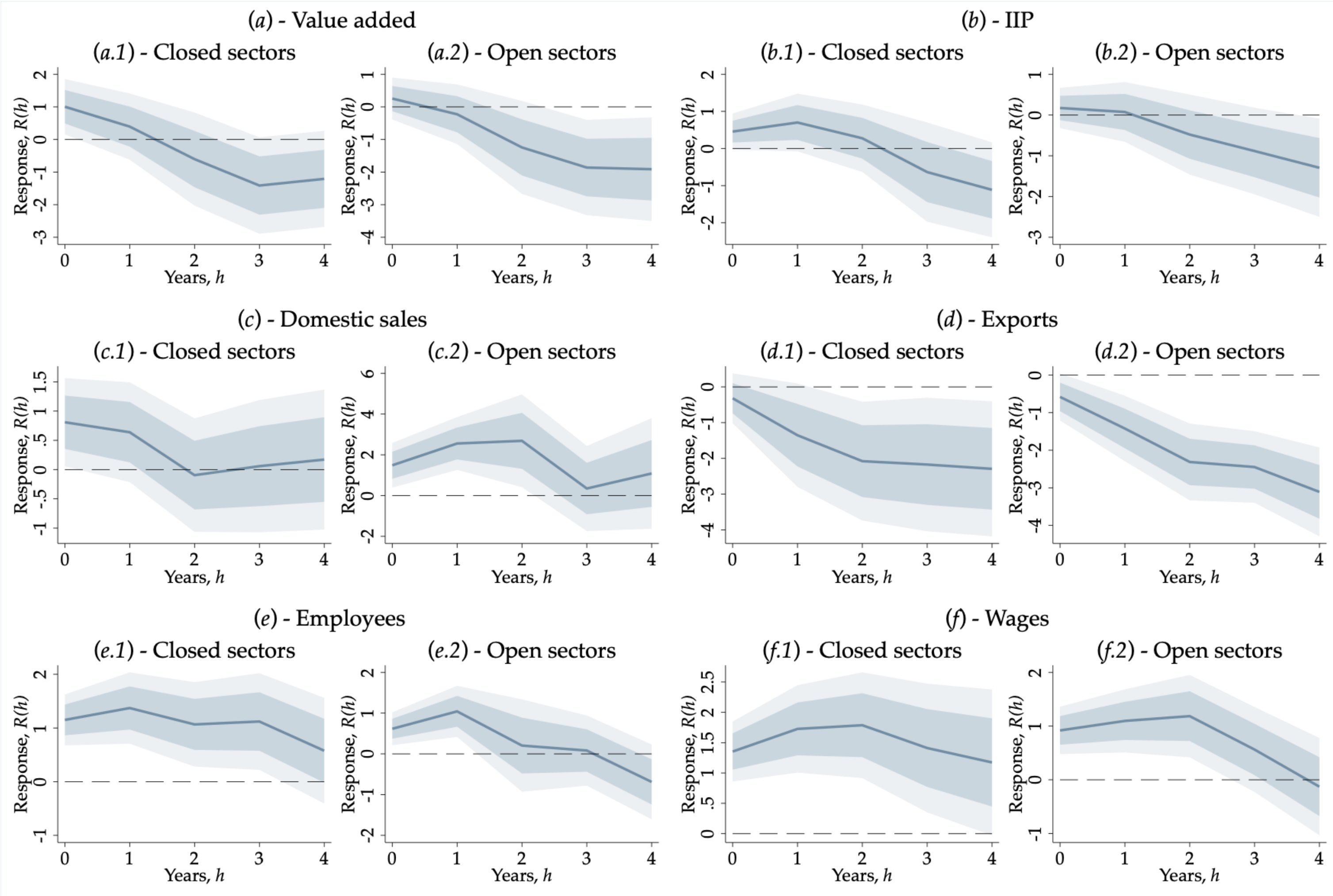

Figure B5 – Cumulative responses to a demand shock, by share of domestic sales in total production

Notes: "Closed sectors" (resp. "Open sectors") correspond to the third (resp. first) tercile of the domestic sales-to-total-production ratio (2.5% trimming at each tail). Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the energy price levels, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

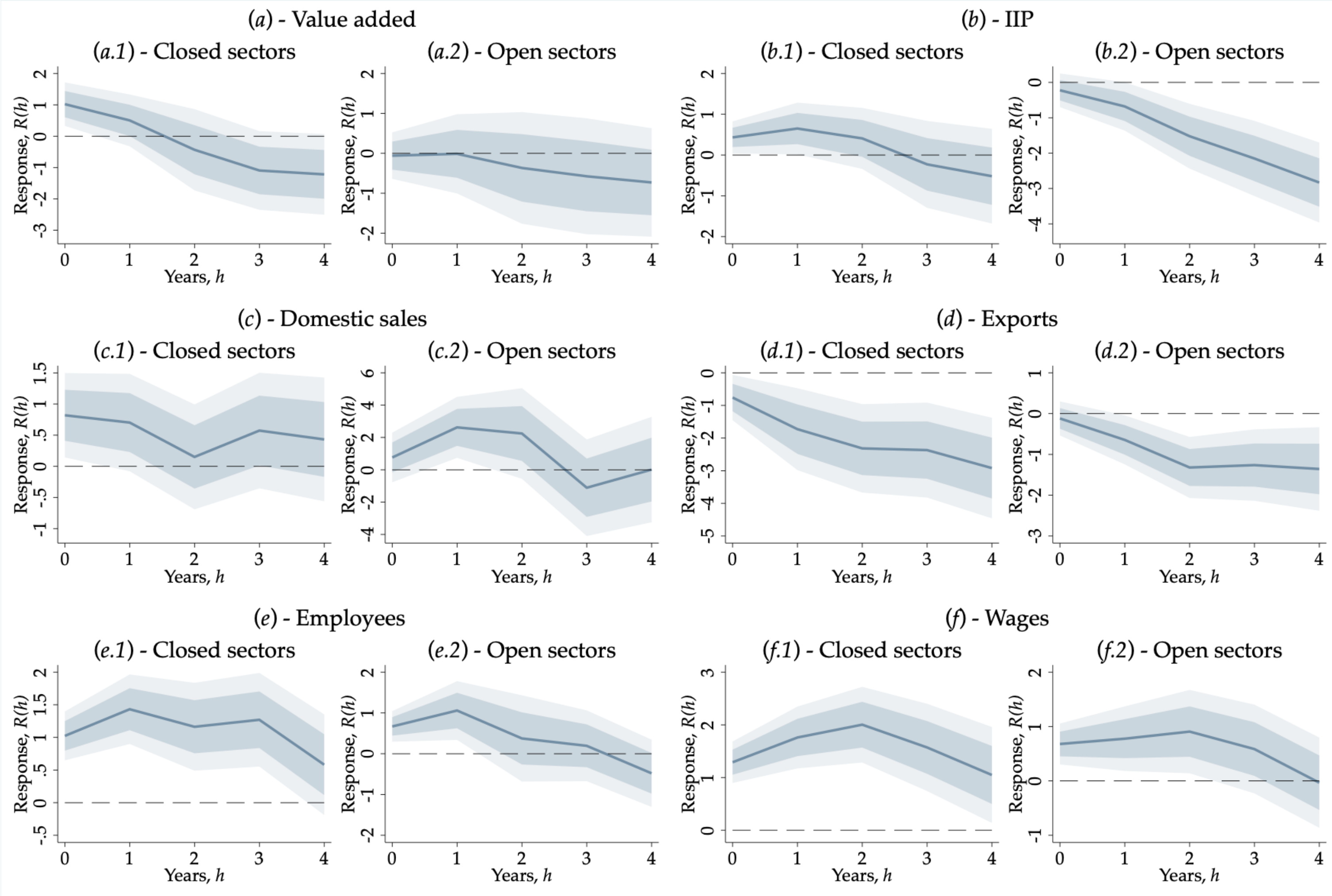

Figure B6 – Cumulative responses to a demand shock, by openness ratio

Notes: Openness is measured as the ratio of the sum of exports and imports to total output. "Closed sectors" (resp. "Open sectors") correspond to the first (resp. last) tercile of openness (2.5% trimming at each tail). Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the energy price levels, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

B.4. Alternative energy price measures

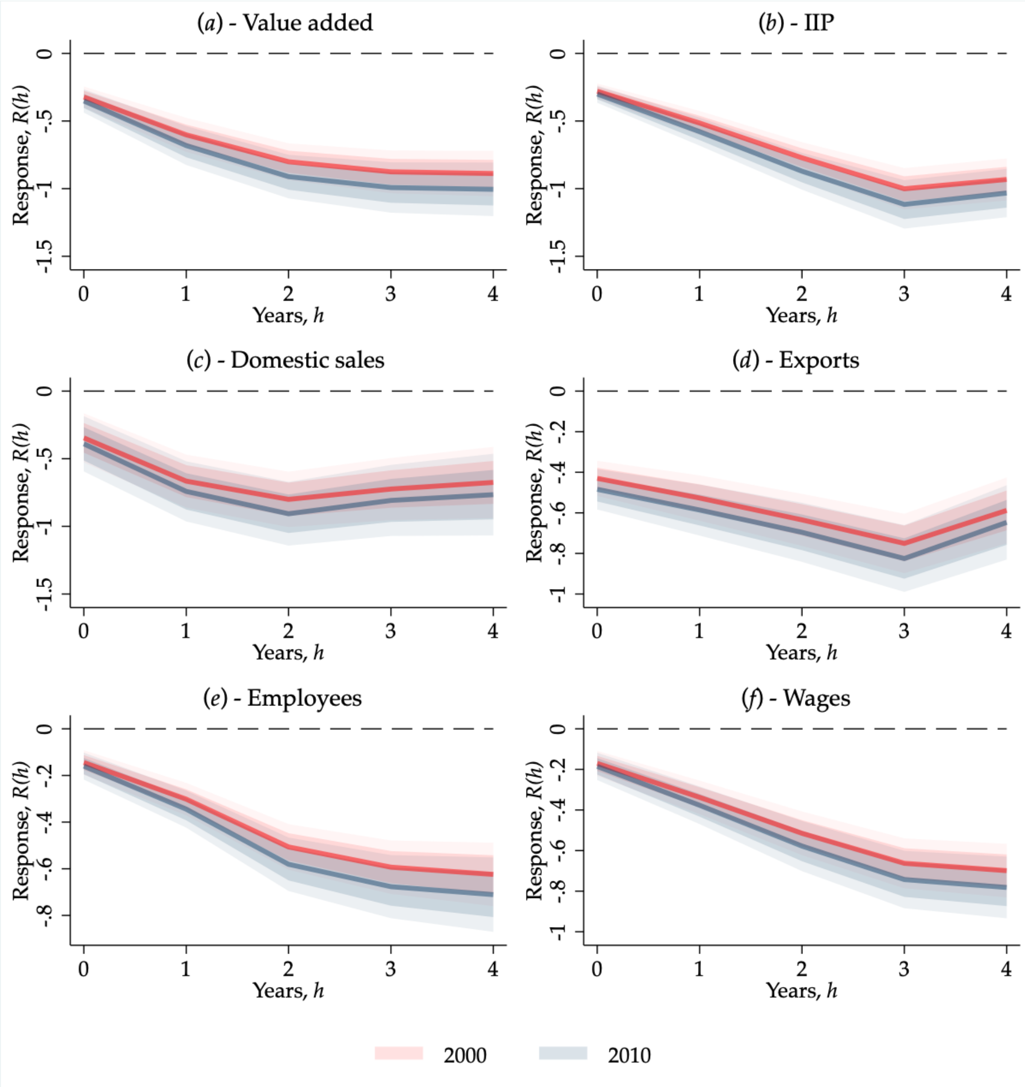

Figure B7 – Cumulative responses to an energy shock — fixed energy mix

Notes: Responses based on LP-IV estimations. The year in the legend denotes the reference year of the energy mix used to calculate the fixed-weights sectoral energy price index. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

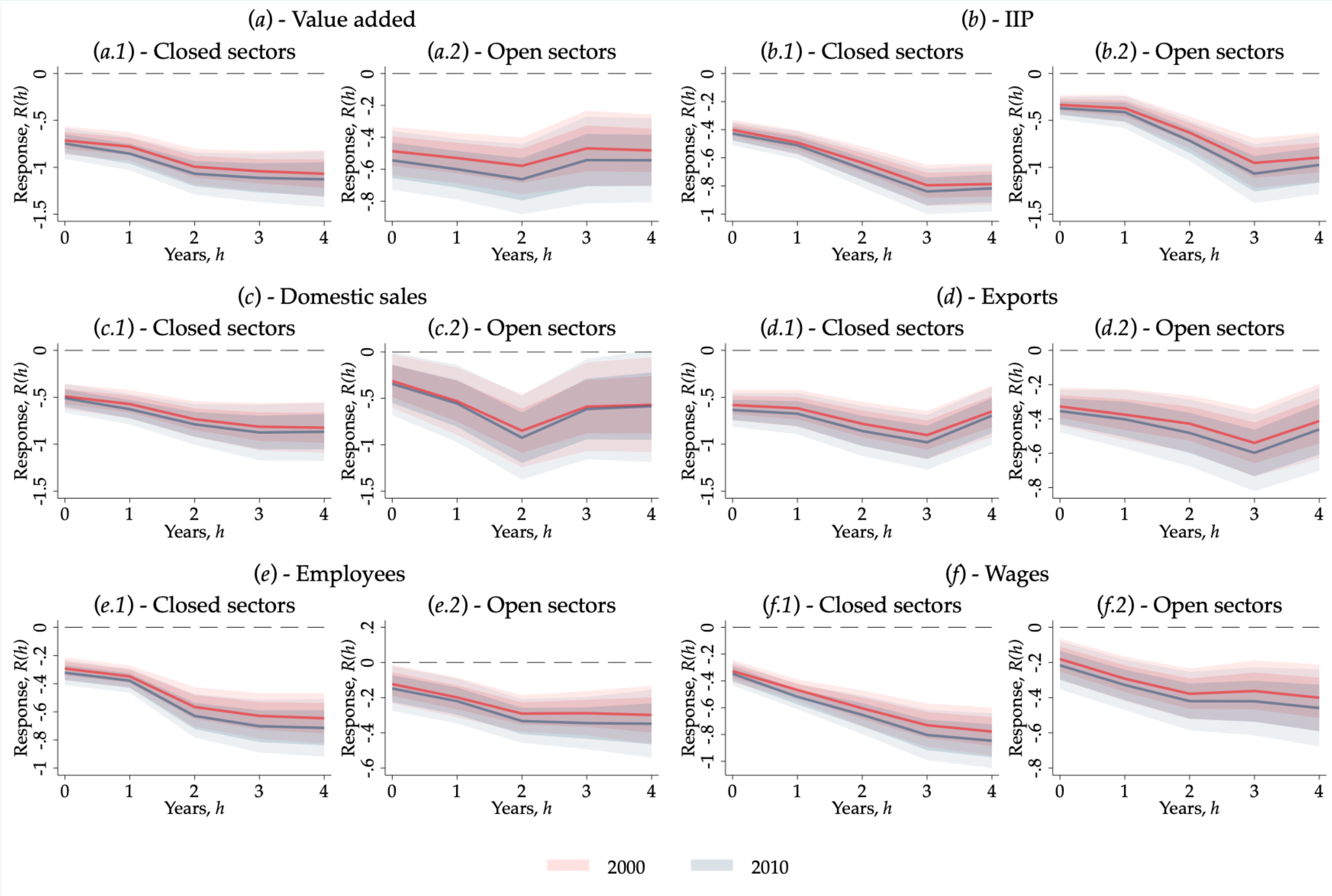

Figure B8 – Cumulative responses to an energy shock, by share of domestic sales in total production — fixed energy mix

Notes: The year in the legend denotes the reference year of the energy mix used to calculate the fixed-weights sectoral energy price index. "Closed sectors" (resp. "Open sectors") correspond to observations above (resp. below) the median of the domestic market share variable (2.5% trimming at each tail). Responses based on LP-IV estimations. The dependent variables are cumulative log differences, i.e., $ln(Y_{i,s,t+h}) - ln(Y_{i,s,t-1})$ with $h = 0, ..., 4$. Inferences based on standard errors clustered at the country-sector level. The set of controls includes: (i) country-sector fixed effects, (ii) one lag of the endogenous variable, (iii) the log change in the domestic demand, (iv) the log change in foreign demand, and (v) the log change in the real effective exchange rate. The small and large (lighter) bands indicate the 68% and 90% confidence intervals, respectively.

B.5. Historical decompositions

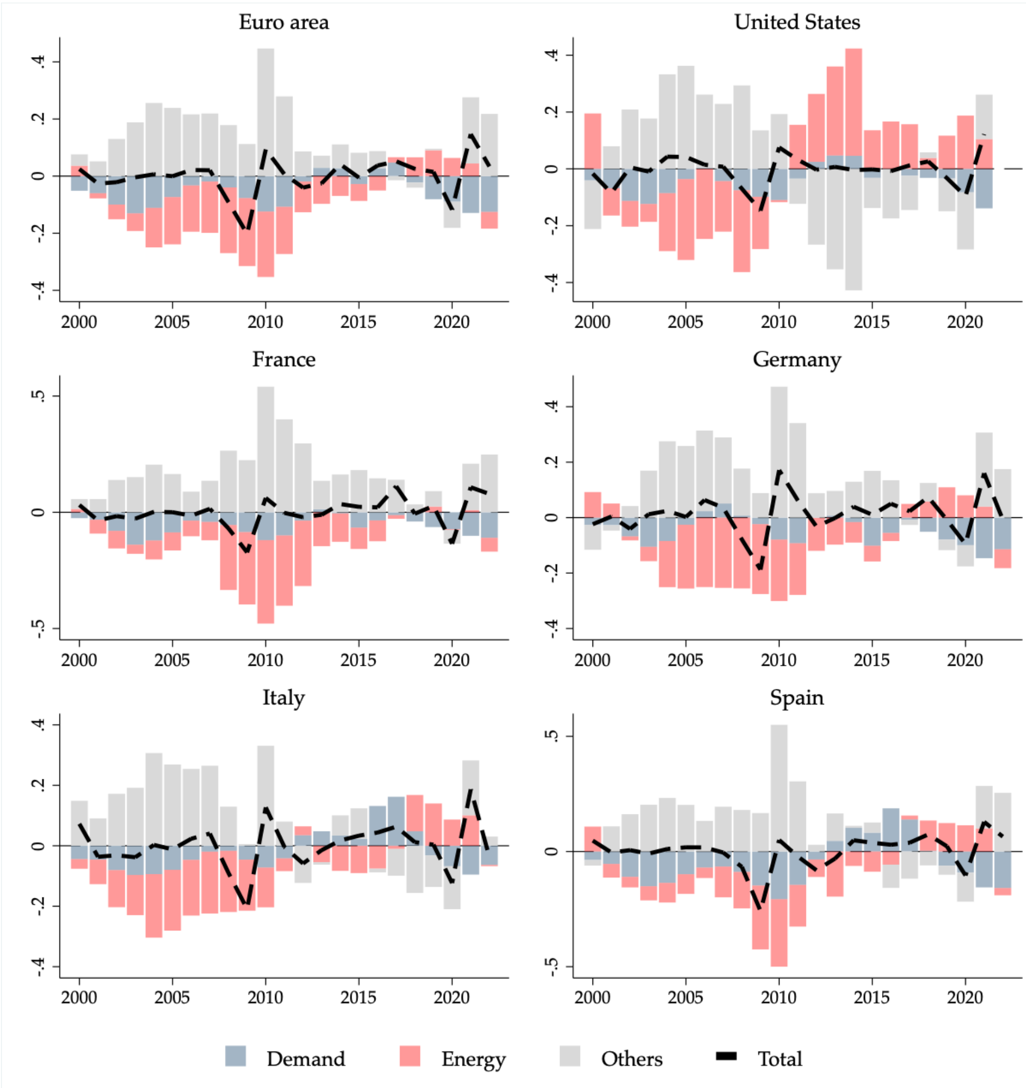

Figure B9 – Historical decompositions — Value added (growth rate)

Notes: Contributions (in percentage points) of the different shocks based on the estimated LP-IV specification that accounts for the degree of sectoral openness and aggregated using the relative sector weights. Contributions are shown from 2000 onward, depending on data availability. The black line (i.e., "Total") represents the observed series, while the colored bars depict the estimated contributions of each shock.

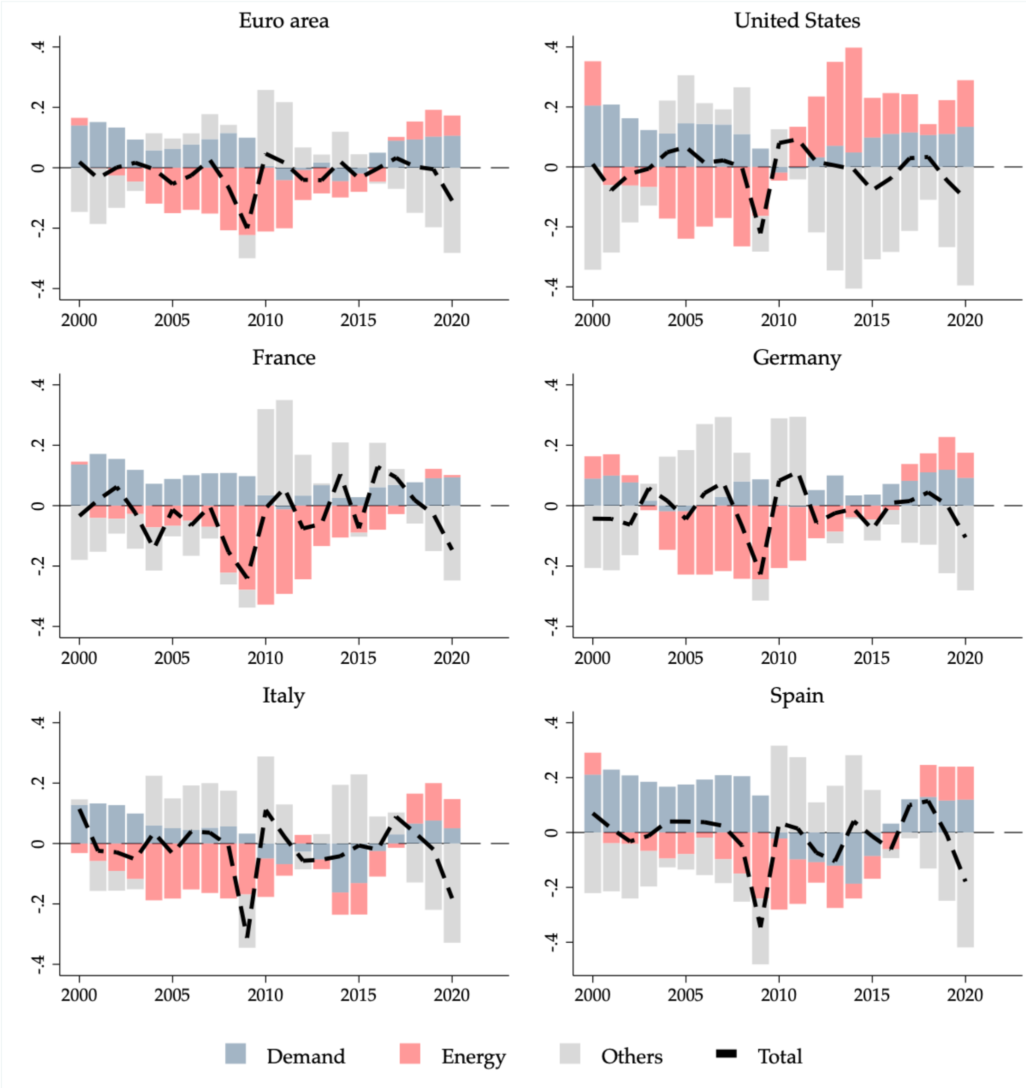

Figure B10 – Historical decompositions — Domestic sales (growth rate)

Notes: Contributions (in percentage points) of the different shocks based on the estimated LP-IV specification that accounts for the degree of sectoral openness and aggregated using the relative sector weights. Contributions are shown from 2000 onward, depending on data availability. The black line (i.e., "Total") represents the observed series, while the colored bars depict the estimated contributions of each shock.

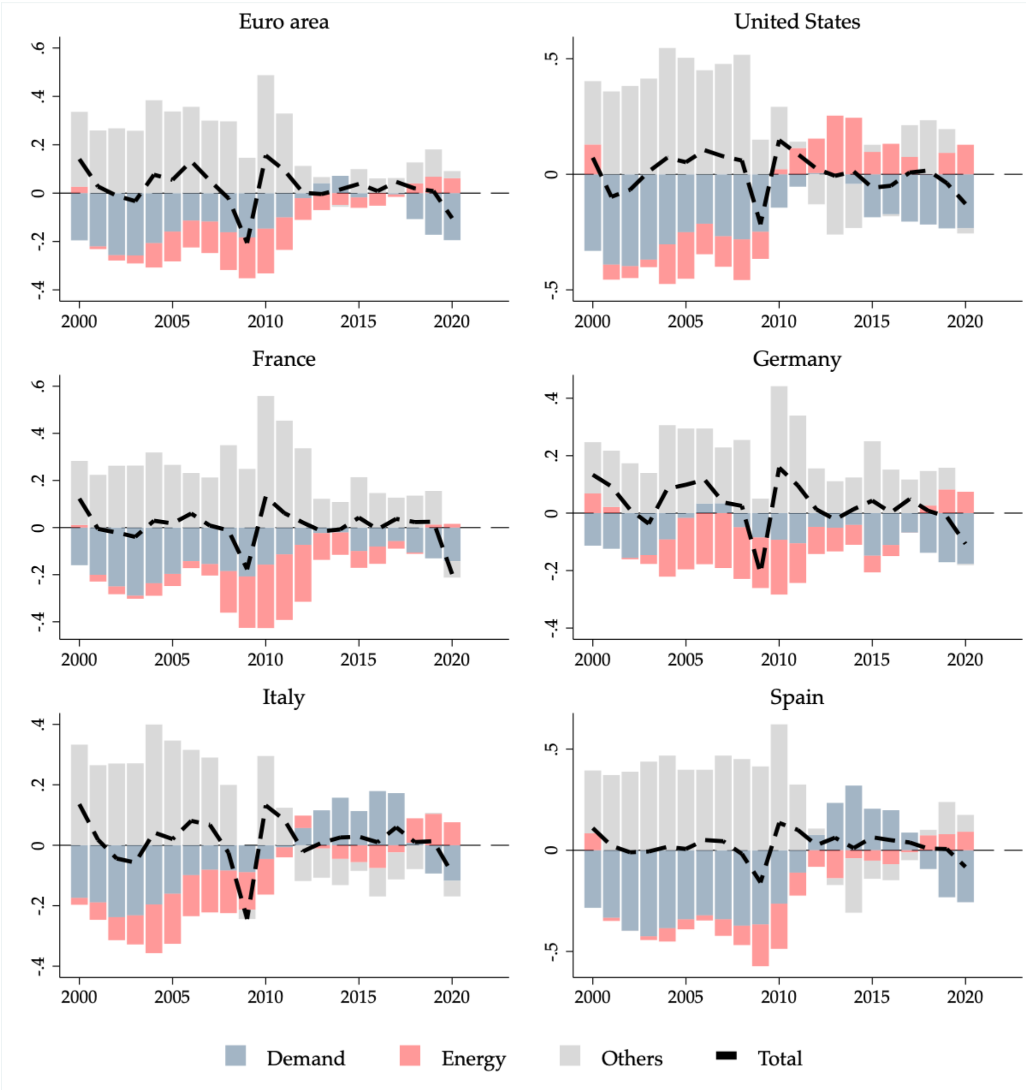

Figure B11 – Historical decompositions — Exports (growth rate)

Notes: Contributions (in percentage points) of the different shocks based on the estimated LP-IV specification that accounts for the degree of sectoral openness and aggregated using the relative sector weights. Contributions are shown from 2000 onward, depending on data availability. The black line (i.e., "Total") represents the observed series, while the colored bars depict the estimated contributions of each shock.

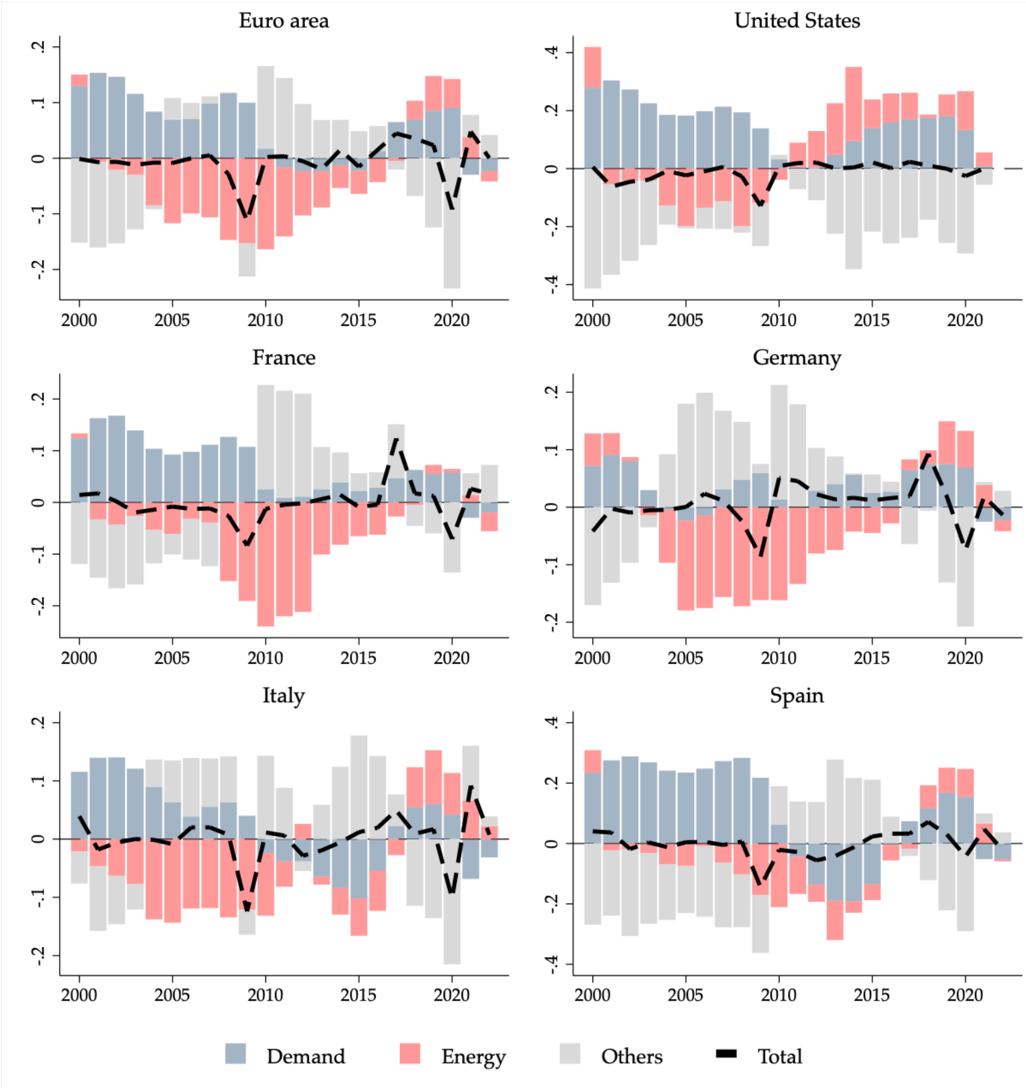

Figure B12 – Historical decompositions — Wages (growth rate)

Notes: Contributions (in percentage points) of the different shocks based on the estimated LP-IV specification that accounts for the degree of sectoral openness and aggregated using the relative sector weights. Contributions are shown from 2000 onward, depending on data availability. The black line (i.e., "Total") represents the observed series, while the colored bars depict the estimated contributions of each shock.